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THE IMPACT OF INSTRUCTIONAL SUPPORT ON STUDENTS' PERFORMANCE: AN EYE TRACKING STUDY

LOREDANA MIHALCA[1]

ABSTRACT. This study examined the effects of various types of instructional support (incomplete worked-out examples - IWE; completion problems - CMP and conventional problems - CVP) on students' attention allocation and performance as they use a computer-based learning environment. Eye movement and performance data were obtained from sixty-three university students who were randomly assigned to one of the three conditions. Results indicated significant differences regarding the number and duration of fixations, not only between the three conditions, but also between these conditions across the five genetics problems students solved during training. These findings indicate that the type of instructional support differently impacted the students' allocation of visual attention, with participants in the IWE condition having significantly lower number of fixations and shorter fixation durations. In addition, the number and duration of fixations were significantly lower in the CMP condition than in the CVP condition, but only at the beginning and the end of training (i. e., problems 1 and 5). Finally, the amount of processing time as revealed by the eye tracking data was associated with the learning outcomes (e. g., training performance), indicating that visual attention is indeed related to the strategic processing during problem solving. The combined use of eye tracking data with learning measures provides a more comprehensive picture of the cognitive processes that underlie the problem solving.

Keywords: *incomplete worked-out examples, completion problems, eye tracking, attention allocation, fixation duration.*

ZUSAMMENFASSUNG. Diese Studie untersuchte die Effekte verschiedener Lernunterstützungen (ausgearbeitete Lösungsbeispiele – IWE; teilweise ausgearbeitete Problemlösungsaufgaben – CMP und konventionelle Problemlösungsaufgaben – CVP) auf die Aufmerksamkeit und Leistung während des Lernens in einer computergestützten Lernumgebung. Augenbewegungen und Leistungsdaten wurden von 63 Studierenden erhoben, die zufällig zu den drei Versuchsbedingungen zugeteilt wurden. Die Ergebnisse

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zeigten signifikante Unterschiede hinsichtlich der Zahl und Dauer der Fixierungen, nicht nur zwischen den drei Gruppen, sondern auch zwischen den Gruppen über die fünf Genetik-Aufgaben hinweg, die die Studierenden während des Trainings lösen mussten. Diese Ergebnisse zeigen, dass die verschiedenen Lernunterstützungen die visuelle Aufmerksamkeit der Studierenden unterschiedlich beeinflussten. Darüber hinaus korrelierte die Verarbeitungszeit, die durch die Augenbewegungen erfasst wurde, mit den Lernergebnissen (der Trainingsleistung), d. h. visuelle Aufmerksamkeit ist mit der strategischen Verarbeitung während des Problemlösens verknüpft. Die Verbindung von Eye-Tracking und Leistungsmessung ergibt ein umfassenderes Bild der kognitiven Prozesse, die dem Problemlösen zu Grunde liegen.

Schlüsselwörter: *ausgearbeitete Lösungsbeispiele, teilweise ausgearbeitete Problemlösungsaufgaben, Eye-Tracking, Aufmerksamkeit, Fixationsdauer.*

1. Introduction

The benefits of presenting students with worked-out examples (i. e., step-by-step demonstrations of how to solve a problem) as compared to completion or conventional problems have been shown in many studies (e. g., Atkinson, Derry, Renkl & Wortham, 2000; Renkl & Atkinson, 2003). However, the vast majority of these studies have used product-related measures (i. e., off-line written tests) from which the benefits of worked-out examples were inferred. To our knowledge, none of these studies have tested the differential effects of instructional support type (i. e., worked-out examples, completion problems, and conventional problems) directly, for example, by using recordings of participants' eye movements (see Van Gog, Kester, Nievelstein, Giesbers & Paas, 2009). Eye movement data can provide more subtle insights into the cognitive processes of problem solving and reveal changes in these processes at an individual level that may occur over time as a result of practice (e. g., Van Gog, Paas & Van Merriënboer, 2004). Therefore, the purpose of this study was to examine students' cognitive processing while learning about genetics with different types of instructional support embedded in a computer-based learning environment (CBLE) using both eye tracking and learning measures. Specifically, this study explored the differences in students' attention allocation in learning from incomplete worked-out examples and completion problems in comparison with conventional problem solving, as well as on their performance and cognitive load.

1.1. Worked-out Examples, Incomplete Worked Examples, and Completion Problems

Problem-solving schemas (i. e., knowledge about problems and corresponding solving procedures) are more easily acquired when learning from worked-out examples rather than traditional problem solving without any support (i. e., conventional problems), at least when students have low prior knowledge in a domain (e. g., Van Gog, Kester & Paas, 2011). Worked-out examples provide students with full instructional support, which consists of a description of the problem state, the solution steps, and the final solution itself, while conventional problems provide only a description of the problem state together with the final solution and students have to complete the solution steps themselves. Numerous studies have shown that instruction using worked-out examples is more effective (i. e., higher performance) and efficient (i. e., higher performance combined with lower instructional time and/or cognitive load) than instruction consisting of conventional problems (for overviews, see Atkinson et al., 2000; Renkl, Hilbert & Schworm, 2009; Van Gog & Rummel, 2010). This is called *worked-out example effect* (see Sweller, Van Merriënboer & Paas, 1998; Sweller, Ayres & Kalyuga, 2011, for more details). The beneficial effects are explained by the fact that worked-out examples reduce unproductive search processes and thus free up the cognitive resources needed for acquiring problem-solving schemas (see Sweller et al., 1998; Van Gog et al., 2011, for reviews).

Contrary to the use of worked-out examples, when solving conventional problems students employ a means-ends analysis, which causes excessive cognitive load and ultimately hinders schema acquisition (Renkl et al., 2009; Van Gog et al., 2011). Cognitive load is defined as the burden imposed on working memory capacity by problem-solving processes (Paas &Van Merriënboer, 1994; see also Paas, Tuovinen, Tabbers & Van Gerven, 2003). Mental effort is the subjective component of cognitive load (Paas et al., 1994), which refers to the cognitive resources allocated to deal with the demands imposed by solving a given problem (Paas et al., 2003). Another subjective measure of the cognitive load refers to the ratings of task difficulty (e. g., Kalyuga, Chandler & Sweller, 1999). The perceived task difficulty is a direct result of the number of elements that need to be simultaneously processed in working memory to understand the instructional material (e. g., a given problem; see Schnotz, 2010). In general, the greater the number of elements that need to be processed simultaneously, the higher the cognitive load, which is reflected by an increase in perceived task difficulty and the amount of mental effort invested (Brünken, Plass & Pleutner, 2003).

Despite the evidence supporting the benefits of worked-out examples in comparison with conventional problems, the findings vary and are contradictory (e. g., Kalyuga, Chandler, Tuovinen & Sweller, 2001; Van Merriënboer & Sweller, 2005). For example, some studies have shown that simply providing worked-out examples is not sufficient to improve learning, because there is no guarantee that

students deeply process and elaborate on the completed solutions steps (see Paas & Van Gog, 2006). A deeper processing and understanding of the worked-out examples can be fostered by making the sub-goals in a solution plan explicit through labeling or visually isolating them (see Catrambone 1995, 1996). According to the sub-goal learning model (Catrambone 1995, 1996), when the solution steps are emphasized by labeling or visually isolating them, students are more likely to self-explain how these steps are connected and contribute to the final solution, which in turn promotes successful learning (see also Renkl et al., 2009).

Another method to improve deep processing is providing so-called incomplete worked-out examples, in which one solution step is omitted. Incomplete worked-out examples have been shown to be more effective than fully worked-out examples in which all steps were presented (e. g., Renkl, 2002; Stark, 1999). Comparing incomplete worked-out examples with fully worked-out examples, Stark (1999) found that the insertion of "blanks" into a sequence of solution steps (making the solution partially incomplete) prompted students' self-explanations, which in turn increased their performance. When faced with "blanks" in the solution steps, students engage more deeply and actively in processing the worked-out steps, because they have to complete by themselves the missing solution (e. g., Renkl, 2002).

In contrast to incomplete worked-out examples, completion problems provide a partial solution with more than just one solution step omitted, representing a transition from incomplete worked-out examples to conventional problems (Van Merriënboer & de Croock, 1992; VanMerriënboer, Schuurman, de Croock & Paas, 2002). Due to the partially provided solution, completion problems stimulate students to process more deeply the completed solution steps and enable them to acquire more complex problem-solving schemas (so-called *completion problem effect*; e. g., Van Merriënboer et al., 2005). It has been shown that completion problems decrease students' excessive cognitive load compared to conventional problems by focusing their attention on relevant aspects of the problem (i. e., the solution steps), which enables them to achieve a higher test performance (e. g., Van Merriënboeret al., 1992).

1. 2. Using eye-tracking methodology to study problem-solving processes

Eye-tracking methodology has been mostly used in text reading and scene perception for studying *where* the learners were looking (i. e., fixation locations), and *for how long* (i. e., fixation duration; for a review, see Rayner, 1998; see also Gegenfurtner, Lehtinen & Säljö, 2011). Put differently, eye-tracking methodology provides insights into the learners' allocation of visual attention to different problem elements, revealing in-depth information about problem-solving processes (e. g., Knoblich, Öllinger & Spivey, 2005). Peters (2010, p. 2) defined problem

solving as "a systematic process of matching items in declarative memory with rules. This process is assumed to continue until the goal is achieved and the problem solved."

According to the eye-mind hypothesis (Just & Carpenter, 1980), which theoretically underlies eye-tracking methodology, there is a close relationship between the information a learner is looking at and the information s/he is thinking about, as well as a relationship between the time spent fixating on information (i. e., fixation duration) and the amount and difficulty of cognitive processing (see Tsai, Hou, Lai, Liu & Yang, 2012). In general, the longer the information is fixated upon, the deeper it is processed and the more difficult it is to comprehend it (e. g., Chuang& Liu, 2012).

Despite the usefulness of eye-tracking methodology, only few studies have used this tool to investigate learners' attention allocation in a problem-solving context (e. g., Hegarty, Mayer & Green, 1992; Hegarty & Just, 1993; Graesser, Lu, Olde, Cooper-Pye & Whitten, 2005), and even fewer that have explored attention allocation in a science problem-solving context (e. g., Tsai et al., 2012). For example, Hegarty and colleagues (e. g., Hegarty et al., 1992; Hegarty, Mayer & Monk, 1995) examined students' eye fixations while solving mathematics word problems. The eye-fixation and performance data obtained in Hegarty et al. 's (1995) study indicated that there were significant differences between successful and unsuccessful problem solvers regarding both the pattern of eye fixations and the pattern of errors in remembering the problem statement. More specifically, unsuccessful students paid more attention (i. e., higher percentage of fixations) to the variable names and numbers when re-reading the problem statement compared to successful students, who paid less attention to these aspects. This result suggests that unsuccessful and successful students use different comprehension strategies during the problem-solving process, that is, a direct-translation strategy (i. e., focusing more on numbers and relational terms such as *more* or *less,* and solving the problem based on these terms), and a problem-model strategy (i. e., focusing more on the variables names, and developing a mental model of the given state of the problem), respectively (Hegarty et al., 1995). Finally, compared to unsuccessful students, successful ones remembered better the given state of the problem, which indicates that they are able to form a meaningful representation of the problem.

Using eye-tracking methodology, Tai, Loehr, and Brigham (2006) investigated the differences in problem-solving behaviors of students with various expertise levels (i. e., prior knowledge) levels in three science disciplines: biology, chemistry and physics. The results indicated that the more expertise a student has in a given discipline, the fewer the fixations on the look zones (i. e., the specific areas of each assessment item such as problem statement zone, multiple choice zone, etc.) and the lower the saccades between these zones. In addition, these authors found differences in eye movements not only between students within a particular discipline, but also within students across the three science disciplines.

More recently, Tsai et al. (2012) examined students' attention allocation while solving a multiple-choice science problem. The results revealed that students paid more attention to the chosen options than the rejected ones. Successful problem solvers spent more time inspecting relevant aspects of the problem rather than the irrelevant aspects when compared to the unsuccessful students, who experienced difficulties in recognizing the relevant aspects. Furthermore, whereas successful problem solvers moved their visual attention from irrelevant to relevant aspects of the problem, for unsuccessful students the opposite was true. Although the last two mentioned studies have provided insights into students' attention allocation while solving science problems, to our knowledge no study has investigated how students allocate their visual attention to science problems when they receive different levels of instructional support (i. e., IWE, CMP, and CVP).

1. 3. The present study

The purpose of this study was to examine the influence of different types of instructional support embedded in a CBLE (i. e., incomplete worked-out examples and completion problems in comparison to conventional problems) on students' attention allocation, as well as on their performance and cognitive load when learning genetics. In addition, the current study investigated the relationship between the on-line processing of the problems (i. e., number of fixations and fixation durations) and the off-line outcomes of learning with different types of instructional support (i. e., training performance, learning time, and cognitive load during training).

Regarding learning outcomes and investments, it was expected that all types of instructional support would lead to cognitive gains (i. e., higher performance) and decreased cognitive load (i. e., perceived task difficulty and invested mental effort) from pre-to-post-test. Furthermore, we predicted that students learning with incomplete worked-out examples and completion problems would achieve a better post-test performance, and experience a lower cognitive load in post-test compared to the conventional problems condition.

Second, we expected that different patterns of visual behavior would emerge from the various indices of eye movement during learning with incomplete worked-out examples, completion and conventional problems. More specifically, we predicted significant differences between the experimental conditions in terms of eye fixations, not only across all students within each condition, but also across the five genetics problems that students had to solve during training. Put differently, it was expected that the condition differences in terms of eye fixations would be significant between the five genetics problems solved in training.

Finally, we expected a clear connection between the on-line cognitive processing revealed by eye-tracking data and off-line learning outcomes during training. More specifically, we predicted that the number and the duration of fixations would positively correlate with training performance, learning time, as well as with the perceived task difficulty and mental effort invested during training. In other words, the more often and longer a problem is fixated, the greater the performance in solving that problem, although it would be perceived as more difficult.

2. Method

2. 1. Participants

Participants in this study were sixty-three students enrolled at a small university in Germany (11 males and 52 females; age M = 22. 75 years, SD = 2. 72). The participants were randomly assigned to one of the three conditions, an incomplete worked-out examples (IWE) condition (n= 21), a completion problems (CMP) condition (n= 21), and a conventional problems (CVP) condition (n= 21). All participants had normal or corrected-to-normal vision and all had at least some basic knowledge of Mendel's Laws, the topic of the study. As compensation for their participation to the study, participants received either €10 or credit points toward their research experience requirement.

2. 2. Apparatus and Materials

Electronic learning environment. The learning environment consisted of a Web application written in PHP scripting language, with a MySQL database connected to it (based on Mihalca, Mengelkamp, Schnotz & Paas, 2015). The database contained 15 genetics problems addressing Mendel's laws and registered all student interactions with the system: performance, perceived difficulty, mental effort scores in all phases of the study (i. e., pre-test, training and post-test), and learning time.

Genetics problems. During the training phase, participants had to solve a total of five genetics problems on the subject of heredity according to Mendel's laws, which differed with regard to the amount of embedded support depending on the experimental condition. Whereas incomplete worked-out examples provided high support, completion and conventional problems provided low support and no support, respectively. Specifically, incomplete worked-out examples provided four out of five solution steps, and students had to complete the final step. Completion problems provided two solution steps out of five, while conventional problems did not provide any support, that is, students had to solve all the steps on their own (see Figure 1 for a screenshot of a conventional problem).

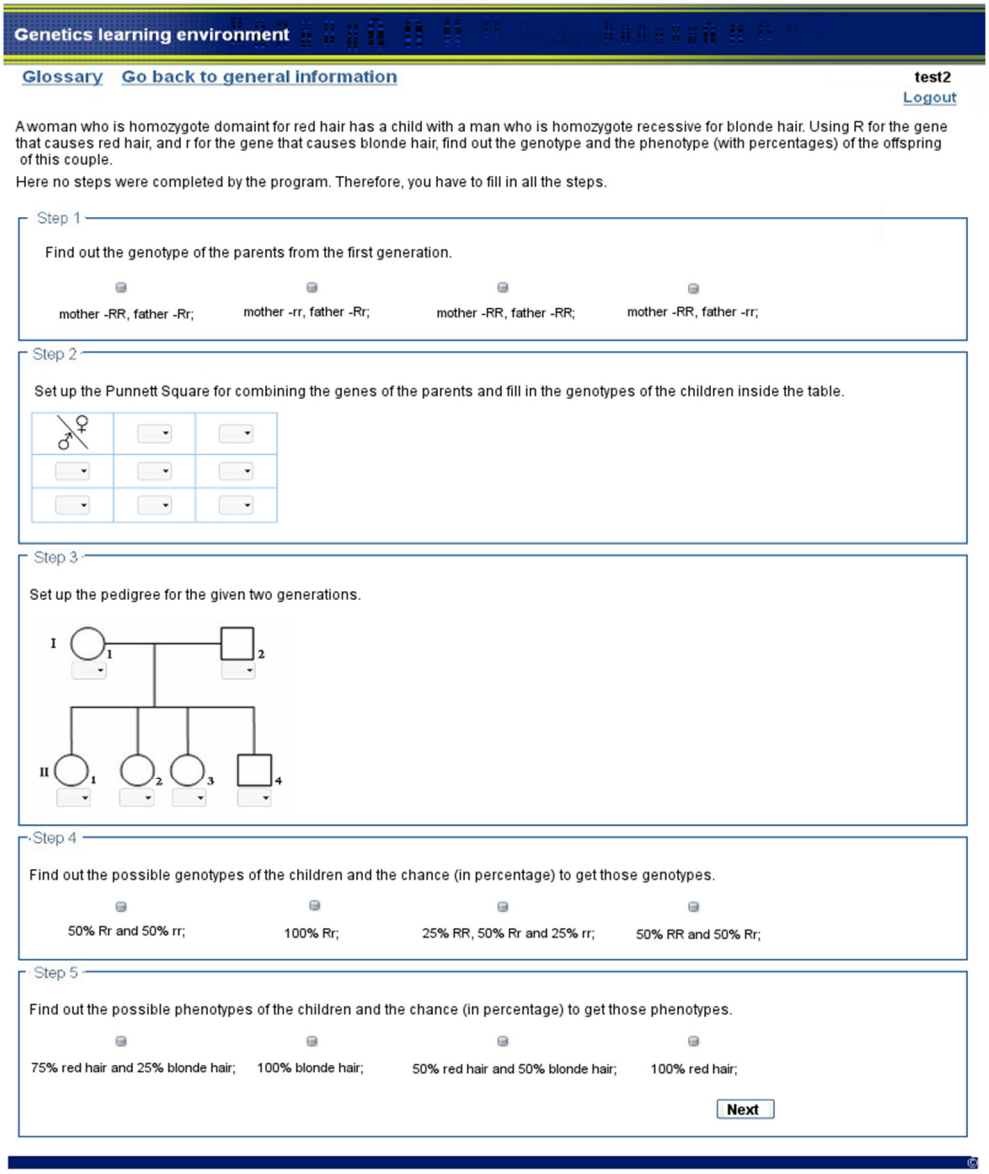


Figure 1. Screenshot of a conventional problem (CVP) in which none of the solution steps were completed by the program. It should be noted that incomplete worked-out examples (IWE) and completion problems (CMP) had the same structure as CVPs, with the difference that in the IWE condition four out of five solution steps were completed by the program and in the CMP condition two out of five steps were completed by the program.

In all conditions the genetics problems were presented in a predetermined simple-to-complex sequence from difficulty level one to difficulty level five. The five difficulty levels were defined in cooperation with two domain experts using several problem characteristics, such as the number of generations (two or three), the number of possible correct solutions (one or two), and the type of reasoning (inductive and/or deductive reasoning).

Eye tracking equipment. Participants' eye movements were recorded using a 60Hz Tobii T60XL eye tracking system, which was integrated into a 24-inch monitor with a maximum resolution of 1920 x 1200 pixels. Tobii StudioTM software was used to analyze participants' eye movements and their keyboard and mouse actions.

2. 3. Instruments

The pre- and post-test consisted of the same seven multiple-choice questions on the subject of heredity (i. e., Mendel's Laws). In order to provide the final solution for problems included in the pre-and post-test participants had to perform all sub-steps (i. e., solution steps) mentally, which was not the case for the problems included in training. The maximum score was 7 points, one point for each correct answer. The reliability (Cronbach's alpha) of the pre-test was. 62, and of the post-test was. 66.

The perceived task difficulty and invested mental effort were measured after each problem during all phases of the study (pre-test, training, and post-test) on a 5-point rating scale with values ranging from 1 (very low) to 5 (very high). These rating scales have been widely used in educational research and shown to be highly reliable (see Paas et al., 2003).

