

**“BABES-BOLYAI” UNIVERSITY  
FACULTY OF PSYCHOLOGY AND EDUCATIONAL KNOWLEDGE  
“EDUCATION, DEVELOPMENT, COGNITION” DOCTORAL SCHOOL**

## **DOCTORAL DISSERTATION**

**“The view of educational software capitalization within the  
study of third grade Romanian language and literature”**

### **SUMMARY**

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## **KEY TERMS**

Information technology, computer aided teaching, electronic computer, educational software, teaching design, computer design, hardware elements, cyberspace, cybernetic analysis, programming, interactive test, Power Point, Visual Basic, site, portal, internet, constructivism, teaching game, Romanian language and literature.

### **The structure and the summary of the doctoral dissertation**

The doctoral dissertation named “The view of educational software capitalization within the study of third grade Romanian language and literature” is structured on two important parts: “Theoretical substantiation” and “Experimental approach. Research presentation of educational software capitalization within the study of third grade Romanian language and literature”.

In chapter I (**Diachronic Computer Aided Training**), we hold forth to highlight some of the general aspects of educational software evolution, a short history of the computers introduced in schools, but also European and National CAT political elements. The study case scores in this context successful educational projects done at primary levels by pointing out the ability of young age students to train in formal contexts. They have done so in a highly relevant manner and in an overwhelming way with the help of computer technologies (the POGO experiment and a school reform project, which had social network intergraded courses, blogging, podcast and consulting websites such as Wikipedia at Redeemer Church of England Elementary School from Blackburn, England).

The theoretical approach continues in chapter II (**From Programmed Training To Computer Aided Training. Self-Analysis Perspective**), by presenting the principles of programmed training, followed by the analysis and the illustration through three types of software programming: linear, branched and mixed.

CAT (Computer Aided