2. 4. Procedure

The experiment was run in individual sessions of approximately 90 minutes. First, participants were given general instructions explaining the procedure and introducing the topic of the study. They were asked to sign an agreement. The participants then started with the pre-test, and after that read a basic introduction. The basic introduction included the main genetics concepts needed for solving the genetics problems during training (e. g., dominant and recessive genes, homozygote and heterozygote gene pairs, genotype and phenotype). After they completed the pre-test, the participants were seated in front of the stimulus PC (65 cm away from the screen) and the eye tracking system was calibrated. During calibration, the eye tracker measured the characteristics of participants' eyes, required to accurately calculate gaze direction. To familiarize participants with the thinking aloud procedure (i. e., they had

to verbalize their own thoughts while solving the genetics problems), they were given a warming-up task. As the thinking aloud data are not relevant for the hypotheses of the current study, they are not reported here. When participants had finished the warming-up task, they started with the training phase. During the training phase the eye movements of all participants were tracked. The participants had to rate the perceived difficulty of each problem and the invested mental effort before the program would let them proceed. Immediately after the training, participants performed the post-test and rated again the perceived difficulty and mental effort after each solved problem. The time spent on each part of the experiment was logged.

2. 5. Eye movement analysis

To analyze participants' eye movements, six areas of interest (AOIs) corresponding to the problem statement and each of the solution steps were defined. AOIs were defined to determine whether and for which amount of time participants were looking at each specific area during the problem solving process. First, the *total number of fixations* was determined for each participant by summing all single fixations on the six AOIs. Second, the *total fixation duration* (or the time for which participants visually inspected the problems) was computed in a similar way by summing all single fixation durations on the six AOIs. Table 1 presents the means and standard deviations for the number of fixations and fixation durationsin training for each experimental condition.

3. Results

For all analyses the level of alpha error was set to. 05. Cohen's (1992) taxonomy of effect sizes was used to classify effects as small, medium or large corresponding to values of. 01,. 06,. 14 for eta-squared, respectively. We calculated performance in pre-test and post-test as proportion correct (i. e., total number of correct items divided by number of all items).

Before testing our hypotheses we computed a MANOVA to check if there were any differences between the three conditions (i. e., IWE, CMP, and CVP) in terms of pre-test performance, perceived difficulty and mental effort invested during the pre-test. Box's M test indicated no violation of the equality of covariance matrices (p =. 293). The results of MANOVA showed no significant effect of condition using Pillai's trace, V =. 080, $F(6, 118)$ =. 824, p =. 554, η_p^2 =. 04, on any of the variables mentioned before. Therefore, there were no significant differences

between the conditions prior to the training phase (see Table 2 for the means and standard deviations of the pre-test performance, perceived difficulty and mental effort in pre-test).

Table 1. Descriptive Statistics for Training Problems by Condition

	IWE (n = 21)		CMP (n = 21)		CVP (n = 21)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Training Problem 1						
1. Performance	.64	.26	.61	.31	.60	.22
2. Perceived difficulty	3.31	.77	3.69	.60	3.64	.81
3. Mental effort	3.20	.79	3.23	.63	3.46	.65
4. Number of fixations	301.62	103.10	363.95	108.35	390.90	155.41
5. Fixation duration	86.55	39.25	115.01	38.33	129.69	48.52
Training Problem 2						
6. Performance	.64	.26	.61	.31	.60	.22
7. Perceived difficulty	3.31	.77	3.69	.60	3.64	.81
8. Mental effort	3.20	.79	3.23	.63	3.46	.65
9. Number of fixations	323.81	100.40	634.10	186.70	491.86	167.66
10. Fixation duration	97.37	33.98	191.79	46.11	161.61	55.44
Training Problem 3						
11. Performance	.64	.26	.61	.31	.60	.22
12. Perceived difficulty	3.31	.77	3.69	.60	3.64	.81
13. Mental effort	3.20	.79	3.23	.63	3.46	.65
14. Number of fixations	268.81	80.74	490.38	196.50	335.24	157.74
15. Fixation duration	80.26	30.26	148.73	61.80	111.79	45.06
Training Problem 4						
16. Performance	.64	.26	.61	.31	.60	.22
17. Perceived difficulty	3.31	.77	3.69	.60	3.64	.81
18. Mental effort	3.20	.79	3.23	.63	3.46	.65
19. Number of fixations	419.67	132.52	850.14	317.12	708.81	340.50
20. Fixation duration	124.55	48.16	258.66	113.25	214.49	91.31
Training Problem 5						
21. Performance	.64	.26	.61	.31	.60	.22
22. Perceived difficulty	3.31	.77	3.69	.60	3.64	.81
23. Mental effort	3.20	.79	3.23	.63	3.46	.65
24. Number of fixations	435.00	220.07	850.67	346.02	992.00	372.85
25. Fixation duration	138.21	80.42	241.95	99.77	297.67	90.80

Note. IWE = incomplete worked examples, CMP = completion problems, CVP = conventional problems.

3. 1. Off-line learning outcomes

In order to examine the differential effects of conditions on learning gains (i. e., pre-to-post-test performance gain scores), a mixed ANOVA using condition as the between-subject factor, and pre-and post-test performance as the within-subject factor was conducted. The results showed that students' performance increased from pre-test (M_{total} =. 62, *SD* =. 26) to post-test (M_{total} =. 84, *SD* =. 20), and this increase was significant, $F(1, 60) = 51.\ 13$, $p <.\ 001$, $\eta_p^2 =.\ 46$. However, mixed ANOVA showed no significant main effect of the condition, $F(2, 60) =.\ 277$, $p =.\ 759$, $\eta_p^2 =.\ 01$, and no interaction between the increase in pre-to-post-test performance and condition, $F(2, 60) =.\ 158$, $p =.\ 854$, $\eta_p^2 =.\ 01$. In other words, the increase of performance from pre-to-post-test was the same for all conditions.

In addition, a mixed ANOVA with condition as the between-subject factor and perceived difficulty from pre- to post-test as the within-subject factor showed that students' perceived difficulty decreased from pre-test ($M_{total} = 3.\ 53$, *SD* =. 75) to post-test ($M_{total} = 2.\ 67$, *SD* =. 66), and this decrease was significant, $F(1, 60) = 127.\ 76$, $p <.\ 001$, $\eta_p^2 =.\ 68$. Mixed ANOVA showed no significant main effect of condition on the pre- to post-test perceived difficulty, $F(2, 60) =.\ 871$, $p =.\ 424$, $\eta_p^2 =.\ 03$, and no interaction between pre- to post-test decrease in perceived difficulty and condition, $F(2, 60) = 1.\ 91$, $p =.\ 157$, $\eta_p^2 =.\ 06$.

Furthermore, a mixed ANOVA showed that students' invested mental effort decreased from pre-test ($M_{total} = 3.\ 28$, *SD* =. 69) to post-test ($M_{total} = 2.\ 95$, *SD* =. 79), and this decrease was significant, $F(1, 60) = 20.\ 50$, $p <.\ 001$, $\eta_p^2 =.\ 26$. However, the results showed no significant main effect of condition on the pre- to post-test mental effort, $F(2, 60) = 1.\ 10$, $p =.\ 339$, $\eta_p^2 =.\ 04$, and no interaction between pre- to post-test decrease in mental effort and condition, $F(2, 60) =.\ 753$, $p =.\ 475$, $\eta_p^2 =.\ 02$. Put differently, the decrease of cognitive load (i. e., perceived difficulty and mental effort) from pre- to post-test was the same for all conditions.

Finally, in order to analyze the effect of different conditions on students' performance and cognitive load after training, we calculated a MANOVA using post-test performance, perceived difficulty and mental effort invested in the post-test as dependent variables. Box's M test indicated no violation of the equality of covariance matrices ($p =.\ 159$). The results of MANOVA showed no significant effect of condition on any of the dependent variables using Pillay's trace, $V =.\ 061$, $F(6, 118) =.\ 614$, $p =.\ 718$ (see Table 2 for the means and standard deviations of the post-test performance, perceived difficulty and mental effort in post-test). Therefore, in all three conditions students obtained the same post-test performance and experienced the same level of cognitive load while completing the post-test.

Table 2. Descriptive Statistics for Pre-and-Post-test by Condition

	IWE (n = 21)		CMP (n = 21)		CVP (n = 21)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Pretest						
1. Performance	4. 48	1. 83	4. 29	2. 15	4. 19	1. 53
2. Perceived difficulty	23. 14	5. 42	25. 81	4. 18	25. 19	5. 89
3. Mental effort	22. 43	5. 53	22. 62	4. 42	23. 86	4. 53
Posttest						
4. Performance	6. 00	1. 18	6. 05	1. 36	5. 67	1. 74
5. Perceived difficulty	18. 19	5. 87	18. 38	3. 63	19. 52	4. 17
6. Mental effort	20. 19	6. 74	19. 52	4. 27	22. 29	5. 16

Note. IWE = incomplete worked examples, CMP = completion problems, CVP = conventional problems.

3. 2. On-line processing during training (i. e., eye tracking data)

A series of mixed ANOVA with condition as the between-subject factor, and number of practice trials (i. e., problems 1 to 5 in training) as the within-subject factor were performed to examine the indices of visual attention allocation (i. e., number of fixations and fixation duration) during problem-solving process in training. Bonferroni correction was used as a post-hoc analysis to evaluate pairwise differences among practice trials, controlling for Type 1 error across tests.

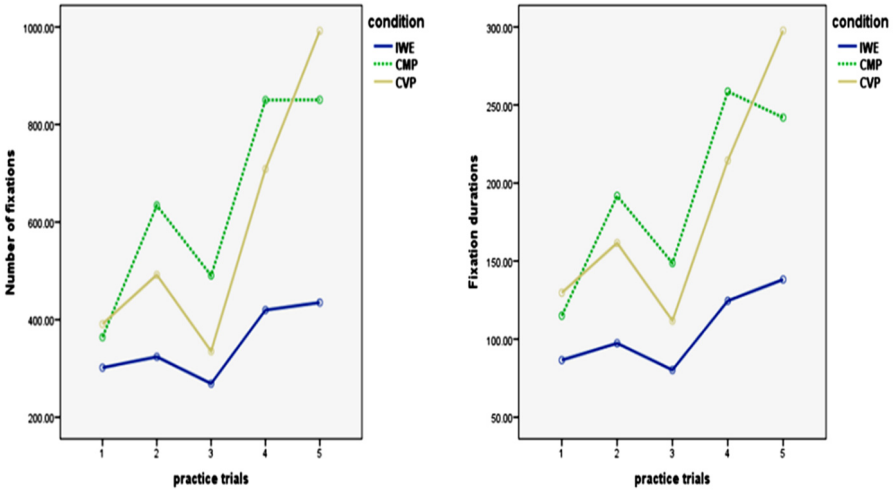
The total number of fixations was analyzed using a mixed ANOVA with condition as the between-subject factor, and number of practice trials (i. e., problems 1 to 5 in training) as the within-subject factor. Mauchly's Test indicated that the assumption of sphericity had been violated ($\chi^2(9) = 44.96$, $p < .001$), therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .735$). The results showed that there was a significant effect of the number of practice trials on the number of fixations, $F(2.94, 176.31) = 70.00$, $p < .001$, $\eta_p^2 = .54$, and a significant interaction between the number of practice trials and condition, $F(5.88, 176.31) = 9.66$, $p < .001$, $\eta_p^2 = .24$. In other words, there were significant differences between the conditions in terms of number of fixations across the five genetics problems in training (see Figure 2). More specifically, the number of fixations in the CMP condition was significantly lower for the first and fifth training problems compared to the CVP condition, whereas for the other three problems (i. e., problems 2, 3 and 4) the number of fixations

was higher in the CMP condition compared to the CVP condition. For the factor number of practice trials, Bonferroni corrected post-hoc tests showed that the number of fixations for problem 1 and problem 3 did not significantly differ (p = 1. 0), but the number of fixations for problem 1 was significantly lower than for all the other problems (i. e., problems 2, 4 and 5; all ps <. 05). In addition, the number of fixations for problem 5 was significantly higher compared to the number of fixations of all the other four problems (all ps <. 05).

Furthermore, a main effect of condition on the number of fixations, F(2, 60) =19. 48, p<. 001, η_p^2 =. 39, was found. Post-hoc comparisons using Games-Howell tests (a post-hoc test for heterogeneous variances between groups) indicated that participants in the IWE condition had a significantly lower number of fixations than participants in both the CMP and CVP conditions (both ps <. 001). However, the number of fixations did not differ significantly among the CMP and CVP conditions (p =. 612).

In a similar way with the number of fixations, the fixation durations were analyzed using a mixed-design ANOVA with condition as the between-subject factor and number of practice trials (i. e., problems 1 to 5 in training) as the within-subject factor. Mauchly's Test indicated that the assumption of sphericity had been violated (χ^2(9) = 57. 08, p <. 001), therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε=. 722). The results showed that there was a significant effect of the number of practice trials on fixation duration, F(2. 89, 173. 23) =64. 55, p<. 001, η_p^2 =. 52, and a significant interaction between the number of practice trials and condition, F(5. 77, 173. 23)=8. 08, p<. 001, η_p^2=. 21, which indicates condition differences in terms of fixation durations across the five genetics problems (see Figure 3). Specifically, the fixation durations on first and fifth training problems were significantly shorter in the CMP condition when compared to the CVP condition, whereas for the other three problems (i. e., problems 2, 3 and 4) the fixation durations were longer in the CMP condition when compared to the CVP condition. For the factor number of practice trails, Bonferroni corrected post-hoc tests showed that the fixation durations on problem 1 and problem 3 did not significantly differ (p = 1. 0), but the fixation durations for problem 1 were significantly shorter than for all the other problems (i. e., problems 2, 4 and 5; all ps <. 001). In addition, the fixation durations on problem 5 were significantly longer compared to the fixation durations on all the other problems (all ps <. 01), except for problem 4 (p =. 177).

Finally, a main effect of condition on fixation durations, F(2, 60) =19. 85, p<. 001, η_p^2=. 40, was found. Post-hoc comparisons using Games-Howell tests indicated that participants in the IWE condition had significantly shorter fixation durations than participants in both the CMP and CVP conditions (both ps <. 001). However, the fixation durations did not differ significantly between the CMP and CVP conditions (p =. 874).



Figures 2 and 3. Graphical representation of the interaction between the type of instructional support (i. e., conditions) and the practice trials on number of fixations (Figure 2), and fixation durations (Figure 3).

3. 3. Connecting on-line processing with off-line learning in training

In order to examine whether the eye tracking measures and learning outcomes in training are related, Kendall's tau correlations were conducted (see Table 3). We choose to use Kendall's tau correlations rather than Spearman's statistic – which is the more popular of the two nonparametric correlations – because Kendall's statistics is a better estimate of the correlation in the population and therefore more accurate generalizations can be drawn (see Field, 2005, p. 181).

A positive correlation between the number and duration of fixations of each training problem and the performance and time spent on that specific problem, as well as between the number and duration of fixations of each problem and the cognitive load (i. e., perceived difficulty and mental effort) experienced while solving that specific problem was expected.

As shown in Table 3, the eye tracking parameters were positively correlated with most of the learning outcomes obtained during training. Notably, there were significant positive correlations between the number and duration of fixations on almost all training problems and the training performance on those problems, their perceived difficulty, the invested mental effort, as well as the time spent on solving the problems. However, there were no significant correlations between the number of fixations on problem 1 and problem 3 and the performance scores obtained on those two problems (τ=. 160, p =. 082, and τ=. 218, p =. 086, respectively).

Furthermore, there were no significant correlations between the number and duration of fixations on problems 4 and 5 and the mental effort invested on those two problems (all *ps*>. 05).

Table 3. Kendall's Tau Correlations Between the Measures (*N* = 63)

Training	Prob. 1 N. of fixations	Prob. 1 Fix. duration	Prob. 2 N. of fixations	Prob. 2 Fix. duration	Prob. 3 N. of fixations	Prob. 3 Fix. duration	Prob. 4 N. of fixations	Prob. 4 Fix. duration	Prob. 5 N. of fixations	Prob. 5 Fix. duration
Problem 1										
1. Performance	.16	.24*								
2. PD	.40**	.38**								
3. Mental Effort	.25*	.32**								
4. Time	.73**	.24*								
Problem 2										
1. Performance			.29**	.32**						
2. PD			.28**	.34**						
3. Mental Effort			.30**	.34**						
4. Time			.71**	.83**						
Problem 3										
1. Performance					.20*	.26**				
2. PD					.39**	.36**				
3. Mental Effort					.26**	.31**				
4. Time					.77**	.82**				
Problem 4										
1. Performance							.33**	.36**		
2. PD							.30**	.33**		
3. Mental Effort							.18	.20*		
4. Time							.76**	.80**		
Problem 5										
1. Performance									.37**	.39**
2. PD									.22*	.18
3. Mental Effort									.12	.13
4. Time									.79**	.86**

Note: PD = perceived difficulty, Prob. = problem, N = numbers, Fix. = fixations

To sum up, overall the more often students look at the problems, and the longer the amount of time they spent processing the problems, the higher the performance on those problems and the greater the perceived difficulty (and invested mental effort). Moreover, the number of fixations on each training problem was highly correlated with the total fixation durations on that specific problem (with τ values ranging from. 690 to. 808; all *ps*<. 001).

4. Discussion

Combining eye-tracking measures with performance data, this study explored the differences in attention allocation during problem-solving processes while using various types of instructional support (i. e., incomplete worked-out examples, completion and conventional problems), by

The first hypothesis that all types of instructional support would lead to cognitive gains (i. e., higher performance) and would decrease cognitive load (i. e., perceived difficulty and invested mental effort) from pre- to post-test, was confirmed by the data. More specifically, all types of instructional support significantly increased students' performance from pre- to post-test, while experiencing a lower cognitive load in post-test compared to pre-test. The combined results of improved performance and decreased cognitive load (i. e., lower "cognitive costs") suggest an increase in overall efficiency due to the training. However, the hypothesis that incomplete worked-out examples and completion problems would lead to a better performance and lower cognitive load in post-test compared to conventional problems was not supported by the results. Specifically, no differences were found between the three conditions in terms of post-test performance and cognitive load experienced in the post-test. This might be a consequence of either the type of instructional support (i. e., a sub-goals oriented support), the type of worked-out examples (i. e., incomplete worked-out examples) or the number of training problems (i. e., only five training problems) provided in the current study. Which of these explanations is more plausible is still an open question and should be addressed in future research.

The main focus of the current study was to reveal how the various types of instructional support influence students' viewing behaviors (i. e., eye fixations) and their learning performance. We hypothesized that the condition differences in terms of eye fixations would be significantly distinct across the five genetics problems solved by students in training. In line with our expectations, the results indicated significant differences in terms of number and duration of fixations not only between the three conditions, but also between these conditions across the five training problems (i. e., practice trials). More specifically, the number of fixations on incomplete worked-out examples was significantly lower than on completion and conventional problems, with no significant differences between the last two conditions. Furthermore, the number of fixations on completion problems was significantly lower for the first and fifth trials compared to conventional problems, whereas for the other training problems (i. e., trials 2, 3 and 4) the reverse was true, that is, the number of fixations was significantly higher for completion problems compared to conventional problems.

This pattern of results was also found for the fixation durations, with participants in the incomplete worked-out examples condition having significantly shorter fixation durations than participants in both the completion and conventional problems conditions. No significant differences in terms of fixation durations were found between the completion and conventional problems. Moreover, the fixation

durations on first and fifth training problems were significantly shorter in the completion problems condition compared to conventional problems condition, while the fixation durations on the other training trials (i. e., problems 2, 3 and 4) were significantly longer in the completion problems condition compared to the conventional problems condition.

These findings indicate that the type of instructional support differently impacts students' allocation of visual attention. Specifically, omitting a few solution steps increased the task involvement as reflected by the higher number of fixations and the longer fixation durations in the completion problems condition compared to the conventional problems condition, but only for practice trials 2, 3 and 4. The fact that the number and duration of fixations was higher for conventional problems compared to completion problems at the beginning and the end of the training phase (i. e., problems 1 and 5) may indicate that these problems require more processing, especially in the conventional problems condition. In other words, the processing for integrating and solving the omitted solution steps of problems 1 and 5 (i. e., completion problems) required less fixation time than the processing needed to build a problem solution plan without any support (i. e., conventional problems; cf., Hegarty et al., 1992). Despite the differences in eye movement parameters (i. e., number and duration of eye fixations) between the CMP and CVP conditions across practice trials, the post-test performance attained in all three experimental conditions was the same. One possible explanation for the lack of differences between conditions in terms of post-test performance might be due to the expertise reversal effect (Kalyuga, 2007). More specifically, the differences in eye movement parameters indicate various aspects depending on students' expertise level: longer fixation durations might indicate productive involvement during problem solving for high prior knowledge students, whereas for low prior students it could suggest unproductive processing (see Schwonke, Berthold & Renkl, 2009).

Furthermore, the eye fixations analysis allows us to identify when students encounter difficulties during the problem-solving process (Chuang & Liu, 2012). In general, longer fixation durations indicate that students have encountered more difficulties in solving the problems, situation in which they do not know what to do next, and start either to stare at the problem for longer or search back and forth between the problem statement and the solution steps (cf., Knoblich et al., 2005).

Finally, it was hypothesized that there would be a positive correlation between on-line processing and off-line measures of learning in training. The results confirmed this hypothesis, indicating a positive correlation between the number and duration of fixations on training problems, on one hand, and the performance on these problems (except for trials1 and 2) and cognitive load experienced while

solving these problems (with the exception of trials 4 and 5 for which no significant correlation with invested mental effort were found), on the other hand. The more often students attended to the problems and the longer the time they spent processing those problems, the greater the obtained performance, and the higher the experienced cognitive load (i. e., perceived difficulty and mental effort). The finding that the higher processing time of training problems (as revealed by eye tracking data) the better the training performance and the deeper the processing of these problems (e. g., more invested mental effort) attests that indices of visual attention are indeed strongly related to the strategic processing during problem solving. However, given the correlational nature of the data, it is not possible to establish any causal relationship between students' viewing behavior and the problem-solving processes, an aspect that should be explored by future studies.

In summary, the present study provides three important results. First, the primary findings of this study are that the type of instructional support students received affects differently the pattern of eye fixations. Second, an important advance in the present study is the fact that learning measures (i. e., training performance) were complemented by measures of on-line cognitive processing during problem solving (i. e., eye tracking data). In this way, a more comprehensive picture of the cognitive processes that underlie problem solving can be provided (cf., Van Gog, Paas, Van Merriënboer & Witte, 2005). The results suggest that learning success while using a CBLE (i. e., higher training performance) is related to the amount of time students spent looking at the training problems (e. g., fixation durations). In addition, the results indicated that students experienced higher cognitive load (e. g., exerted more mental effort) when processing the training problems for a longer time (which is revealed by both higher fixation durations and greater learning time). Third, the in-depth investigation of the way in which students interact with different types of instructional support is very useful for designing and implementing effective CBLEs. This type of research is important given that CBLEs are increasingly used in education and their characteristics may influence self-regulated learning in a different way than traditional learning materials (de Bruin & Van Gog, 2012).

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AN INTERVENTION PROGRAM FOR THE DEVELOPMENT OF LEARNING TO LEARN COMPETENCY OF 11TH GRADE STUDENTS WITH LEARNING DIFFICULTIES IN STUDYING ROMANIAN LANGUAGE AND LITERATURE

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ABSTRACT. Education and training have to provide the learning environment for the development of learning to learn competency for all citizens, including those with fewer opportunities. The main purpose of the formative experiment proposed in this paper was to develop and implement a formative intervention program focused on developing an operational model of learning to learn competency on cognitive, metacognitive and non-cognitive dimensions for 11th grade students with learning difficulties at Romanian Language and Literature. The sample of subjects consisted in 106 students of 11th grade with learning difficulties from three technical high schools and colleges. Using critical reflection, metacognitive reflection, strategic decision making and training subjects in complex, analytical and creative learning situations with interdisciplinary links in an articulated intervention program proved to be efficient in activating and optimizing learning behavior and therefore, in decreasing the frequency learning difficulties. The statistically significant differences between pretest and posttest results in conjunction with developments, highlighted by quantitative and qualitative benchmarks, of subjects in the experimental group during the formative intervention allow us to appreciate that the assumption underlying the experimental study was validated.

Keywords: *intervention program, the learning to learn competency, learning difficulties, critical reflection, metacognitive reflection, strategic decision making.*

Zusammenfassung. Erziehung und Bildung sollen für alle Bürger, einschließlich jener, die geringere Möglichkeiten haben, das Lernumfeld für die Entwicklung von Lernkompetenz anbieten. Der Hauptzweck der formativen Experiment, das in

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diesem Beitrag vorgeschlagen wird, war einen formativen Interventionsprogramm zu entwickeln und durchzuführen. Das formative Interventionsprogramm konzentriert sich auf einem operatives Modell für die Lernkompetenzentwicklung in Bezug auf den kognitiven, metakognitiven, nicht-kognitiven Dimensionen bei den Schülern mit Lernschwierigkeiten in der rumänischen Sprache und Literatur in der elfte Klasse. Die Teilnehmer an diesem Experiment sind 106 Schüler mit Lernschwierigkeiten. Sie sind in die elfte Klasse an drei Gymnasien und Fachhochschulen. Die Verwendeung von kritischer, metakognitiver Reflexion, strategischen Entscheidungsfindung und der Einbindung der Teilnehmern in komplexen, analytischen, kreativen Lernsituationen, mit interdisziplinären Verbindungen im Rahmen von dem Interventionsprogramm, haben die formative Wirksamkeit beweist, indem das Lernverhalten aktiviert und optimiert wurde. Folglich, hat die Häufigkeit von den Lernschwierigkeiten abgenommen. Statistisch signifikante Unterschiede zwischen Pretest- und Posttestergebnisse im Zusammenhang mit den Entwicklungen, bei quantitativen und qualitativen Niveau, den Personen in der Experimentalgruppe, während der formativen Intervention erlauben uns zu schätzen, dass die Hypothese der experimentellen Studie bestätigt wurde.

Schlüsselwörter: *Interventionsprogramm, Lernkompetenz, Lernschwierigkeiten, die kritische Reflexion, die metakognitive Reflexion, strategische Entscheidungsfindung*

Introduction

In recent years the concern of educators and psychologists to address learning and knowledge in terms of active participation of subjects has greatly increased. The key feature for this is reflexivity, self-awareness, self-regulation. In this context, it is becoming increasingly necessary for young people to improve their potential through the formal educational system so that "learning to learn" along with building a better quality learning would transcend beyond the classroom and allow students to solve everyday situations.

Competency-based education is a learning process centered on the ability and the responsibility of each student, on the development of his autonomy and self-confidence. It aims essentially three main objectives (Roegiers 2004 apud Manolescu, M., 2010, p. 55):

1. To emphasize the skills that the student must master at the end of each school year and at the end of compulsory education.

2. To give meaning to learning, to show students what are the uses of what they learn in school.

3. To certify the student's acquisitions in terms of solving concrete situations and not in terms of a sum of knowledge and skills that the student will forget or will do not know how to use them in working life.

Competency-based learning is built on a system of teaching and learning that constantly develops the autonomy and the ability of learning to learn. Thus, students are real organizers of their own learning and therefore need motivation and supervision, as well as the development of cognitive strategies and cognitive goals that will help them learn and reflect on their learning. The advantages of competency-based learning within the school are summarized by B. Rey et al. (2012, p. 37) as follows:

- Avoids fragmentation of tasks and loss of meaning for students.
- Incites learning in an active state.
- Gives purpose and meaning of school knowledge.
- Helps learning to operate a deep transformation of the subject learners.
- Can help reduce the selectivity and "failure culture".

We say that learning is strategic when the learner is aware of the learning process and controls his efforts in using particular skills and strategies. These learning features are well defined through the concept of strategic learning (Paris, S., Lipson M. and Wixson, K. 1983 apud Vianin, P., 2011). On the other hand, reflective learning, closely related to reflective teaching is above all "assumed learning, self-determined, having as main features the following: it is active (even interactive), assisted, self-regulated (self-monitored, self-assessed), constructive, meaningful" (Ezechil, L., 2010, p. 250). Reflective learning is more than just helpful, it is necessary in the study of all school subjects as "it helps students' thinking that reflect cognitively and metacognitively for future activities, they anticipate and manage their work and their whole activity , as the possibilities to solve a task or problem are multiple (Bocoș, M.-D., 2013, p. 163).

"Learning to learn" competency has been identified in many contexts as being fundamental for achieving success in a knowledge based society (European Council, 2006). Candy (1990 apud Hofmann, 2008, p. 175) describes learning to learn as a competency that allows people to become more efficient, flexible and self-organized learners in a variety of contexts. The learning to learn competency is understood as a meta-competence (Hofmann, 2008, p. 175), because it has an impact on the selection, implication and acquisition of other competencies for XXI century. In this paper we choose the definition of the European Union (European Commission, 2006), which supports the existence of three structural dimensions of learning to learn competency: cognitive, metacognitive and emotional and motivational dimensions combined with socio-cultural learning environment. Thus, according to Hoskins and Fredriksoon (2008), the concept of learning to learn is studied to consider an European framework and to test measuring the expression "learning to learn".

Education and training have to secure the learning environment in order for this competency to be developed for every citizen, including individuals that are part of a disadvantaged group (those with special needs, dropping out of school etc.) as well as through different learning contexts (formal, non-formal and informal). In any school, any student may have learning difficulties at a specific moment, at a specific object of education, in a certain activity or more. Learning difficulties may be present for a short period of time or can mark all the school years. The contemporary school is a school of great individual diversity, which tends to be a school for all - an inclusive school and categorization of the learning difficulties should reflect this diversity as well as the diversity of educational support that students need. Learning difficulties are temporary obstacles in the learning activity that affect the input of information, their processing and the output process, both in terms of cognitive and metacognitive perspective, in the case of persons who hold full basic intellectual capacities both structurally and functionally. Therefore, the development of learning competency at students with learning difficulties is an important pedagogical stake.

We believe that an explanation regarding the poor performance of students in school is related to the fact that there is not a sufficiently strong connection between the general education curriculum and the new educational paradigm of social realities, a competency-based curriculum. By organizing learning and through its optimal design, the differences between students should not widen. Teaching strategy should be designed and implemented to ensure the full development of each student's capacity. The Romanian school should become a school of innovative learning and deep learning (Chiş V., 2005), a school of competencies training and development.

Pedagogy, therefore, that aims to develop the competencies, increases also student's efforts for meaningful experiences by focussing on purpose, active, authentic and collaborative tasks (Jonassen et al., 2008). Teaching methods that are, therefore necessary to develop key competencies, should be oriented towards interdisciplinary and cross-curricular teaching and learning oriented towards teamwork combined with individual approaches and project-based work (Gordon, Halasz, Krawczyk et al., 2009).

Being a transversal type of competency, learning to learn competency could not be attached strictly to just one discipline from the curriculum at the pre-university level. Thus, learning to learn competency could be developed either by a self-standing approach, based on learning the techniques, the methods and learning strategies, independent from the traditional disciplines or by means of infusion in disciplinary or inter-disciplinary approaches, therefore contributing to the development of other key-competencies and becoming a result of the latter.

The study of Romanian Language and Literature cannot ignore the fields covering transversal skills, knowledge and attitudes, that this discipline envisaged by default. During secondary education, students must train their communication skills necessary to perform any activities in society, but also the learning to learn competency. The latter should become a reality in our schools for all students. They should develop a competency of the utmost importance for the future, that of knowing how to educate themselves lifelong using their own intellectual resources.

Research Design

Research objectives

The main aim of this research is to stimulate the development of learning to learn key-competence by means of implementing an intervention program to 11th grade students with learning difficulties in studying Romanian Language and Literature, so that the learner reaches the authentic, reflexive and strategic, efficient, autonomous/independent learning based on comprehension.

The general research question from which the research started was as follows: Is it possible to stimulate the learning to learn key-competence to 11th grade students with learning difficulties by implementing an intervention program in studying Romanian Language and Literature? From this general question derive the following specific research questions:

- Is it possible that the high school students, respectively 11th graders to become more competent in learning to learn and, thus, become independent learners?
- Under what conditions and in what ways the Romanian Language and Literature teachers are able to develop the learning competency of high school students and, therefore "learning to learn"?
- How do we know if the educational interventions on the students are effective?

Further, we intend to answer these questions, although we are aware of the complexity of learning to learn competency, of the difficulties posed by the processes of conceptualization and experimental study of this competency.

The main aim of the formative experiment presented in this paper relies in the elaboration and applying a formative intervention program centered on an operational model of development of learning to learn competence at the metacognitive, cognitive and non-cognitive level to 11th grade students with learning difficulties in studying Romanian Language and Literature.

Research hypothesis

Starting from the identified problems in the analysis of the school results of 11th grade students, of their learning difficulties, we have elaborated the following general hypothesis of the research:

- The implementation of an educational intervention program to 11th grade students in order to value entirely, in personalized manner and in a socio-constructivist framework the critical reflection, the metacognitive reflection and the strategic decisions making, will diminish the frequency of learning difficulties in studying Romanian Language and Literature.

Taking into consideration the general hypothesis, the following specific hypothesis have been resulted:

- If the learning situations are organized and displayed according to our personal model of learning to learn competence development, then the students with learning difficulties will improve their critical reflection, their originality and cognitive flexibility;
- If the learning situations are organized and displayed according to our personal model of learning to learn competence development, then the students with learning difficulties will intensify the degree of metacognitive awareness and regulation of learning;
- If the learning situations are organized and displayed according to our personal model of learning to learn competence development, then the students with learning difficulties will optimize the practice of learning strategies related to problem solving in reading texts.

Research variables

According to the general hypothesis, we deduce the independent variable (I.V.) in our research as being the following:

I.V.: The implementation to 11th grades of the educational intervention program which values entirely, in personalized manner and in socio-constructivist framework:

- critical reflection;
- metacognitive reflection;
- strategic decisions making.

The dependent variable (D.V.) meaning effects, expectations, school results regards the frequency of manifestation of learning difficulties in studying Romanian Language and Literature to 11th grade students, a variable represented by:

D.V.1. the level of the process of critical reflection operationalized by means of behaviors frequency using critical thinking skills in Romanian Language and Literature discipline;

D.V.2. the degree of awareness and the incidence of behaviors' metacognitive regulation in learning;

D.V.3. the level of practice of learning strategies related to problem solving in reading texts.

Procedure

The qualitative **sample of subjects** was based on using the unique group of students sample type. This is a group constituted by age and grade criterion, existing before research. The unique group technique is based on "the using a single group, to whom independent variable or variables are applied, aiming and quantifying their effect at different stages" (Bocoș, M., 2003, p. 66). The advantage of such sampling consists in the development of the research in the natural, ordinary environment, in natural organization of the educational process.

In this research we focused on the 11th grade of high school which is part of post-compulsory and upper secondary education of the deepening curricular cycle. From the results of the national tests, particularly results of the simulation for the baccalaureate exam of the 11th grade, we can get a vision on the level of skill acquisitions at a certain time and we can identify their gaps in time to be remedied during the school year. Furthermore we can identify the learning difficulties specific to a subject or the general learning difficulties, specific to more subjects. On the other hand, we must keep in mind that the 11th grade student is 17-18 years old, that is in his adolescence stage, which poses a number of socio-emotional, attitudinal or character problems. These problems can reflect upon the quality of school performance also.

After coding the names of students, followed by the interpretation of the pretest results and the analysis of the academic achievement in Romanian Language and Literature subject (grade means at the end of the first semester of 2013-2014 school year between grades 4 and 6) a number 106 students of 11th grade with learning difficulties were included in the sample. They belonged to three technical high schools and colleges in Cluj-Napoca. Therefore, the group of subjects includes students whose main limitations are mostly located at the level of efficient management of cognitive, metacognitive, motivational and affective resources. The formative experiment was attended by 11th grade students aged between 17 and 18 years old, 59 boys and 47 girls, 55 students from urban area and 51 students from rural area. We also ensured that there was a relative homogeneity of the experimental group composition in relation to these variables.

In formal educational contexts, namely in psycho-pedagogical counseling, **the sample content** included scientific contents according to the compulsory curriculum for 11th grade students, through the intervention program displayed

within the formal activities of counseling and orientation. One of the first directions of sample content formation was the identification of the themes and contents that were to be included in the experimental approach according to the specific program from the curricular area Counseling and Orientation for 11th grade. The themes that we proposed in our intervention program were studied during the second semester of the 2013-2014 school year. The activities were based on the use of bibliographic materials, of a modern logistics base and was mainly an applicative character. Thus, the intervention program included themes and curriculum contents using the non-literary texts. Thematic units representing the investigation framework were organized so that teaching curriculum content selected to provide a foundation for the development of learning to learn competency for engaging and carrying out the reflexive and strategic activities. A second direction of sample content formation was the decision regarding the strategic and reflexive processes and behavior that were to be practiced during the intervention.

Instruments

Critical reflection was measured by Motivational Strategies for Learning Questionnaire (MSLQ) developed by Pintrich, Smith, Garcia and McKeachie, in 1991. For the purpose of our research from the cognitive and metacognitive strategies scale, we selected the critical thinking sub-scale with a Cronbach alpha coefficient of 0.80 obtained by the authors. Because this questionnaire is applied specifying the name of the discipline or course, we opted for the Romanian Language and Literature subject and the reason for this is that the critical thinking skills are developed more frequently and systematically in this discipline than in other disciplines of educational framework plan.

From the repertoire of methods for assessing of the metacognition within school learning in the existing literature, we selected a scale developed by G. Schraw and R.S. Dennison (1994) and named by the authors the Metacognition Awareness Inventory (MAI). We decided to use this tool (translated and adapted by A. Glava, 2007) in the pretest and posttest phases of this investigative approach.

Another instrument used to measure strategic decision making, awareness and use of learning strategies was the Metacognitive Awareness of Reading Strategies Inventory (MARSI) designed by Mokhtari and Reichard (2002) from which we selected the problem solving strategies sub-scale in reading situations.

Both the psychometric qualities obtained by the instruments translated and adapted for Romanian school population with the consent of the authors and significant correlations obtained between the variables studied were the focus of the tools' pilot study. The values of Cronbach alpha coefficients of internal consistency

for each scale applied showed a high degree of reliability. The interpretation of the collected data allowed reaching favorable conclusions for further research on a larger scale.

A theoretical model of development of learning to learn competency at students with learning difficulties

The variety of theoretical contributions within the scientific literature dedicated to the learning to learn competency has led us to try to structure a development model of this competency in an integrative and original manner, which should reflect our understanding of the theme. Benchmarks offered by this model were the basis for structuring our own experimental approaches.

The theoretical development model of learning to learn competency (original model) articulates systemically the combination of knowledge, abilities and attitudes necessary for the development of this competency according to the levels of learning taxonomies; it values entirely the processes of critical reflection, of metacognitive reflection and strategic decision making within a socio-constructivist context. Between these internal structural components there is an inter-dependency relation thus one emphasizes the other reciprocally.

For an instructive strategy to be efficient, for students with learning difficulties, it is necessary to focus on the cognitive, metacognitive and non-cognitive (motivational, emotional and contextual) processes, following a coherent model of action. Many of these approaches are oriented toward some of the above mentioned aspects, but not toward all of them. The challenge that we introduce is to apply a model as complete as possible.

We have intended that theoretical-applicative model structured by us and experienced during the formative intervention to be characterized by:

- structural relevance, ensured, on the one hand, by the introduction within the model of the cognitive, metacognitive and non-cognitive dimensions, which are intrinsic and complementary in every learning process, and, on the other hand, by the introduction of the main components of the competency (knowledge, abilities, attitudes), considered as fundamental in the scientific literature;
- functional relevance, through the identification of the conditions and practical approaches so that to support the development of learning to learn competency.

We considered that the key elements for this are:

• designing learning tasks so that they can be characterized by a certain complexity and integrate barriers, socio-cognitive conflicts with inherent formative potential;

• shaping the learning environment so that it may contribute to providing benchmarks for critical reflection, complex metacognitive reflection and strategic decision making;

• the use of implicit and explicit teaching practices of metacognition.

Description of the psycho-pedagogical intervention program

Many researchers claim that the inefficiency of efforts for students with learning difficulties should be linked to a type of metacognitive deficiency more than a cognitive one. They have knowledge and competencies acquired more or less, but do not know how to use them, nor to transfer them. This inefficiency is attributed primarily to the fact that these students do not know what they know. Being aware of this reality and based on the data interpretation that we gathered within the observational stage of the research, we can introduce the following premises of the research:

- In the school context the main learning difficulties identified within the context of studying Romanian Language and Literature are the ones regarding metacognition, which need to be analyzed together with the cognitive and non-cognitive difficulties, without diminishing their value.

Assuming the mentioned premise, we propose, from a pragmatic perspective, to design and implement an educational intervention program for 11th grade students with learning difficulties. From an operational perspective, for the implementation of this program, we have developed an operational tool that is educational intervention plan to lower school difficulties frequencies to 11th grade students.

Analyzed from the structural perspective, our educational intervention program refers to the following relevant components: program curriculum; the contents used; the human resources (teachers, counselors, teachers of Romanian Language and Literature, class teachers); material resources (equipment, instruments); time resources; procedural resources (official and unofficial curricular documents).

From the functional operational and pragmatic perspective, our educational intervention program values the theoretical model of development of learning to learn competence. This model emphasizes the following components, relevant from educational perspective and especially from the psycho-pedagogical perspective that we have investigated:

 Critical reflection (cognitive dimension) – referring to activation of knowledge and existent cognitive ability and their practice in new situations, the analysis, evaluation, opinion formulation and conflictual interpretation;

 Metacognitive reflection (metacognitive dimension) – emphasizing the awareness and regulation of their own thinking processes;

 Strategic decision making (non-cognitive dimension) – regarding the management of behavior in alternative problem-solving situations, the selecting, adaptation, practice etc. of learning strategies, students making a decision or a succession of decisions about the optimal or at least convenient option.

The diversity and complexity of variables encountered imply the use of the concept "process" in relation to the development of learning to learn competence for diminishing the 11th grade students' difficulties. In the context of our research, the development of this competence reveals a specific process, being structured into three main stages, timely organized:

1. *The initial stage* – the teacher, in this case the researcher, planes and anticipates the teaching and learning sequences, the didactic and counseling situations as well as the intervention strategies;
2. *The development stage* – the researcher places the students in meaningful contexts regarding the learning object, stimulates the reflective behavior regarding the content as well as the metacognitive processes;
3. *The consolidation stage* – the researcher analyzes the effects of the intervention performed within the formal context of counseling and studying Romanian Language and Literature, both for students and for himself.

The activities were displayed in an interactive atmosphere, by means of team work, open talk and each student having access to the informational support necessary for the activity. The methods used in the formative experiment stage were primarily active and interactive. Thus, we mention several methods and procedures used in this stage, also mentioned in the suggested intervention program: methods and techniques of developing the critical attitude (the mosaic method, techniques such as: "I know - I want to know - I have learnt", "Think - Pairs – Share", "Anticipate, Survey, Think" etc.); methods and techniques of individual activities (SINELG method, the active learning, techniques: "Question and Answer", "Post-it notes" - Memorizing etc.); methods and techniques of reflection (personal reflection, techniques: "Talking to yourself" - Thinking out loud, "I know - I think, I learn - I am thinking" - Before and After, "Writing what you are thinking about" - Reflection journal etc.); methods and techniques based on problem-solving (case studies, techniques: "Difficult and Easy Questions" - Superior Questions, "I anticipate - I survey - I am thinking", "The Transfer of Discussion" -The Bridge etc.); methods and techniques of graphically collecting and organizing information (techniques: mind mapping, SWOT Analysis, POWW, Thinking Hats etc.). We mention that these active and interactive methods and techniques have been adapted in application based on circumstances, objectives, specific educational situation. It appealed to different combinations between these methods and other traditional active and interactive methods.

Given the fact that one of the essential premises underlying the structure of the formative investigation was that involving learners in solving learning tasks involving critical processing of information, has the potential to initiate and support the metacognitive reflection and self-regulation of learning, we consider relevant that most of the proposed learning tasks are organized analytically and creatively. In addition, most of the tasks to be performed are complex, establishing interdisciplinary links. It is interesting that in solving the tasks most of the school knowledge and techniques are evident from the start to students as elements of competency to action. Not only these tasks are a key motivation for learning, but also what is taught in this context becomes the image of a tool for students to understand the reality and act on it. In fact, what we want is that the procedures which are taught at school should not remain some school rituals that the student will not integrate them in any way in his view of the world. If we want these procedures to be dynamic, applied responsibly and part of the vision the student will have about reality, than it may be useful that these procedures and learning strategies are acquired, developed during learning tasks/mini-projects that the student has mastered. Solving tasks favors the development of learning to learn competency because the students are familiarized to see the strategies learned in school as some tools used to achieve goals that they can perceive and that are important to them.

Data Analysis and Interpretation

To identify the existence of differences in the experimental group between the three variables, we used the t test for comparison of means, for two paired samples.

Average scores obtained for the **critical reflection** variable in the pretest and the posttest phase, as well as the calculated values of Paired-Samples T Test (option exists in SPSS software package version 17.0) shows that the average level of development of critical reflection of the subjects involved in research is 4.12 in pretest and 5.02 in posttest. Also, observing the two standard deviations (0.67 and 0.73), we see that they are very similar, which is an advantage. We also observe a significant ($p < 0.001$) and strong correlation (0.75) between pretest and posttest data.

Table no. 1 shows the value for t (-18.52) which, with 105 degrees of freedom, is significant at 0.00 for the bidirectional level. Therefore, as the level of significance is less than 0.005, scores of subjects for the development of critical reflection during postexperimental stage are significantly higher than scores obtained during the preexperimental one.

Table no.1. The results of test t for the experimental group regarding the critical reflection during the pretesting and posttesting stages

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
CR_pretest & CR_posttest	-0,90000	,50010	,04857	-0,99631	-0,80369	-18,529	105	,000

The average level of the critical reflection development during the post-experimental stage (M = 5.02, AS = 0.73) is significantly higher (t = -18.52, df = 105, p bidirectional < 0,005) as opposed to the average level of the critical reflection development during the preexperimental stage (M = 4.12, AS = 0.67).

Test t data shows that there is a significant difference between the average scores obtained by the subjects during the pretesting and posttesting stages. In order to identify the degree of impact of this difference we have calculated Cohen's coefficient d based on test t value for pair samples (having dependent scores). After calculating *d* Cohen[3] (*d* Cohen = 5.79, r = 0.94) we can conclude that there is a strong effect of our intervention regarding the development of critical reflection during the postexperimental stage as opposed to the preexperimental stage.

The results obtained after the analysis of the intra-subjects design allow us to confirm that ***the specific hypothesis no. 1 of the experiment is being confirmed***. Thus, the intervention program proved its efficiency regarding the improvement degree of critical reflection.

The statistical data shows that the average level of development of **metacognitive reflection** of the subjects involved in research is 3.02 in pretest and 4.05 in posttest. Also, following the two standard deviations (0.45 and 0.44), we see that they are very similar, which is an advantage.

[3] For calculation the effect size based on Cohen's coefficient d, it used the website:
http://www.polyu.edu.hk/mm/effectsizefaqs/calculator/calculator.html
r= aprox. 0,2 – weak correlation
r = aprox. 0,5 – medium correlation
r = aprox. 0,8 – strong correlation

The extent to which the two sets of scores from the pretest and posttest of metacognitive reflection correlate is clear from the significant ($p < 0.001$) and the strong correlation (0.89).

Table no. 2 shows the value for t (-51.21) which, with 105 degrees of freedom, is significant at 0.00 for the bidirectional level. Therefore, with the significance level being below 0.005, the scores for the development of metacognitive reflection during postexperimental stage are significantly higher than scores obtained during the preexperimental one.

Table no. 2. The results of test t for the experimental group regarding the metacognitive reflection during the pretesting and posttesting stages

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
MR_pretest & MR_posttest	-1,02094	,20523	,01993	-1,06047	-,98142	-51,217	105	,000

The average level of the metacognitive reflection development during the postexperimental stage (M = 4.05, AS = 0.44) is significantly higher (t = -51.21, df = 105, p bidirectional < 0,005) as opposed to the average level of metacognitive reflection development during the preexperimental stage (M = 3.02, AS = 0.45).

In what concerns the increase of the effect size regarding metacognitive reflection, Cohen's coefficient d = 7.03, meaning for a r = 0.96 represents a powerful effect of our intervention.

The specific hypothesis no. 2 is being confirmed, all the subjects appreciating as positive the relation between the formative program that we have suggested and the increase of the efficiency in learning.

The average level of the development of **strategic decision-making** process of the subjects involved in research is 3.10 in pretest and 4.21 in posttest. Taking into consideration the two standard deviations (0.56 and 0.47), we see that they are very close in value, which is an advantage in this case also.

Regarding the scores obtained for strategic decision making in pretest and posttest there is a significant ($p <0.001$) and strong correlation (0.84) between the two sets of scores.

Table no. 3 gives the value for t (-37.95) which, with 105 degrees of freedom, is significant at 0.00 for the bidirectional level. Therefore, observing that the significance level is smaller than 0.005, the scores of subjects for the development of strategic decision-making process during postexperimental stage are significantly higher than scores obtained during the pre-experimental one.

Table no. 3. The results of test t for the experimental group regarding the variable of strategic decisions making during the pretesting and posttesting stages

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
SDM_pretest & SDM_posttest	-1,10877	,30074	,02921	-1,16669	-1,05085	-37,958	105	,000

The average level of the strategic decisions making process development during the postexperimental stage (M = 4.21, AS = 0.48) is significantly higher (t = -37.95, df = 105, p bidirectional < 0,005) as opposed to the average level of the strategic decisions making process development during the preexperimental stage (M = 3.10, AS = 0.56).

We also mention that in the case of the strategic decisions making development, our intervention had a strongly significant effect (d Cohen = 5.10, r = 0.93).

The results obtained allow us to sustain that ***hypothesis no. 3 is being confirmed***. The intervention program has had a positive effect upon the quality of learning strategies, facilitating the development of several attitudes of strategic decisions making in problem-solving situations regarding reading texts.

All these results demonstrate that during the experimental approach, practicing critical reflection, metacognitive reflection and strategic decision making in complex learning situations, there has been a significant increase in the incidence of learning behavior on cognitive, metacognitive, non-cognitive dimensions and an optimization of awareness, planning, monitoring and regulating learning level.

In the pretesting stage we were interested in analyzing in what way these three variables correlate. According to Pearson's coefficient correlation analysis we note that there is a statistically significant correlation between the degree of

development of critical reflection abilities and the degree of metacognitive reflection abilities established at r = 0,424. Moreover, there is a positive correlation between the critical reflection abilities and the ability of strategic decisions making (r = 0,510). Between the degree of metacognitive reflection capacities and that of decisions making there is no strong correlation (r = 0,499). In this way we can argue that there are significant but not strong correlations (p < 0,001) between the three processes that contribute to the development of learning to learn competency.

Intending to identify the degree of correlation between the three variables regarding the development of learning to learn competency during the posttesting period, we have used Pearson's correlation coefficients (table no. 4).

Table no. 4. Correlations obtained between the three variables in the posttest phase

		Critical reflection	Metacognitive reflection	Strategic decision-making
Critical reflection	Pearson Correlation	1	,786**	,809**
	Sig. (2-tailed)		,000	,000
	N	106	106	106
Metacognitive reflection	Pearson Correlation	,786**	1	,760**
	Sig. (2-tailed)	,000		,000
	N	106	106	106
Strategic decision-making	Pearson Correlation	, 809**	,760**	1
	Sig. (2-tailed)	,000	,000	
	N	106	106	106
**. Correlation is significant at the 0.01 level (2-tailed).				

After the data analysis we can notice that between the three processes contributing to the development of learning to learn competence, there are significant positive correlations (p < 0,001). Therefore, the level of development of critical reflection positively correlates with the level of metacognitive reflection at a r = 0.78 and with that of strategic decisions making at a r = 0.80. Also, the level of the development of metacognitive reflection positively correlates with the level of strategic decisions making at a r = 0.76.

In other words, the average values in the applied inventories are significantly higher in posttest for each of the three variables that contribute to the development of learning to learn competency, than the values obtained in applying the same inventories in the pretest phase. In the same vein, the correlations between the three variables are kept positive and become significantly stronger in posttest.

In conclusion, we can mention the following arguments regarding the three processes intended by us through implementing the model of development of learning to learn competence:

- students with a high level of critical reflection have also a high level of metacognitive reflection;
- students with a high level of critical reflection have also a high level of strategic decisions making;
- students with a high level of strategic decisions making have also a high level of metacognitive reflection.

Examining the scatter diagrams regarding the relations between critical reflection and metacognitive reflection, between critical reflection and strategic decision-making and between metacognitive reflection and strategic decision-making, it can be said that there is no evidence of a curvilinear relationship or an unwanted influence of anomalous variables.

We mention that although the correlation coefficients do not have an equal value with 1, although they do not indicate a perfect correlation between the variables, these correlations are significant. Moreover, the development of a competence and its structural components happens in time therefore we expected an unequal correlation between critical reflection, metacognitive reflection and the process of strategic decisions making. Thus, the existence of certain significant correlations between these components, although not perfect, intends to complete the rest of the statistical data and emphasizes the efficiency and functionality of our model of development of learning to learn competency.

To assess the extent to which the introduction into the educational program of various learning situations meant to values integrative critical reflection, metacognitive reflection and strategic decisions making induces positive effects on the learning behaviors level, determining the decrease in frequency of learning difficulties, we also analyzed qualitatively the evolution scores of open reflection diaries, the main tool used for metacognitive reflection.

The statistically significant differences between pretest and posttest results in conjunction with developments, highlighted by quantitative and qualitative benchmarks, of subjects in the experimental group during the formative intervention allow us to appreciate that the assumption underlying the experimental study was validated. Using critical reflection, metacognitive reflection, strategic decision making and training subjects in complex, analytical and creative learning situations with interdisciplinary links in an articulated intervention program proved to be efficient in activating and optimizing learning behavior and therefore, in decreasing the frequency learning difficulties facing the 11th grade students.

Discussions and Conclusions

Intending to increase the quality of reflection in learning, we tried to create authentic learning situations in which students' self-assumed cognitive efforts that cooperated to overcome their difficulties of learning to blend and go hand in hand with those of colleagues in formal educational contexts.

Our intervention reveals an increase at the level of critical reflection in the posttest phase compared to the pretest. This increase was always associated with the activation of existing knowledge and skills and applying them in new situations, along with the search for alternative solutions to choose the best one based on evidence, with evaluating alternatives and adopting a reasoned position. The educational intervention plan to decrease the frequency of learning difficulties for 11th graders was a strategic operational tool that allowed each student with learning difficulties, but also to the group itself to evolve in terms of orientation of cognitive interests, of search for answers to complex questions, of analysis and synthesis of information and opinions, of ensuring understanding new things and learning in a broad sense. It is an approach that applies beyond the school and classroom space, in the context of life situations of students with learning difficulties.

During the experimental approach, practicing metacognitive reflection and using metacognitions to monitor and control metacognitively learning, there was a significant optimization of awareness in personal metacognition and a significant increase in the incidence of planning, monitoring and evaluation of learning behavior. Metacognitive reflection has provided the context for students to use their decision-making skills when they analyze their own performance as well as their peers' performance, questioning what has been learned and deciding what other alternatives for the same problems are possible. Reflection improves learning because it gives students an opportunity to review previous actions and decisions before continuing and enables them to make appropriate decisions afterwards.

For our experiment, the solutions that we proposed, tested, implemented and validated statistically emphasized the strategic and reflective learning underlying the development of learning to learn competency. The educational school practice has proved the efficiency of the proposed independent variable. Thus, regarding the students on the experimental group we are able to appreciate that:

- All students were encouraged to get involved in solving tasks and issues, because we worked on different tasks with different degrees of complexity.

- Knowing that the students learn by building meaning, they were encouraged to explore different information, to ask questions, to reflect on what they have learned, to examine the implications of using learning strategies and to apply them in a useful manner, to change their understanding about a particular topic.
- The active and interactive involvement of students increased everyone's responsibility in solving tasks.
- The frequency of learning difficulties on cognitive, metacognitive and non-cognitive dimensions diminished and implicitly the school performance in Romanian Language and Literature subject has grown significantly.
- The decrease of learning difficulties was also due to a good knowledge of their own learning, to a more a rigorous and objective self-assessment. Identifying their own limits, gaps and difficulties was often the most important step in eliminating them.
- The improvement of metacognitive strategies led to a more efficient learning management (management of cognitive and non-cognitive resources, time management, motivation dosage management etc.).
- There was an increase in situation of solving learning tasks and problems by repeated attempts, by various approaches, decreasing the risk of task avoidance, of lack of motivation or of abandonment.
- The relationships between students and between teacher and students have improved considerably and they materialized in a better, more effective communication.

The psycho-pedagogical program, suggested and evaluated within this paper, allows the structuring of coherent manner of action, in order to improve the results of 11th grade students. Whatever the nature of learning difficulties the students experience, this program shows a great advantage, which is the focus on what the student can do to help himself. This is the reason why we emphasize the necessity within the Romanian educational system, to promote a nuanced and coherent ensemble of educational practices to determine the existence of formative learning experiences to students, by means of actively and interactively engaging them in studying the school disciplines, as well as supporting them to become capable of learning to learn.

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READING RATE AND FLUENCY BASED INSTRUCTION FOR CHILDREN WITH INTELLECTUAL DISABILITY: A CASE STUDIES

FABIOLA CASARINI[1], ADELE CARPITELLI[2]

ABSTRACT. We studied the effects of word fluency training on text reading rate in four students diagnosed with intellectual disability, from mild to severe. Prior and after the intervention, participants read three different texts for the age-graded level, to evaluate the effects of training on reading fluency. The independent variable was a fluency training for reading words based on Precision Teaching. During the intervention correct responses and faster rate of responding were reinforced. The results showed a significant improvement in oral text reading for all participants. Word fluency training seemed to be also efficient, requiring a brief intervention to reach important reading goals.

Keywords: *Oral Reading Fluency, Precision Teaching, Disability, Word fluency training, Fluency aims, Effectiveness, Efficiency.*

ZUSAMMENFASUNG. Wir haben die wirkung eines training von einfluss lessen von einen textin vier schuler mit einer diagnose von mittlere und schwere intellektuelle behinderung studiert. Vor und nach dem eingreif sind an den schuler drei verchindene texten unterbreitet worden, zum die auswirkung. Bewerten von dem training des fliessenden lessen eines textes. Werent dem eingreif sind fliessende und richtige antworten belohnt worden. Die ergebnise zeigen ein bedeutende verbesserung im lessen bei allen scheint wirksam. Ein kurzer eingreif hat ermoeglicht das man nein wichtiges ziel erreicht hat. Das lessen, das fliessende lessen genauigkeit teaching, behinderung lessen training einfluss woerter fliessende ziele, leistung, wirksamkeit.

Schlusselworter: *Mundelselsefluss, Praezisioni lehre, Behinderung, Unterricht fliessend, Effectiveness, Wirkungs.*

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Introduction

In 1964, Lindsley wrote: "*Children are not retarded. Only their behaviour in average environments is sometimes retarded".* In half a century after, both, regular and special education, teacher still rarely implement evidenced based teaching methods to ensure that their children's skills acquisitions is both accurate and fluent.

Since the rate of acquisition of new ability or behaviour is strictly related to environmental factors, the creation of specific instructional programs should be fundamental (Perini, 1997; Perini & Bijou, 1993). Applied research with learning-disabled students describes the sequence of prerequisite tasks and a be main tactic to build reading fluency (Casarini & Andolfi, 2015): to model fluent oral reading (Blevins, 2001; Rasinski, 2003), to provide direct instruction and feedback (NICHD, 2000; Snow et al., 1998), to offer many opportunities for practice and to provide students with plenty of materials at their independent reading level (Allington, 2000).

More aspects are related with an effective fluency based instruction. Precision Teaching (PT) was one of the most replicated fluency-based intervention packages and demonstrated a great potential for strengthening any curriculum for children with or without intellectual disability (Beck & Clement, 1991; Lindsley, 1992; Fabrizio, Pahl & Moors 2002; Cavallini, Berardo & Perini, 2008). The concept of PT rests on four founding principles: "(1) the child knows best: in the sense that a child's response to a task or learning approach is the best indicator of whether a given teaching method is working with that child; (2) Focus on observable behaviours: a practical rule that makes it possible to take accurate counts, to monitor whether a child is improving in response to the current teaching method; (3) Use frequency measures to monitor performance: PT focuses on rate, or frequency of responding, which can only be measured by using the number (or count) of correct and incorrect responses within a given timeframe; and (4) Use a standardised graphic display, standard celeration chart, to record performance measures and make in- structional decisions" (Hughes, Beverley & Whitehead, 2007).

Research shows that precision teaching can facilitate growth in reading fluency and other aspects of reading achievement (Adams, 1990; Therrien, 2004). Reading is the primary medium for the transfer of knowledge in all curriculum areas (Cawley, Miller & Carr, 1990; Tressoldi, Stella & Faggella, 2001) and indeed is a prerequisite skill required for much of what children learn in schools (Hughes, Beverley & Whitehead, 2007). If a child does not function at an average grade-level reading ability he or she will likely find it difficult to progress in most subject areas. Moreover, oral reading fluency has been shown to predict comprehension better than other direct measures of reading comprehension,

such as questioning and retelling (Fuchs, Fuchs, Hosp & Jenkins, 2001). In fact, if component skills are not fluent, moving on to tasks predicated on those skills makes learning more difficult and may ultimately lead to dysfluency in that subject (Kubina, Young & Kilwein, 2004). Reviews of the Italian reading literature (Cazzaniga, Re, Cornoldi, Poli & Tressoldi, 2005; Tressoldi, Vio, Lorusso, Facoetti & Iozzino, 2003; Riccardi, Ripamonti, Truzoli & Salvatico; 2004) point to two behaviours that most likely function as foundational skills for reading: syllable recognition and word recognition. The general notion is that if students are fluent in decoding skills, they will spend "less time and effort ... directed to recognition activities" (Gunderson, 1984, p. 267). PT represents an educational strategy for building reading flu- ency in which a student rereads syllables and/or words until meeting a criterion level (Cavallini, Berardo & Perini, 2008). There is still a general tendency to emphasize the development of physical and social skills, in the belief that children with mental retardation have very little potential for cognitive development (Cavallini et al., 2008). The correlation between fluency and reading comprehension was clearly established by a large-scale analysis of data from the National As- sessment of Educational Progress in Reading (Pinnell, Pikulski, Wixson, Campbell, Gough & Beatty, 1995). Cavallini and Perini (2009), found that, in typically developed children, promotion of sublexical component fluency does not show evidence of influencing reading as a general performance. Conversely, the automatization of word recognition positively affected text reading. The current study evaluates the efficacy and efficiency (in term of educational time) of teaching frequent words to fluent levels in 4 children with mental retardation.

Methodology

Research Objective

The objective of this study was to elaborate and investigate the benefits, in term of effectiveness and efficiency, of a fluency based reading intervention in three children with mild intellectual disability and a children with severe intellectual disability (See Table 1).

Table 1. Age, Sex and IQ score (Leiter-r, 2002) for all participants.

Participant	Age	Sex	IQ
F.	8	M	81
P.	10	F	77
L.	7	M	80
T.	14	M	57

The application in students with severe and mild intellectual disability of a fluency based intervention program structured on component of reading to achieve oral reading fluency. In this research we focused on: teaching words in isolation led to reading improvement in oral reading text.

Research variables

The dependent variable measured in this study was the number of syllables read per minute. Data probes were taken according CBM procedure (Deno, 1985): participants read three different texts for aged-graded level and mean data were recorded.

The independent variables in this study was a fluency training for reading words based on Precision Teaching (Binder et. al, 1990).

During the intervention students were motivated to increase their rate of correct responses and faster rates of responding were reinforced. Reinforcements and corrections were delivered at the end of each session (15-seconds "sprints"). Each child was informed of the daily frequency aim to reach and at the end of every sprint the researcher provided contingent informational feedback related to individual performance.

Procedure

Data were collected during one-to-one instruction throughout one hour interventions. During training sessions, participants conducted brief practice sprints (15 seconds). Each child was informed of the daily frequency aim to reach and the researcher motivated them, through verbal social approvals, to do their best on each trial and to read as fast as possible until timer sounded. Participants went through four practice sprints per worksheet and the teacher followed a specific decision protocol to take correct decisions. The protocol was based on the Morningside Teaching Model (Johnson, 2004)

Generalized reinforcers (tokens and social praise) and corrections were delivered at the end of the sprint. Reaching the daily aim was the condition to obtain the tangible reinforcement previously agreed whit the child. At the end of each sprint the teacher also gave informative feedbacks related to the performance and the number of words read. Researcher then visually dispayed on a graph the highest score for each words' reading session and showed pupils their results and progresses. The reading training for every set stopped when fluency aim (the frequency range the child needed to achieve before moving on to another task) were reached (from 90 to 120 words per minute).

To evaluate the efficacy of words-fluency training, with respect to speed improvement in age-graded text reading (i.e., observed in composite skills after practicing component skills and defined as "application"; Kubina, Young & Kilwein, 2004; Hughes et al., 2007), the participant had to read three different texts per months.

A CBM assessment procedure was then conducted every month. During the monthly assessment, children had to read three grade-appropriate texts. These readings must have been completely novel for the participants and no feedback was provided after all performances. The researcher calculated the mean of correct and incorrect syllables score and recorded the data on a graph, where the number of correct and incorrect syllables read was displayed separately.

Results

This study investigated the effectiveness and efficiency of a fluency based reading intervention in four children with intellectual disability. Each reading training set was printed on a worksheet and after training sessions, daily best performances were recorded. Figure 1 shows an example related to the performance of participant F. data are expressed as number of words read per minute. The frequency of text reading during CBM probes were recorded as number of syllables per minute, Table 2 lists the pre and post intervention evaluation. Results show improvement in text reading frequency for all participants, indicating the effectiveness of the training.

Results are similar to studies conducted with typically developed slow readers of English (Hughes, Beverley & Whitehead, 2007).

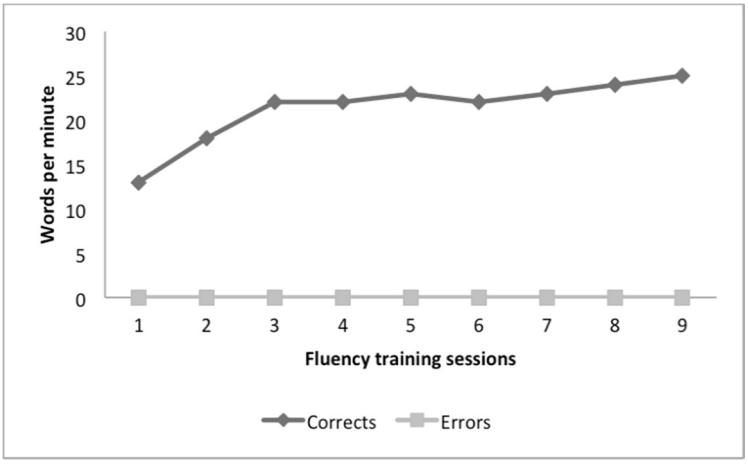

Figure 1. Performance of participant F. for a single word set

The reading improvement at the end of the seven month of training, for all participants was over 35 syllables per minute. If we consider that the mean development of reading speed for typical Italian readers is 25,2 syllables per minute in one year (Tressoldi & al., 2001), we can state that the intervention is also efficient.

The intervention lasted 7 month; lessons (about 40 minutes) took place twice a week. It's calculated summing all the drills (15 seconds) performed during the word-fluency training.

Table 2. Pre and post reading probe for all participants

Participant	Pre Probe (Syllable/min)	Post Probe (Syllable/min)	Reading improvement (Syllables/min)
F.	76	120	44
P.	84	125	41
L.	72	110	38
T.	55	92	37

Each participant was actively involved on training for 150 minutes. The total practice is the time during which participants were actively involved on task.

Fluency based instruction seems to be a useful method to improve text reading in children with intellectual disability.

One of the aims of the present study was to evaluate the extent to which fluency training in the component elements of reading (words or syllables) would promote greater improvement in age-graded text reading, an ability considered by Precision Teachers to be a composite skill (Kubina, Young & Kilwein 2004). If we consider the effects correlated with an increase in reading speed, such as text comprehension (Fuchs & Fuchs, 1986; Nathan & Stanovich, 1991), it appears evident that precision teaching used in association with a word-recognition curriculum can represent an effective intervention instrument for teachers and educators. The use of brief practice sprints, constant monitoring of results, and the promotion of a sense of fun during repetitive practice (sprints) offers a new effective way to exercise many instrumental abilities that are typically considered to be "boring", but are crucial to achieving academic goals.

Despite the present study's limitations (small number of participants, no control group, no multiple baseline measurements), the data gathered and the results raise interesting issues.

More research could also be conducted to compare or integrate word fluency instruction with different kind of intervention and to investigate comprehension outcomes. Reading "Self pace" response rhythms, brief practice

sprints, performance aims, informative feedbacks, graphic display are some of the aspects related with the acquisition of a fluent performance (Binder, 1996; Lindsley, 1996; Binder & al., 1990; Kessissoglou &Farrel, 1995; Lindsley, 1992; Koorland e al., 1990, Locke e Latham, 1990; White, 2000; West & al, 1990; White, 1986). Isolating the main component that makes fluency training an effective method is complex (Doughty, Chase e O'Shields, 2004; Kuhn e Stahl 2003; Singer-Dudek e Greer, 2005; Hanratty e Greer, 2000). Findings are ambiguous but examinating clinical effects we can support other researchers' statement related to fluency based instruction as an efficient way to train many instrumental abilities even with students with intellectual disability (Heward, 2003; Carnine, 1976).

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A COMPARISON OF STAKEHOLDERS' VIEWS ON SCIENCE EDUCATION IN ROMANIA AND GERMANY: RESULTS FROM THE INTERNATIONAL PROFILES CURRICULAR DELPHI STUDY ON SCIENCE EDUCATION

THERESA SCHULTE[1], GABRIEL GORGHIU[2], CLAUS BOLTE[1]

ABSTRACT. Within the framework of the FP7 funded European Project entitled "*PROFILES - Professional Reflection Oriented Focus on Inquiry-based Learning and Education through Science*", 22 partner institutions from 21 countries are involved in making efforts to disseminate a modern understanding of scientific literacy and facilitate an uptake of inquiry-based science education (IBSE). Embedded in this project is the International PROFILES Curricular Delphi Study on Science Education, which aims at identifying desirable aspects and shortcomings of modern science education with respect to scientific literacy.

In the International PROFILES Curricular Delphi Study on Science Education, different stakeholders' views on desirable aspects of scientific literacy based science education are by means of the Delphi method collected in three consecutive rounds by the PROFILES partners in 21 different countries. As relevant stakeholders involved with science and science education, these studies include students, pre- and in-service science teachers, science education researchers and scientists.

In the first round, the stakeholder's views in each country were collected in individual statements and through qualitative analyses classified into category systems. In this contribution, the results of the first round from Germany and Romania are compared. The comparison shows that despite cultural differences and different educational systems, similar tendencies can be found in the stakeholders' views in the two countries.

Keywords: *Science Education, Delphi study, PROFILES project.*

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ZUSAMMENFASUNG. Im Rahmen des Europäischen PROFILES Projekts sind 22 Partnerinstitutionen aus 21 Ländern beteiligt, ein modernes Verständnis naturwissenschaftlicher Grundbildung (scientific literacy) zu erarbeiten und eine Implementation von inquiry-based science education (IBSE) zu fördern, was auf Deutsch in etwa mit forschend-entwickelndem Lernen übersetzt werden kann. Eingebettet in dieses Projekt ist die Internationale PROFILES curriculare Delphi-Studie Naturwissenschaften, die auf die Ermittlung wünschenswertes Aspekte und Mängel der im gegenwärtigen modernen naturwissenschaftlichen Unterricht in Bezug auf naturwissenschaftliche Grundbildung abzielt.

In der Studie werden die Ansichten verschiedener Interessenvertreter (stakeholder) zu wünschenswerten Aspekte naturwissenschaftlicher Grundbildung in drei aufeinander folgenden Runden von den PROFILES Partnerinstitutionen in 21 verschiedenen Ländern mithilfe der Delphi-Methode erfasst. Als relevante Interessengruppen bezüglich naturwissenschaftlicher Bildung werden sowohl Schüler, Lehramtsstudenten, Referendare, und Lehrer mit naturwissenschaftlichen Fächern als auch in der Naturwissenschaftsdidaktik tätige Personen und Naturwissenschaftler mit einbezogen.

In der ersten Runde wurden die Ansichten der beteiligten Interessenvertreter in den verschiedenen Ländern jeweils in Textform erhoben. Durch qualitative Inhaltsanalyse wurden die Aussagen anschließend in Kategoriensysteme überführt. In diesem Beitrag werden die Ergebnisse der ersten Runde aus Deutschland und Rumänien miteinander verglichen. Aus dem Vergleich geht hervor, dass trotz unterschiedlicher Bildungssysteme und kultureller Unterschiede ähnliche Tendenzen in den Schwerpunkten der Interessenvertreter in den beiden Ländern erkennbar sind.

Schlüsselwörter: Bildungwissenschaften, Delphi Studium, PROFILES Projeckt.

Introduction

As is well known that in the last years a clear decrease of young students' interest for science lessons has been noticed, the actual actors involved in science education must find solutions for raising the children's interest in learning activities related to this area. In this sense, some reports suggest that inquiry activities lead to promising results, with visible positive impact in students' attitudes (Chang & Mao, 1999; Shymanski, Yore & Anderson, 2004). On the other hand, besides getting more interest in science, inquiry activities are found to stimulate interest that is more sustainable after the moment of intervention (Gibson & Chase, 2002).

The IBSE paradigm - *Inquiry Based Science Education* - represents an approach which is focused on student inquiry as the driving force for learning, the teaching process being organized around questions and problems, in a highly student-centered inquiry process. The IBSE methodology proposes that students learn through and about scientific inquiry rather than by teachers presenting scientific content knowledge (PROFILES Consortium, 2010).

In this respect, one of the main objectives of the PROFILES project (http://www.profiles-project.eu) is to promote IBSE through raising the self-efficacy of science teachers to take ownership of more effective ways of teaching students, supported by stakeholders (PROFILES Consortium, 2010). Thus, the PROFILES partnership (represented by 22 institutions from 20 countries) agreed to conduct a curricular Delphi Study (Bolte, 2008; Häußler, Frey, Hoffmann, Rost & Spada, 1980; Mayer, 1992) with the aim *to involve various stakeholders in reflecting on contents and aims of science education as well as in outlining aspects and approaches of modern science education.*

Description of the procedure

In light of previous curricular Delphi Studies in Science, the PROFILES Curricular Delphi Study on Science Education was divided into three rounds (Bolte & Schulte, 2011):

(a) *Round I* - gave the opportunity to participants for expressing their opinions related to *aspects of contemporary and pedagogically desired science education* in open-text responses to three open questions regarding *motives, situations* and *contexts***,** as well as *fields*, *aspects* and *qualifications*.
(b) *Round II* - provided the participants with the necessary information concerning the defined categories of the first round and asked the participants *to prioritize the given categorie*s as well as to assess *to what extent the aspects expressed by the categories are realized in practice*
(c) *Round III* - provided the participants with *concepts of desirable science education empirically identified on the basis of the second round and again asked them for weighted assessment* (similar to the second round).

The target group who took part in the Delphi Study was selected in order to *cover significant parts of German & Romanian societies*, *emphasizing mainly on the stakeholders directly involved with curricular aspects of science education* (Bolte, 2003; Gorghiu et al., 2013). That is the reason for selecting participants involved in different scientific and educational fields. In this respect, the structure of the target group consisted of the following sub-groups:

(a) *students / young students* - 16-18 years old;
(b) *pre-service teachers* (university students involved in Science programmes) and *trainee science teachers* (young teachers);
(c) *Science teachers* and *trainee science teachers* (experienced teachers);
(d) *educators, didacticians* and *in-service teacher educators* (in chemistry, physics, biology, geography and general science areas);
(e) *scientists* (chemists, physicists, biologists);
(f) *education politicians* (spokespersons for education policy),
(g) *people who are not directly involved with Sciences* (university students, teachers, parents, humanists) – just in Romania.

In this paper, specific results obtained in the 1st round of Curricular Delphi Study on Science Education, performed by *Freie Universitat Berlin* (Germany) and *Valahia University Targoviste* (Romania) PROFILES teams are presented. Each participant from the selected target group was requested to fill in maximum *10 form sheets,* in which he/she could formulate statements in such way that *each answer contains three formal components* (Bolte & Schulte, 2011):

(a) *statements about situations, contexts or motives where scientific literacy is useful* ("which situations and motives can be taken as a reason and in which context should science-related themes be put in order to stimulate and further scientific educational processes?");
(b) *statements about fields of science that are considered significant and which the individual should have dealt with* ("which science-related contents, methods and themes should a (scientifically) educated person have dealt with intensively?");
(c) *statements about the qualifications that must be attained* ("which form of availability, skills, and attitudes should the individual attain regarding contents, methods and themes
(d) that are considered as educationally relevant?").

An overview of the procedure of data analysis in the first round of the Curricular Delphi Study on Science Education is illustrated in Figure 1 (Bolte, 2003).

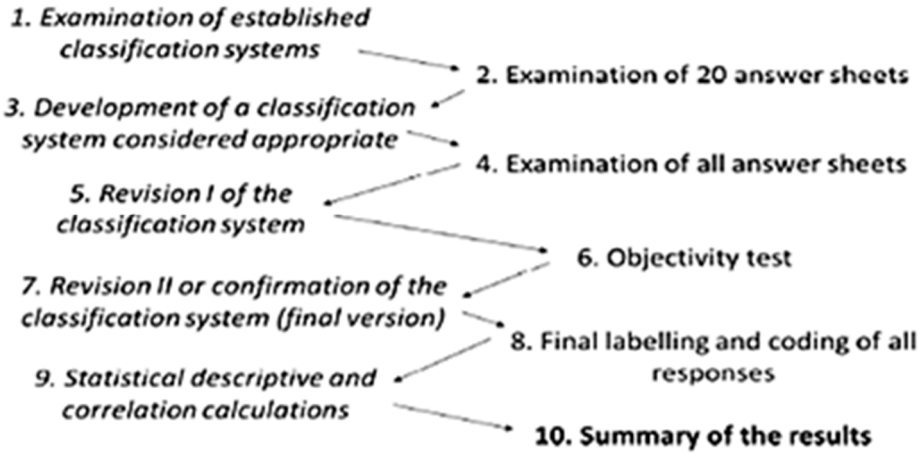


Figure 1. Mutual coordination of constructive development phases and empirical work phases (Bolte, 2003)

As recommended, *a classification system was chosen* based on *a set of categories on the basis of which all the statements can be assigned, grouped and systematized*.

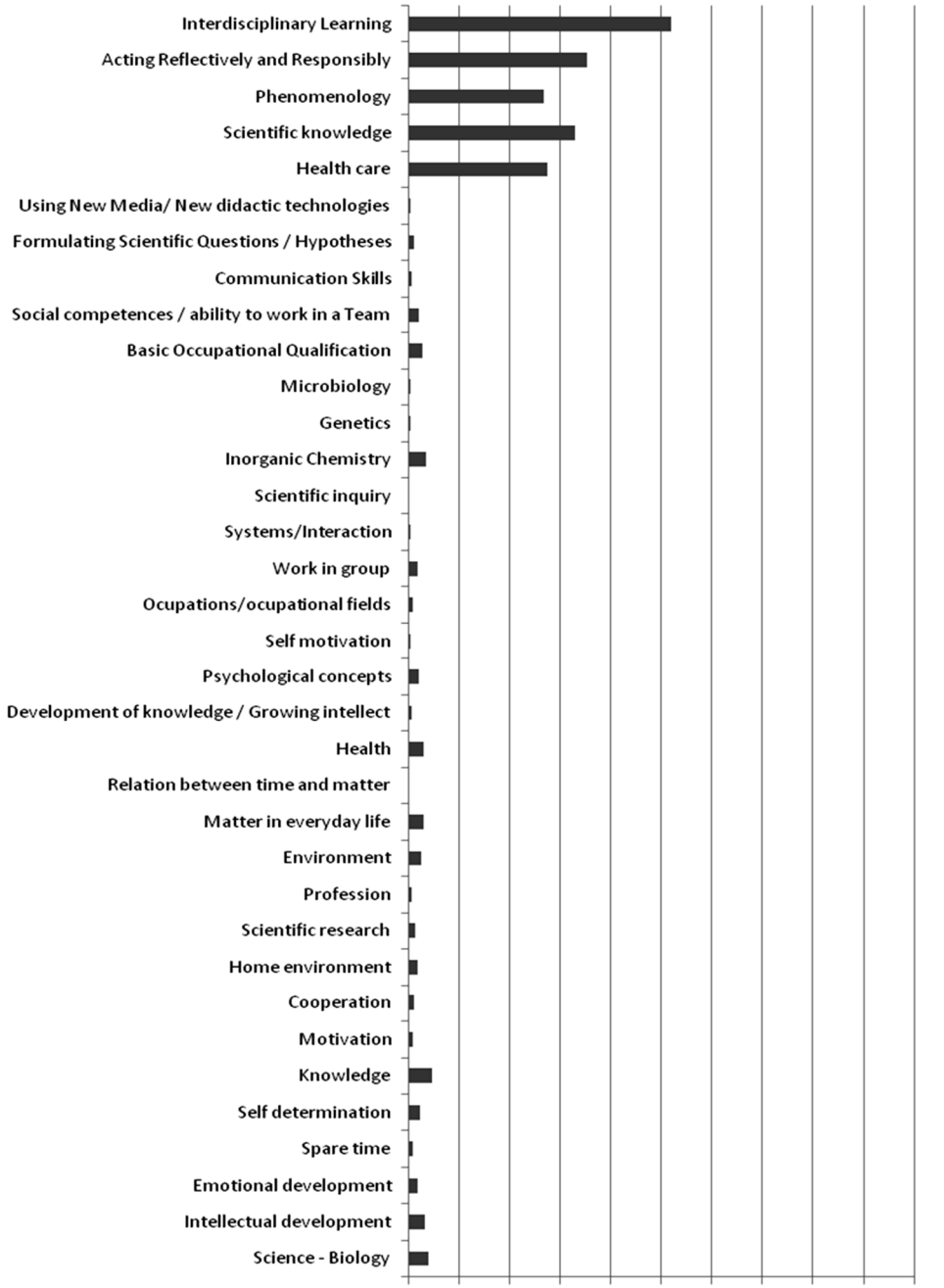
The *set of categories* was subdivided into *three parts* (I: *situations, contexts and motives*, II: *fields* and III: *qualifications*), but also a *subdivision of part II* (*field*) into *part IIa* (*basic concepts and topics*) and *part IIb* (*scientific fields and perspectives*), as well as a *subdivision of part III* (*qualifications*) into *part IIIa* (*qualifications/attitudes/skills*) and *part IIIb* (*methodical aspects related to qualifications*) were introduced.

Results and discussion

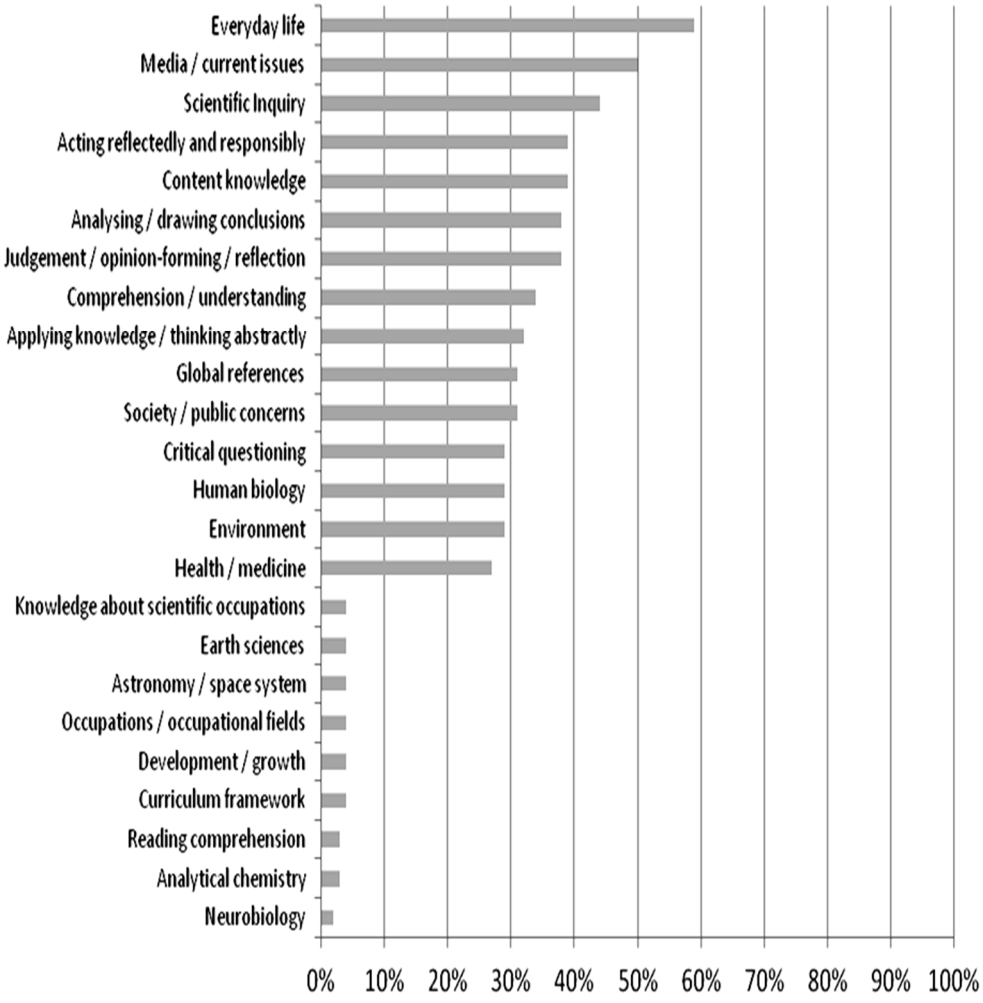
The following results are structured according to the different parts of the classification system, focusing on the results regarding the whole sample as well as regarding the different sample groups. Frequencies of the stipulated categories by the different target groups are illustrated, but the overall analyses is based on the *categories which were mentioned rarely* (*≤ 5%*) or *often* (*≥ 25%*) - figures 2-6.

In the participants' statements from Romania an important orientation was directed on the following categories: **"Health care"** (part I), **"Scientific knowledge"** and **"Phenomenology"** (part IIa), **"Environmental Chemistry"** (part IIb), **"Acting reflectively and responsibly"** (part IIIa) and finally, **"Interdisciplinary Learning"** (part IIIb). In particular, the group of students mentioned **"Self motivation"**, **"Social competences / Ability to work in a team"** and **"Spare time"** (over 40%), the group of teachers and trainee teachers emphasized **"Doing research"**, **"Microbiology"** and **"Genetics"** (over 50%), the group of educators, didacticians and in-service teacher educators expressed **"Civic education"**, **"Nature"** and **"Environment"** (over 30%), the group of scientists mentioned **"Cooperative ways of learning"** and **"Self determination"** (over 50%), as main categories. As an observation, even it is not illustrated in the following diagrams, it is important to mention that just the group of education politicians provided statements allocated to the category **"Scientific Inquiry"** (rated as 100%) and just the group of people who are not directly involved with sciences provided statements allocated to the categories **"Using New Media/New didactic technologies"** and "**Systems / Interaction"** (both being rated as 100%).

In Germany, according to the participants' statements, an especially strong focus was set on aspects related to the categories **"Media / current issues"** and **"Everyday life"** (part I*) as well as* on **"Scientific inquiry"** (part IIa*),* **"Human biology"** *and* **"Electrodynamics"** (part IIb), *and on* **"Rational thinking / analyzing / drawing conclusions"**, **"(Specialized) Knowledge"** and **"Acting reflectively and responsibly"** (part III). In particular, the group of Students mentioned **"Everyday life"**, **"Content knowledge"** and **"Scientific inquiry"** (over 40%), the group of teachers and trainee teachers stipulated **"Everyday life"**, **"Scientific inquiry"** and **"Media / current issues"** (over 45%), the group of educators, didacticians and in-service teacher educators expressed **"Everyday life"**, **"Judgment / opinion-forming / reflection"** and **"Acting reflectively and responsibly"** (over 60%), the group of scientists mentioned **"Analyzing / drawing conclusions"**, **"Media / current issues"** and **"Everyday life"** (over 40%), as main categories.

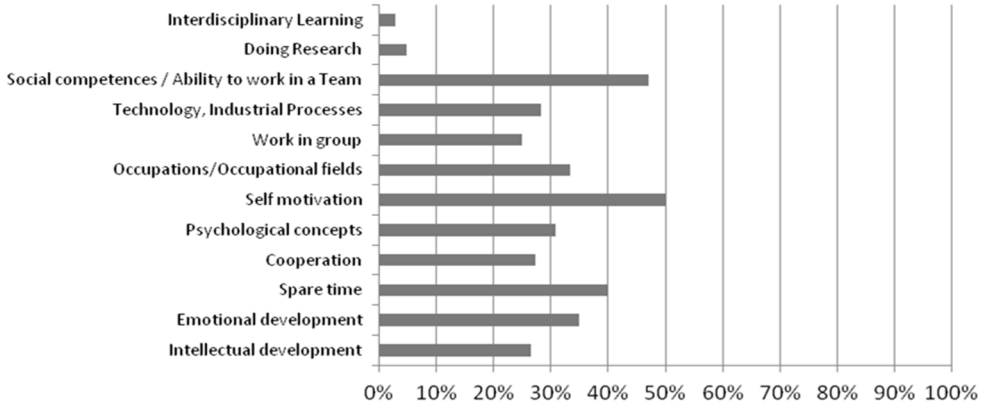

Interdisciplinary Learning
Acting Reflectively and Responsibly
Phenomenology
Scientific knowledge
Health care
Using New Media/ New didactic technologies
Formulating Scientific Questions / Hypotheses
Communication Skills
Social competences / ability to work in a Team
Basic Occupational Qualification
Microbiology
Genetics
Inorganic Chemistry
Scientific inquiry
Systems/Interaction
Work in group
Ocupations/ocupational fields
Self motivation
Psychological concepts
Development of knowledge / Growing intellect
Health
Relation between time and matter
Matter in everyday life
Environment
Profession
Scientific research
Home environment
Cooperation
Motivation
Knowledge
Self determination
Spare time
Emotional development
Intellectual development
Science - Biology
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

(a)

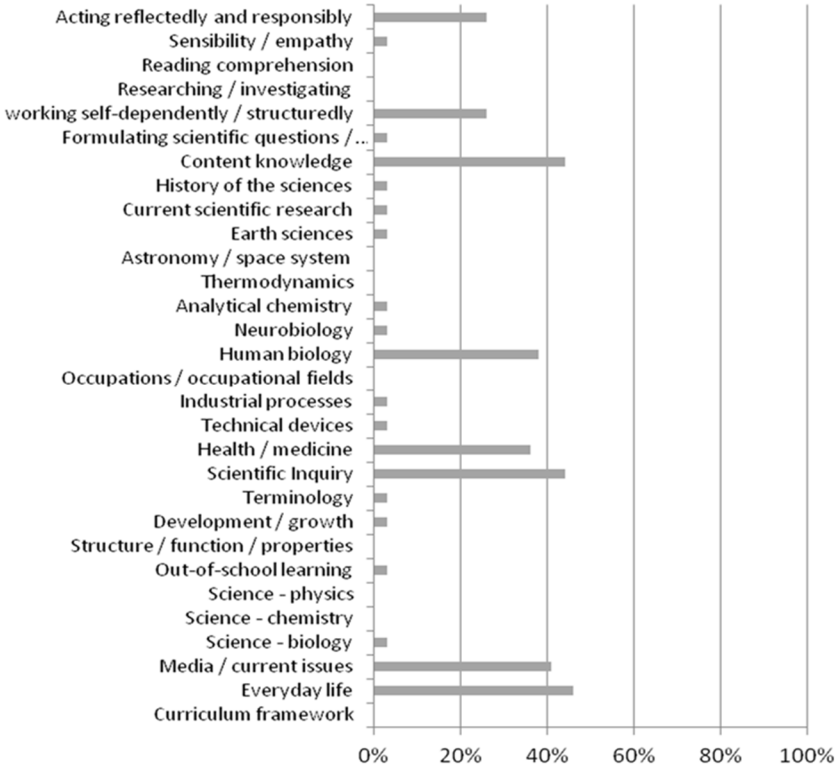


(b)

Figure 2. Overview of the categories that were mentioned rarely (≤ 5%) or often (≥ 25%) - Mean percentages regarding the *whole Sample Group* – (a) Romania; (b) Germany



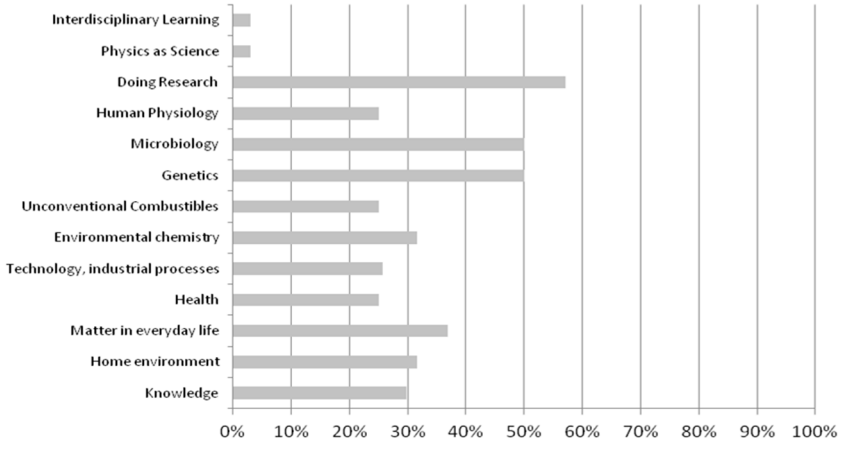
(a)



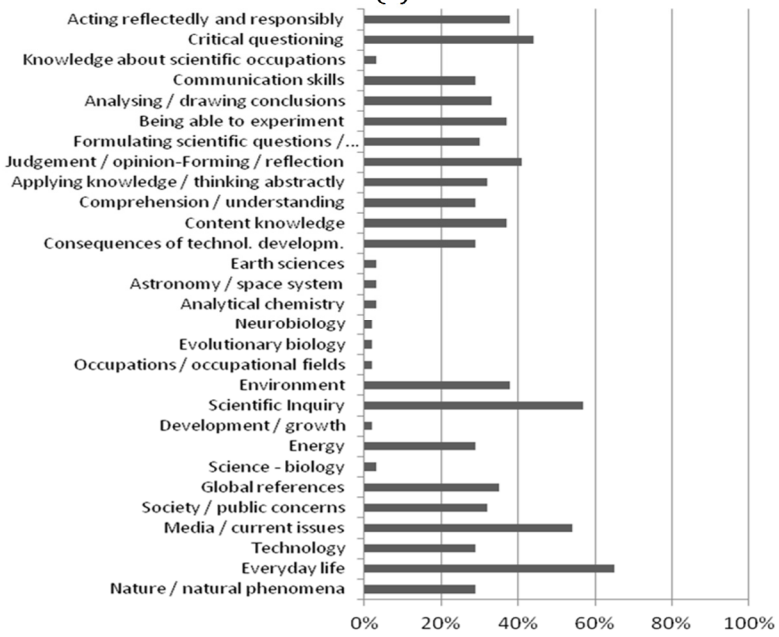
(b)

Figure 3. Overview of the categories that were mentioned rarely (≤ 5%) or often (≥ 25%) - Mean percentages regarding the *Group of Students (Pupils)* – (a) Romania; (b) Germany

A differentiated view on the category frequencies of the different subsamples shows that *the different groups feature different focuses and thus deviate in several cases from each other regarding the relative frequency of mentioning the different categories*.



(a)



(b)

Figure 4. Overview of the categories that were mentioned rarely (≤ 5%) or often (≥ 25%) - Mean percentages regarding the *Group of Teachers & Trainee Teachers* – (a) Romania; (b) Germany

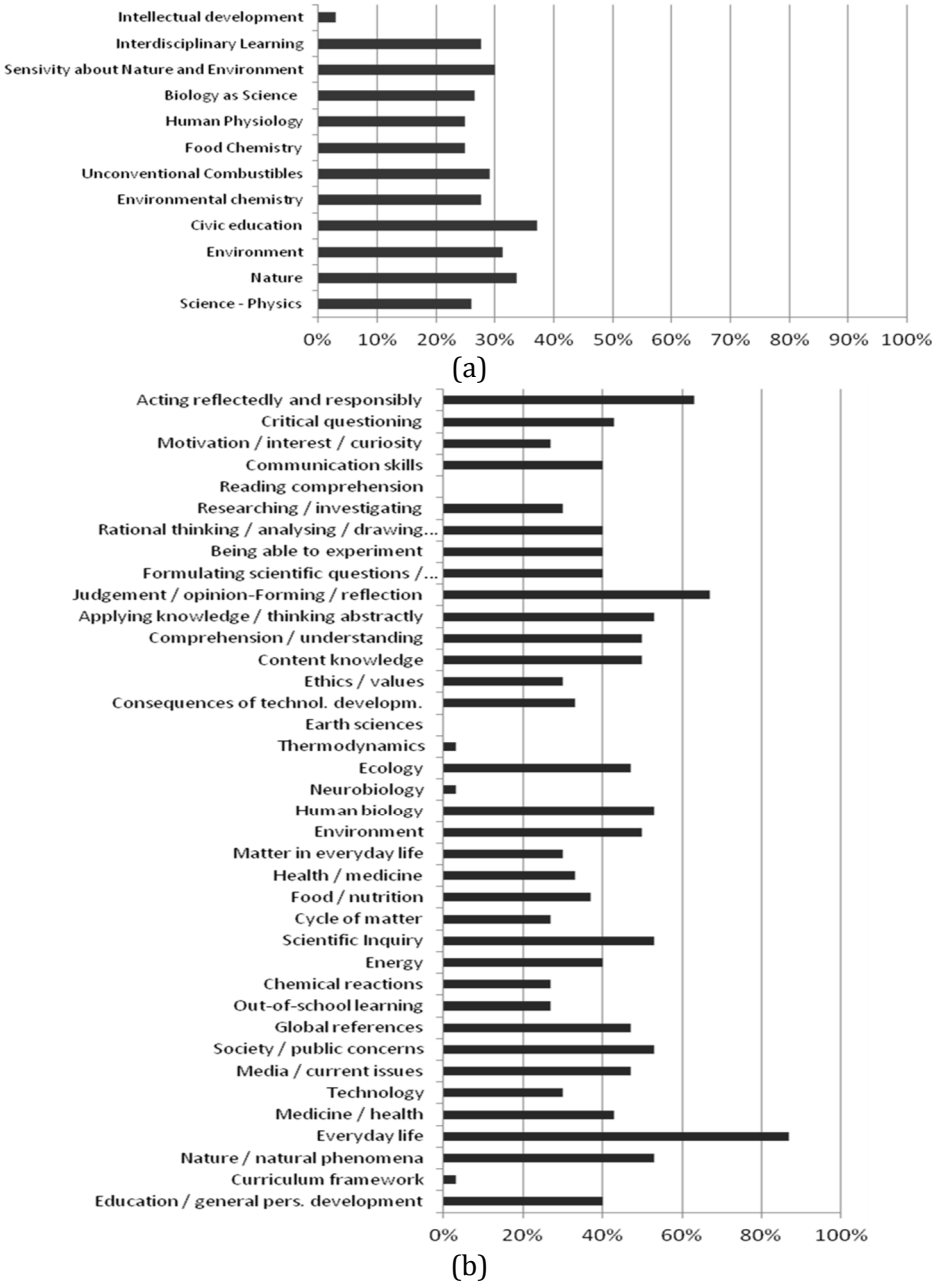
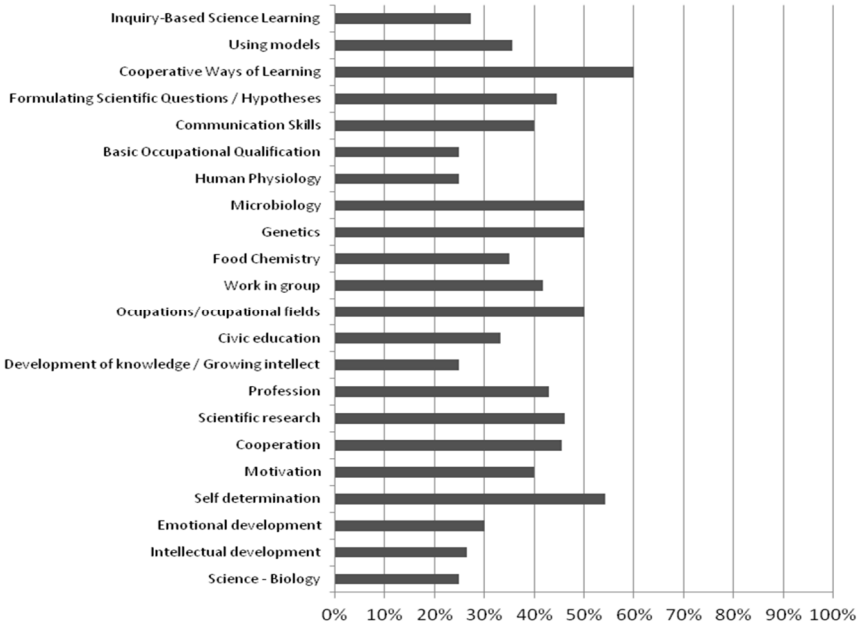
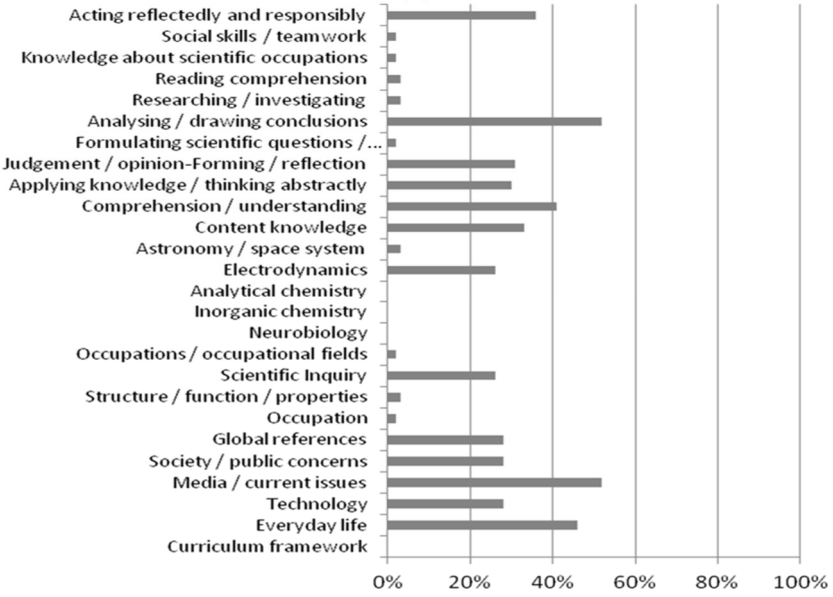


Figure 5. Overview of the categories that were mentioned rarely (≤ 5%) or often (≥ 25%) - Mean percentages regarding the *Group of Educators, Didactics & In-service Teacher Educators* – (a) Romania; (b) Germany



(a)



(b)

Figure 6. Overview of the categories that were mentioned rarely (≤ 5%) or often (≥ 25%) - Mean percentages regarding the *Group of Scientists* – (a) Romania; (b) Germany

Conclusions

The results obtained in the first round of the PROFILES Curricular Delphi Study on Science Education reveal first insights into stakeholders' views about desirable aspects of scientific literacy based science education. The comparison between the first round results from Germany and Romania shows that stakeholders in both countries share several similar emphases about meaningful science education. In particular, common accentuations include aspects related to the connection of science and everyday life and current issues, elements related to the promotion of scientific inquiry, as well as aspects referring to more overarching aims of education. The question whether those aspects only rarely referred to by the participants in both countries are actually considered as less important for science education or whether they are less mentioned because they are not very much present in current science education cannot be answered on the basis of the results of the first round but is investigated in the course of the second round. Further analyses will show how far similarities between German and Romanian stakeholders are maintained.

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(RECOMMENDED CITATION)

BUILDING RESILIENCE AMONG ADOLESCENTS WITH CANCER: A CASE STUDY

VÂJÂEAN CAMELIA CRISTINA[1], BĂBAN ADRIANA[1]

ABSTRACT. The aim of this study was to evaluate the efficiency of a psycho-educational program to increase resilience in the case of an adolescent diagnosed with cancer. The program incorporates the cognitive-behavioral principles and resilience protective factors of adolescents with cancer. The program consisted of six individual meetings based on the information provided by a booklet specially designed for this project. The efficiency of the program was assessed by evaluating the protective factors at the beginning of the program, at the end of it and at a 1 month follow-up. Also, the opinions of the participant involved in this study were assessed by a questionnaire with open questions.

The results showed that there was an increase in scores on effective coping strategies and perceived social support. Depression scores remained at a low level throughout the study and anxiety and optimism scores showed an increase after the program and a decrease at follow-up. Preliminary outcomes showed changes in the desired direction. The implications of the results are discussed. Through this study we emphasize the need for development of evidence-based programs for improving quality of life in adolescents with cancer.

Keywords: *adolescent, cancer, resilience, coping, psycho-educational program*

ABSTRAKT. Das Ziel dieser Studie war es, die Effizienz eines psycho-pädagogisches Programm um die Widerstandsfähigkeit im Falle eines Jugendlichen mit Krebs diagnostiziert erhöhen zu bewerten. Das Programm beinhaltet die Kognitiv-Behavioristischen Prinzipien und Faktoren der Ausdauerschützung in Jugendlichen mit Krebs. Das Programm beinhaltet sechs verschiedene Treffen, welche sich auf den Informationen der spezifisch für diesem Programm erstellten Broschüre stützen. Die Leistungsfähigkeit des Programms wurde durch die Evaluation der Schützungsfaktoren am Anfang des Programms, am Ende dessen und nach einem Monat Nacharbeitungszeit gemessen. Die Meinungen der Jugendlichen, die an

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diesem Projekt teilgenommen haben, wurden mithilfe eines Fragebogens mit offenen Fragen beurteilt. Die hier-erfassten Resultate zeigen, dass ein Wachstum im Bereiche der effektiven Coping-Strategien und der wahrgenommenen sozialen Unterstützung bemerkbar sind. Depressions-niveau ist auf einer niedrigen Ebene durch die Studie hindurch geblieben. Bezüglich der Anxietät und des Optimismus konnte man eine Steigerung nach dem Programm bemerken, jedoch eine Senkung während der Nachfolge. Die Voruntersuchungsresultate dieser Studie zeigen Änderungen in der gewünschten Richtung. Die Implikationen dieses Resultats werden besprochen. Durch dieser Studie betonen wir die Notwendigkeit für Recherche und Entwicklung der sich auf Beweisen-stützenden Programmen für Jugendliche mit Krebs, wobei man die Entwicklungssonderheiten und deren spezielle Bedürfnisse.

Schlüsselwörter: *Jugendlicher, Krebs, Ausdauer, Bewältigungstrategie, Lernen duch Psychologie*

Introduction

Cancer in adolescence

Adolescents with cancer (AWC) have to adapt to normal developmental changes, but also to changes that occur along with the cancer diagnosis. We note that there are few studies that address the problem of resilience in AWC and even fewer studies that create and evaluate targeted programs for them. Given the complex system of the disease that can interfere with the typical development of adolescents, psycho-educational programs are needed in this particular age segment (Fernandez & Barr, 2006).

To create appropriate programs for this age group, we need to understand the complex nature of the disease, treatment and the way that teenagers react and understand these events. The cancer experience interferes with the typical challenges faced by adolescents: forming an identity and self-image, increasing autonomy as well as the development of social and romantic relationships (Blotchy & Cohen, 1985). Emotions are an important factor, as they are related to the coping strategies that adolescents use, to mental health, various behaviors and social relationships. Not all AWC react in the same way and certainly not all of them develop psychological problems, but medical conditions caused by illness create a risk background for developing psychological problems.

In their meta-analysis Ettinger and Heiney (1993), identified several problems faced by AWC: adverse effects of treatment, loss of control, problems related to body image and self-concept, family dependency, relationships with friends and pain management. Some of these problems are included among the psychosocial needs identified by us in a previous study: teenagers need information about diagnosis and treatment, management of emotions, communication with friends and family, body image management and how to cope with hospitalization periods (Vâjâean & Băban, 2014).

Resilience

Adolescents' adaptation to these situations, despite these adverse circumstances, involves the development of resilience. When we talk about resilience, there are three main characteristics we have to mention: the presence of conditions with a high level of distress, the presence of protective factors (internal and external resources), and the development a positive adaptability, despite a significant adverse experience (Garmezy, 1990; Zolkoski & Bullock, 2012). In this study, resilience refers to a dynamic process encompassing positive adaptation within the context of significant adversity (Luthar, Cicchetti & Becker, 2000). The Protective Factors Model (Garmezy, 1992) shows that the presence of protective factors can reduce the relationship between risk factors and negative results like high levels of emotional distress. In other words, resilience is inhibited by risk factors and promoted by protective factors.

Risk factors

Risk factors can be divided into two categories (Haase, 2004). The first category, illness related risks are: uncertainty about diagnostic and symptom-related distress. These factors can have negative influences on quality of life and resilience. Uncertainty is greater when the patient doesn't understand what is happening to him, or when he/she doesn't have a clear conceptualization about disease, treatment and side effects. Psychological distress increases with the uncertainty. Pain, anxiety and mood disturbance related to disease have been associated with the cancer experience, so these variables must be taken into account in an intervention which targets resilience.

The second category of factors are those related to individual risk: defensive coping. Coping refers to "the constantly changing cognitive and behavioral efforts to manage specific external/ internal demands appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984). Defensive coping are those strategies used in order to protect the self in threatening situations (Compas, Connor-Smith, Saltzman, Thomsen & Wadsworth,

2001). These strategies can create problems when they become stable over time, and when the adolescents don't develop adaptive coping strategies, so that may affect the level of resilience and quality of life (Bull & Drotar, 1991). Differences between coping strategies were associated with variability in emotional response to stressful events, so some forms of coping, such as denial or self-blame were associated with higher levels of distress (Folkman & Lazarus, 1988).

Protective factors of resilience and programs that foster them

Protective factors can be divided into three categories: individual, family and social protective factors (Haase, 2004). In this study we focus on individual protective factors, without forgetting the importance of programs that facilitate the integration of AWC in social life, or family protective factors, because family is an important source of protection from psychosocial problems.

Individual protective factors are related to coping strategies, because they are one of the important components of resilience that can be promoted. Examples of adaptive coping strategies are problem solving strategies, positive reappraisal, optimism, acceptance, looking for social support and gaining knowledge about cancer and treatment (Kyngas, et al., 2001). Amongst the protective factors there is also the self-efficacy regarding the promotion of coping strategies (Bandura, 1994). Patients with high levels of perceived self-efficacy showed a greater capability to engage in active coping strategies in order to cope better with problems related to the disease and treatment (Heitzmann, et al., 2011). There is also research showing that enhancing the positive affects increases resilience (Fredrickson, 2001) and maintains a proactive attitude. Individuals who use coping strategies trying to solve the problem instead of avoiding it have more positive affect, which leads to an increase of resilience (Vulpe & Dafinoiu, 2012).

In a review of developed interventions for adolescents with cancer (Seitz, Besier & Goldbeck, 2009), four interventions that approach different problems associated with diagnosis were evaluated. The most promising results were from a study that addresses the psychosexual problems of adolescents with cancer (Canada, Schover & Li, 2007). The program consists in education and support regarding cancer and such issues as sexual development and function. The participants from the interventions group reported increased knowledge about the effect of cancer on sexuality, improved body image, and a significant decrease in the overall level of emotional distress after the intervention.

Children who are well informed about the disease and treatment have lower levels of distress and anxiety, especially in terms of psychological distress caused by medical procedures (Jaaniste, Hayes & Von Baeyer, 2007). The

program *Coping with Cancer* Web-based Program Content (O'Conner-Von, 2009) was developed for adolescents with cancer in order to increase their level of knowledge regarding diagnosis and treatment, to lower the level of anxiety and to increase healthy coping strategies. Following the program, no significant differences in anxiety or coping were detected. On the other hand, there was a significant change in cancer knowledge.

In a study of 40 adolescents with chronic disease, the offering of information regarding coping strategies were very appreciated because these strategies are considered to be usefull by adolescents in order to efficiently addapt to desease (Kyngäs, 2003). The efficiency of the informational programs for reducing the depression and anxiety was also demonstrated for adults with cancer (Jacobs, Ross, Walker & Stockdale, 1983). Psycho-educational programs based on information about disease, treatment and specific coping strategies have been well established for other chronic diseases like diabetes (Lehmann, 1997).

Current study

The REZI (from resilience – in Romanian "**rezi**lienţă") psycho-educational program addresses the main needs of adolescents with cancer in order to increase the protective factors of resilience. The program is based on cognitive behavioral paradigm components such as: cognitive restructuring, promoting adaptive coping strategies and problem-solving strategies, acceptance, self-efficacy and on need assessment of AWC, conducted in a previous study (Vâjâean & Băban, 2014). The main topics that emerged from the analysis were information about disease and treatment, emotion management, communication with friends and family and bodily changes management. Amongst the most effective coping strategies used by AWC were cognitive reappraisal, optimism or positive thinking and the use of family as a veritable source of support, instrumental actions performed during hospitalization (reading, watching movies, internet or activities in the playroom, wearing a wig) and seeking information on the internet especially. Healthcare was not mentioned as a source of information. We noticed that AWC had weak strategies for emotion management, they often used avoidance as a coping mechanism and didn't use friends as a source of social support. Also, the results shaped a pattern of emotions, characterized by feelings of hope, but also fear, anxiety, insecurity or sadness (Vâjâean & Băban, 2014).

Based on literature (Haase, 2004; Bull & Drotar, 1991) and on the results from need assessment, we developed a psycho-educational booklet for teens with cancer. The main themes of the booklet were: general information about cancer and treatment, emotions and thoughts about cancer, communication with friends and family, time spent in the hospital and bodily changes. Each chapter from the

booklet was discussed in an individual meeting with the patient. This study does not intend to validate a protocol for intervention in cancer. Our objective was to evaluate the validity of the program developed around the needs of adolescents with cancer by applying it to one pilot study.

Methods

Objective: The aim of this study was to evaluate the efficiency of a psycho-educational program to increase resilience in the case of an adolescent diagnosed with cancer.

Case description

The participant from this study, M.M, is a 15 year old girl, a high school student, diagnosed with Undifferentiated Nasopharyngeal Carcinoma. The main treatments were chemotherapy and radiotherapy. Parents provided written consent for the adolescent. The study was approved by the Ethics Committee of Babes-Bolyai University and by the Institute of Oncology "Dr. Ion Chiricuţă", Cluj-Napoca, Romania.

The program is structured on four individual meetings where the information from the booklet is discussed and followed by one last meeting. Questionnaires that evaluate protective factors of resilience were applied before the program (baseline), after the program (the evaluation of program effectiveness) and on the follow-up meeting after 1 month of completing the program. Also at the last meeting of the program, the participant provided feedback on the usefulness of the information provided by the booklet and also on the strengths and weaknesses of the program.

Each meeting aims to clarify the information contained in the booklet and to identify possible barriers that teens face when they use this information. Self-efficacy is a very important aspect of this program. Through the process of vicarious coping, some examples of teenagers who went through the same situation are discussed and various ways of dealing with stressful situations are illustrated by role-play. Through the self-monitoring process, the adolescent assess their emotions, behaviors and changes that occur during the program (by using a diary). Similarly, through the process of social persuasion the counselor encourages the patient and provides feedback within a framework of acceptance, empathy and non-directive speech.

In the first meeting general information about the patient was discussed, the assessment instruments were completed, and also first information about the significance of the cancer disease and treatments was introduced. At this point, M. knew the diagnosis, following the beginning of treatment in the shortest time. This moment was marked by both uncertainty about the future, as well as by relief, because until then, the adolescent didn't know exactly what was happening with her and why she had certain physical symptoms.

In the second meeting, the main elements of cognitive behavioral theory were discussed. We wanted the adolescent to understand the A-B-C model (Ellis, 2001) or the connection between events, thoughts and emotions. Also, we addressed specific emotions such as anxiety or sadness and specific emotion regulation strategies. An example of exercise in this chapter refers to how AWC can cope with various concerns. The exercise is called The Worry Solution (Butler & Hope, 2007), under the motto: *If worrying makes you do something, it is useful, otherwise worry is pointless.* The teenager is directed to answer three questions: What am I worrying about? Is there anything I can do about this? Is there anything I can do right now? Based on these questions specific problem solving strategies are constructed. These thoughts and emotions can be customized on the adolescent life situations. In the case of M., most examples illustrate possible situations from school or the treatment: *I worry that the radiotherapy mask will tighten on me*, or *I worry that colleagues from school will laugh at me*.

The third meeting addressed the bodily changes that may occur as effects of treatments. A negative body image is often associated with avoidance of social situations and feelings of depression and anxiety (Pendley, Dahlquist & Dreyer, 1997). Together with the adolescent, we made a plan of action before the hair started to fall. The transition was easier when the hair was cut short. During the treatment, the teenage wore a wig to deal with the moment when she met her friends. Also, irrational thoughts about body image were modified according to the cognitive behavioral paradigm. The discussions based on the information from this chapter tried to reduce the emotional impact of hair loss and to develop an action plan to promote a sense of control.

The fourth meeting addressed the topic of communication between the adolescent and family, respectively friends. During the meeting we discussed strategies that facilitated the integration of the adolescent in the group of colleagues and friends from school. Strategies based on assertive communication to improve family relationships were also discussed, especially with the parent who remained with the teenager during hospitalization.

The fifth meeting was built on distraction components that form the acronym *ACCEPTS - activities, contributing, comparisons, emotions, pushing away, thoughts and sensations* (Linehan, 1993). Those components had the role of promoting distress tolerance, developing the ability to accept the negative affect and situations and promoting problem-solving strategies. Also in this meeting, the guided imagery relaxation technique was learned (Baider, Uziely & Kaplan De-Nour, 1994), in which M.M learned to relax by imagining that she is in her room. M.M considered that this scenario was the most appropriate for her.

During **the follow-up meeting** the main information from the meetings was reviewed. Also concerns regarding the first day of school have been discussed, which M.M considered them the most important problem. Through role-playing, M.M practiced applying communication and coping strategies and other coping strategies, learnt in chapter four, with colleagues at school.

Measurements

Distress, the level of anxiety and depression, were measured using the HADS scale - Hospital Anxiety and Depression scale (Zigmond & Snaith, 1983), Romanian version (Ladea, 2005). HADS, which consists of two subscales, one for symptoms of anxiety (HADS-A) and one for symptoms of depression (HADS-D) use subscale scores ranging from 0 to 7, indicating normal distress, from 8 to 10, indicating low distress and 11 to 14 indicating maximum distress. This scale has been adapted to the Romanian population (Ladea, 2005).

Optimism, defined as disposition or tendency to see events in a favorable manner, was measured using the LOT-R scale - Life Orientation Test (Scheier, Carver & Bridges, 1994), (Băban, 1998). The scale contains 10 items, listed on a 5-point Likert scale, where 0 means "strongly disagree" and 4 means "strongly agree". Items 2, 5, 6, and 8 are fillers and high values imply optimism. This scale has been adapted to the Romanian population (Băban, 1998)

Perceived social support was measured using Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet & Farley, 1988). This scale is suitable for teenagers due to the inclusion of items that refer to family, friends and significant others. The scale contains 12 items, on a 7-point Likert scale, where 1 means "strongly disagree" and 7 means "strongly agree". This scale has been adapted to the Romanian population (Marcu & Podea, 2013)

Coping Self-efficacy is the ability to perform certain behaviors to manage or cope with disease and related treatments. In order to measure self-efficacy the CBI scale was used - The Behavior Inventory Cancer brief form (Heitzmann et al., 2001). The scale covers seven major areas in which adolescents must develop self-efficacy, namely: (i) the maintenance activity and independence; (ii) searching and understanding medical information; (iii) stress management;

(iv) adaptation to the adverse effects of treatment; (v) the acceptance of the disease and maintaining a positive attitude; (vi) emotion regulation; (vii) social support. The scale contains 14 items, on a 9-point Likert scale, where 1 means "not at all confident", 5 means "medium confidence" and 9 means "very confident". This scale has been adapted to the Romanian population (Mereuta & Craciun, 2009).

Satisfaction with the program was measured through the following questions, on a 5-point Likert scale, where 1 means "not at all" and 5 means "very much": "how helpful did you find the information from the booklet?"; "how much did the information from the booklet help you understand your situation?"; "how much did the information from the booklet help you understand your emotions?"; "how much did the information from the booklet help you communicate with your friends and family?"; "how much did the information from the booklet help you adapt to bodily changes?"; "how much did the information from the booklet help you pass through hospitalization periods more easily?"

Strengths and weaknesses of the program were measured through the following open questions for each chapter from the booklet: "please mention one thing you liked in this chapter"; "please mention one thing you would like to improve in this chapter".

Results

At the baseline, M.M obtained a score of 10 on the anxiety scale (HADS-A), which is considered a low level of distress; a score of 8 on the depression scale (HADS-D), which is considered a normal level of distress. After the program, M.M obtained a score of 14 on the anxiety scale, which is considered a high level of distress and a score of 7 to the depression scale. Also, at the follow-up assessment, M.M obtained a score of 6 on the anxiety scale and a score of 9 on the depression scale (Fig.1 and Fig.2).

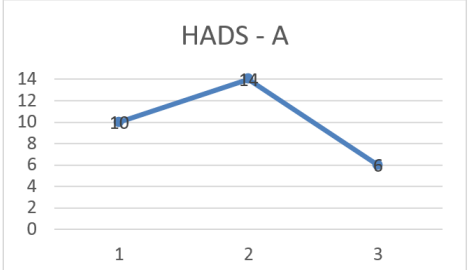

Fig. 1. Anxiety scores in the three moments of the study: baseline (T1), after the program (T2) and follow-up (T3)

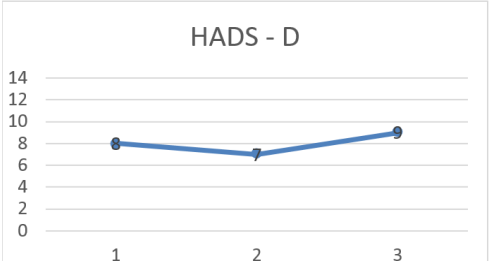

Fig. 2. Depression scores in the three moments of the study: baseline (T1), after the program (T2) and follow-up (T3)

Specific cut-off scores and population norms have not been established for coping self-efficacy scale, a total coping efficacy score is calculated by summing the scale scores. High scores (124) reflect stronger self-efficacy. At the baseline, M.M obtained a score of 91 on this scale. After the program, M.M obtained a score of 107 and at the follow-up assessment, M.M obtained a score of 120 (Fig.3).

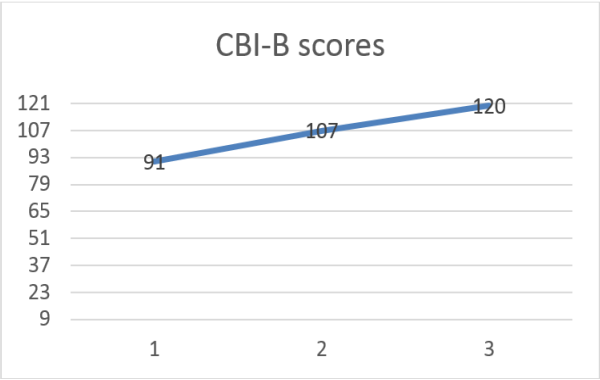

Fig. 3. Coping self-efficacy scores in the three moments of the study: baseline (T1), after the program (T2) and follow-up (T3)

Optimism score ranges from 0 to 24 and high values imply optimism. At the baseline, M.M obtained a score of 18 on this scale. After the program, M.M obtained a score of 12 and at the follow-up assessment, M.M obtained a score of 18 (Fig.4).

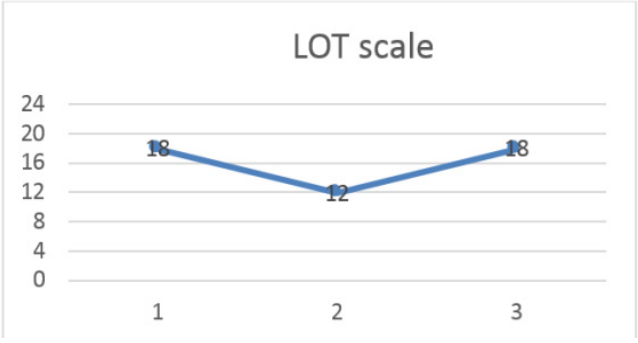

Fig.4. Optimism scores in the three moments of the study: baseline (T1), after the program (T2) and follow-up (T3)

Perceived social support scores ranges from 0 to 24 and high values imply a high perceived level of social support. We were interested in two subscales of this scale, perceived social support from the family and from friends. At the baseline, M.M obtained a score of 18 for family social support, and 5 for friend's social support. After the program, M.M obtained a score of 20 for family social support, and 11 for friend's social support. At the follow-up assessment, M.M obtained a score of 20 for family social support, and 13 for friend's social support (Fig. 5 and Fig. 6).

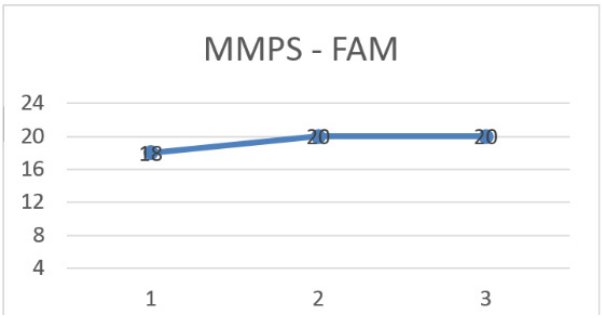

Fig. 5. Perceived family social support scores in the three moments of the study: baseline, after the program, and follow-up

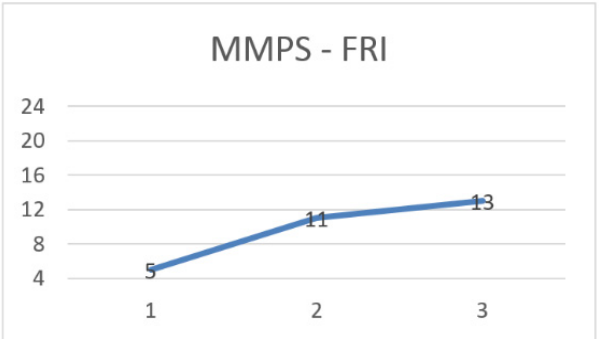

Fig. 6. Perceived friends social support scores in the three moments of the study: baseline, after the program, and follow-up

In terms of *satisfaction with the program*, M.M believed that the information presented in the booklet were very useful in understanding the disease, current emotions and bodily changes. Also, the information presented partially helped her to communicate more efficiently with her friends and family. In terms of improved points for the presented material, M.M considers that more

examples of teenagers who went through the same situation would be useful. According to her, it would be useful to know that she is not the only one who passes through such situations and also to find ways to solve various problems that arise during treatment (ex: how to cope with the situation in which the radiotherapy mask tightens its grip on me, etc.).

"I would add more opinions of teenagers that pass through this situation."

She also considers that it would be useful to have more information regarding communication with the family and more activities to occupy their time spent in hospital.

"I would like to find more tips on how to communicate with my family."

Discussion

AWC have special psychological needs, which should be addressed in programs specifically developed for this age and situation. The REZI psycho-educational program is based on cognitive behavioral paradigm components, cognitive restructuring, promoting adaptive coping strategies and problem-solving strategies, acceptance, self-efficacy. These protective factors minimize the impact of risk factors and promote resilience. The REZI Program is structured on five individual meetings and a follow-up meeting, where the information from the psycho-educational booklet developed for this program is discussed. This program was tested on a single patient. Because it proved to help this single case, Future studies should test this program on a larger sample of patients. It is also necessary in future studies to include a control group to see if its protective factors changes are the result of the program or other factors. Protective factors of resilience were evaluated in the three moments of the study. Future research should evaluate the protective factors of resilience with multiple measurements, in the three stages of the study.

In this study, there was an increase in scores in terms of effective coping strategies and perceived social support. Depression levels remained at a low level throughout the study. In terms of anxiety and optimism, scores show an increase after the program and a decrease on the follow-up. This trend may have several explanations. First, the program started alongside the initiation of treatment, when, according to the grief process (Engel, 1962) the patient may pass through a period of shock, denial and disbelief (Axelrod, 2006). The next stage on this process is characterized by anxiety, depression and anger, and the final stage is characterized by resolution and acceptance. These processes can interfere with the effectiveness of the program. Also, treatments can influence the emotional state of the patient, which can interfere with the psycho-educational program process. In the case of adolescent "M.M." the treatment process could interfere

with the effectiveness of the program. More precisely, at the end of the program the pacient had finished the chemotherapy treatment, but began the radiotherapy treatment. Challenges associated with this treatment are different from those associated with chemotherapy. During the program, the patient had learned to face challenges like loss of hair, but the radiotherapy treatment was associated with new ones which could have impacted the level of anxiety. To improve the REZI program there is need for adolescents to learn to adapt to emotional problems especially, not just the practical ones. More precisely, we consider necessary that the program should focus more on cognitions behind emotional problems in order to be able to apply these cognitive strategies to a wider range of situations.

According to qualitative information, the adolescent involved in the study considers that offering examples of adolescents that passed through these health problems successfully would help in the process of disease addaptation.According to Bandura's theory (1994), one of the most important sources of self-efficacy is vicariant learning, so we suggest that programs destined for adolescents with cancer contain a series of examples of adolescents that efficiently adapted to disease. Other than these examples, we underline the importance of offering age specific activities that adolescents can practice during hospitalization Within the institution where the study took place, the activities are held especially for children with cancer, and recently, the Little People Association (For more information please access*: http://www.thelittlepeople.ro/*) prepared a special room dedicated to adolescents with cancer. In the case of patient M.M., she refused to participate in group activities, preferring to engage in different activities alone, which were more matching to her health state and hospital conditions. Future programs could offer a series of activity examples that can be shaped to the needs of adolescents with cancer, from a medical point of view as well as age appropriate.

Preliminary outcome from this study data show changes in the desired direction (e.g. increased effective coping strategies, perceived social support and optimism). An evidence based intervention that help AWC to cope better with the cancer challenges during the early phases of the treatment would represent an important step in the services provided to these patients. Through this study we emphasize the need for development of evidence-based programs for adolescents with cancer, taking into account the particularities and their special needs.

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OPTING FOR THE TEACHING PROFESSION: VOCATION OR OPPORTUNITY

ADRIANA DENISA MANEA[1], CRISTIAN STAN[2]

ABSTRACT. Our research aimed to study the motivational and attitudinal spectrum of people who chose to be teachers after graduation and decided to attend the post-graduate training program for pursuing a teaching career. The main method of investigation was the survey based on the questionnaire. The items of the questionnaire included the current employment status of trainees, the determination of the decision to pursue a teaching career, the motivation behind this option, the time horizon in which they think they will practice as teachers, as well as the estimated level of professional satisfaction. The study highlights the need for early vocational counseling programs that should ease a correct option for the teaching profession.

Keywords: *teaching career, teaching training program, motivation, didactic competence, professional satisfaction, vocational counseling*

ZUSAMMENFASSUNG. Unsere Forschung zielt das Studium vom motivationalen Spektrum und von den Einstellungen den Personen, die als Lehrer nach dem Studium arbeiten wählen und die beschlossen, an einem Weiterbildungsprogramm für die Verfolgung eines Lehrtätigkeit teilzunehmen. Die wichtigste Untersuchungsmethode ist die Untersuchung basiert auf einem Fragebogen. Die Fragen des Fragebogen beziehen sich auf den aktuellen Beschäftigungsstatus der Auszubildenden, Festigkeit der Entscheidung als Lehrer zu arbeiten, die Motivation dieser Entscheidung, Zeithorizont in dem sie denken, sie werden als Lehrer arbeiten und der geschätzten Arbeitszufriedenheit. Die Studie unterstreicht die Notwendigkeit einem frühzeitigen Berufsberatungsprogramm, um eine solide Wahl für den Lehrerberuf zu erleichtern.

Schlüsselwörter: *Lehrtätigkeit, Lehrausbildungsprogramm, Motivation, Lehrkompetenz, Arbeitszufriedenheit, Berufsberatung*

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Introduction

The teaching profession, perhaps more than other jobs, requires a clear vocational orientation on behalf of those who choose this career. In this relationship, we are considering the reality that there is a strong interdetermination relation between the quality of the instructive-educative process and society's level of development.

In any society teachers are most important for many reasons. Teachers impart knowledge to children. These children are the future generation. What these children learn from their teachers from a very young age stay with them in some form throughout their lives. So, teachers definitely have an impact and a significant mark on children (be it very young or old alike), as they teach and help them in developing knowledge so that they can be useful and productive to their society. Hence, teachers play a vital role in developing the future and shaping up the lives of next generation and so people with the above mentioned qualities and those who have a particular idea about the roles and functions of being a teacher can and will definitely be a better teacher (Gopinath, S., 2015). An important role in ensuring an effective and performing educational system is granted to training and development programs for the future teachers. Teacher preparation has been continually searching for the best possible ways of preparing teachers in the future. It is increasingly urged to focus on way of developing education quality through teacher preparation program. The concept of teaching professional experiences recognizes pre-service teachers as key elements in their own professional growth, role of model, knowledge constructors and distributors, and agents of change in students learning behaviors (Cochran-Smith and Lytle, 1999; Darling-Hammond, 1994; Nuangchalerm, P. & Prachagool, V., 2010).

The training system of the next generation of teachers is important, obviously, from the point of view of endowing them with strategies and methods meant to orient the knowledge acquisition and the building of competences towards in-depth learning. Generally research shows that for teachers to make sustainable changes to their instructional methods new implementations must adhere to specific principles, and importantly, must provide evidence that they produce results (Klapwijk, N., 2012). In other words, the acquaintance of the forthcoming teachers to distinct methods and teaching strategies is not the only aspect of importance, but there is also the emotional adhesion to these and the belief that they will function. In this respect, we are taking into consideration the fact that pre-service beginning teachers have a well-developed set of personal beliefs about learning and teaching prior to entering their teacher preparation programme. These beliefs constitute meaning that these novices have constructed on the basis of their personal experiences and cultural backgrounds (Hollins, E.R., 2011, Gowrie, G. & Ramdass, M., 2012).

For example, within the pre-service stage, the future teachers build their own professional identity and the value and attitude system that this identity embodies has a decisive impact upon their understanding of the teaching career.

The concepts of self-identity in general and teacher identity in particular are fundamental to our understanding of what the teaching profession means to an individual and of the tensions and conflicts teachers experience at different stages in their professional career. This is most transparent at the initial stages of becoming teachers (Barker, D.G., 2010). Simultaneously with the building of the professional identity is a period when the bases of motivation for the teaching career as well as the resilience bases are established. The career motivation in teachers may be explained on the basis of the motivation-cognition relation, and its maintenance and improvement may be obtained by means of personal development. (Toma, R., 2009)

It is a common belief that a teacher's motivation - strongly related to the desire to be involved in the educational process - is an essential component of classroom effectiveness and improvement (Good, T. & Brophy, J., 1994, Gultekin, H, Acar, E., 2014). Resilient teachers are an important part of every community. If schools are to help create a happy present and sustainable future for children, their teachers should be confident, emotionally intelligent, flexible, healthy, optimistic, positive people – but the evidence on such resilience is worrying (Barnes, M.J., 2013).

By synthetizing, we deem important the study of initial training programs of the future teachers not only from the perspective of the informational contents that are implemented at this stage but also from the perspective of the vocational potential of those who choose a didactic career.

Research Coordinates

The aim of our research was to study the motivational and attitude spectrum of the people who opted to become teachers after graduation and who had decided to enroll in a post-university training program to pursue a teaching career. The main investigation method was the questionnaire-based survey. The questionnaire included half-open format items with multiple choice options and was applied to a number of 112 subjects. The results we obtained are presented in tables below. We must mention that all the ethical principles specific to a psychopedagogical investigation were respected.

Presentation and interpretation of results

The first item of the survey was in regard to the professional status of the participants to the post-university training program in view of pursuing a didactic career. The results are presented in Table 1.

Table 1. Professional status of the participants

Current professional status	N	%
Employee	61	54.46%
Unemployed	36	32,14%
Others	15	13.39%
Total	112	100%

The data indicated in the table above reveal that the sample of surveyed subjects is mainly made of 54, 46% individuals who account for active workforce, which allows us to state that the interest in attending didactic training classes is not necessarily related to the lack of a job, but also to the possibility of accessing a more attractive and benefit-generator domain on the workforce market. We also reckon that such professional reconversion may be caused not only by the intention of pursuing a teaching career, but also by the prediction of losing the current employment position, a situation that has oriented subjects towards ensuring a professional alternative. It is also significant to mention that 32, 14% of the learners are currently unemployed, their option for the teaching career being merely contextual from the perspective of the professional reconversion.

The second item of the questionnaire focused on identifying the reasons why the subjects didn't attend didactic training classes during their university studies. The data we obtained are presented in Table 2.

Table 2. Reasons why learners didn't enroll in Teacher Training Module classes during their university studies

Which was the reason why you didn't enroll in the Teacher Training Module during university studies?	N	%
I had no knowledge of the existence of such classes	11	9.82 %
Specialty courses were highly demanding	63	56.25 %
I had no intention of pursuing a teaching career back then	38	33.93 %
Total	112	100 %

As indicated in Table 2, the main reason why the subjects hadn't enrolled in Teacher Training Module classes during their university studies was the fact that their specialty courses were highly demanding, these subjects representing 56, 25%, which is more than half of those surveyed. The decision that a third of the surveyed subjects took-33, 93% referring to attending such classes even if they lacked any previous intention of pursuing such teaching career seems also surprising. We consider that this group's reconversion towards a teaching career is determined by the momentous impossibility of finding a job that corresponds to their training level. Moreover, a small number of subjects, 9, 82% claim they failed to enroll in the Teacher Training Module classes because they had no knowledge of the existence of such courses.

The third item of the questionnaire aimed at finding out the extent to which the surveyed subjects manifest a clear option in pursuing the teaching career.

Table 3. The firmness of the option regarding the pursue of a teaching career

Are you completely decided to pursue a teaching career?	N	%
Yes	76	67.86 %
No	36	32.14 %
Total	112	100 %

According to the data displayed in Table 3 we observe that even if the number of those who are enrolled in Teacher Training Module classes with a specific intention of having a didactic career is high (67.86%), however, nearly a third of them are not firmly convinced they will embrace this career. This aspect indicates that the attractiveness degree of the teaching profession is not an increased one, being however a valid professional alternative to a third of the surveyed individuals.

Another item regarded the subjects' opinion on the need for a certain personality profile in view of exercising successfully and in optimum conditions the teaching career. The results are shown in Table 4.

Table 4. The need for a personality profile that is adequate to the teaching profession

Do you consider that a certain personality profile is necessary to exercise the teaching career?	N	%
Yes	83	74.11 %
No	29	25.89 %
Total	112	100 %

Specialized studies in the field indicate that the quality of the teaching act is conditioned by the existence and the level of specific didactic abilities, but there is also the popular belief according to which any individual who possesses scientific knowledge in a certain area is capable of teaching learners the respective contents. The analysis of the data in the table above allows us to observe that fact that a significant percentage of respondents, 74,11% consider that a certain personality profile is deemed essential in order to exercise the teaching career successfully, as such a career is associated with a set of competences that a teacher possess(scientific, psycho-relational, pedagogical, digital). At the same time, we also observe that a quarter of the subjects, 25, 89% state that there is no need for such a personality profile in exercising the didactic career.

Another item of the questionnaire focused on identifying the motivation behind the subjects' decision to enroll in post-university courses in view of training for a teacher career. The results are exposed in Table 5.

Table 5. The motivation behind the enrolment in post-university courses

What was the main reason for attending these classes?	N	%
The acquisition of necessary skills for the teaching profession	90	80.36 %
The gaining of the certificate that allows for the exercise of a teaching career	22	19.64 %
Total	112	100 %

The analysis of the data indicated in the table above reveals that the main reason behind the decision to attend post-university classes in order to train for a teaching career was, to a vast majority of 80,36% subjects, the intent of acquiring skills and abilities that are necessary for a successful exercise of the teaching career. Nonetheless, a significant share of respondents, 19,64% admitted there was a mere interest in gaining the certificate that will allow them to teach, which confirms the results obtained with the previous item, namely that nearly 20% of the subjects consider specialty training a sufficient requirement in pursuing the teaching career.

The following item in the questionnaire has the objective of identifying the extent to which subjects estimate that pursuing the teaching career will bring them professional satisfaction. Table 6 captures the results of this item.

Table 6. Estimating the degree of professional satisfaction

To what level do you consider that pursuing a teaching career will bring you professional satisfaction?	N	%
Very High	10	8.93 %
High	69	61.61 %
Small	27	24.11 %
Not at all	6	5.37 %
Total	112	100%

The data in the above table indicates the fact that nearly 70% of respondents manifest optimism in this sense, estimating that a teaching career would grant them a very high level of professional satisfaction (8.93%) or a high level (61.61%). However, we must also observe the fact that nearly 30% of the subjects consider that pursuing a teaching career will bring professional satisfaction to a small level (24.11%) or even none at all (5.37%), a reality that renders pessimism and reduced interest in the teaching career.

The last item of the questionnaire emphasized the aspect of stability in a teaching career. The results are shown in Table 7.

Table 7. Stability in the teaching career

In case you were offered a more advantageous job offer after your employment in education, would you give your career up?	N	%
Yes	58	51.79 %
No	54	48.21 %
Total	112	100 %

The analysis of the data structured in the table above reveals an interesting polarization of the two groups within our sample, by means of the position they take regarding a better job offer as compared to their future position in the educational system. While 51.79% of the respondents are willing to renounce their teaching career in the case of a better prospect, 48.21% claim they will stick to the initial decision and maintain their job. The opinions allow us to state that the teaching profession is rather seen as a sum of responsibilities and less as a series of social and financial advantages, which explains the availability that half of the respondents showed upon abandoning the teaching career in case of a more attractive offer.

Conclusions

The study we conducted, including a sample made of 112 subjects, certifies the fact that the training level of the future teachers depends not only on the quality of the training program they attend but also on their personal perspective upon the teaching career. Regarding the limits of our study we mention that the data analysis was conducted with respect to the educational models of initial and continuing training at the level of the contemporary Romanian education system, which does not allow us to extend the conclusions of our research at a general level in the worldwide or European context.

The recorded data show that nearly one third of the learners opt for a teaching career in the absence of another job, while 51.79 % of them confess they would be willing to quit their teaching position in the prospect of a better professional offer, and 32.14% of the surveyed respondents state that, even if they do attend teacher training classes, they are not fully convinced they will become teachers. Moreover, 29.48% of the enrolled learners estimate that pursuing a teaching career will bring professional satisfaction to a small extent or even none at all, and 33.93% state that they had no intention of becoming teachers during their university studies. All of these led to the conclusion that nearly a third of the participants to the post-university teacher training program somehow see the teaching career with a negative outlook, by envisaging it as a mere momentous professional alternative, one that roused no special interest during their initial training, one that will not ensure sufficient professional benefits and one they would abandon in case of a better employment prospect. We reckon that this set of negative expectations will lead to a decrease in the educational employment and implicitly to a diminishing of the performance level in the teaching activity. We believe that a potential solution to this situation may be represented by the implementation of consistent vocational counseling programs within initial training, meant to facilitate the orientation of undergraduates towards a teaching career, a fact that could ensure not only a more effective training activity but also improved didactic performance, as well as an increase in the level of professional satisfaction.

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Retraction notice

Regarding the article: “A Comprehensive Analysis of the Views of Turkish Teachers on the Process of Intercultural Education”, author: SERTEL ALTUN, Studia Universitatis Babeş-Bolyai Psychologia-Paedagogia, 58(2013), No. 1, 37–51.

This article has been retracted at the request of the author. We offer apologies to the readers of the journal for this inconvenience.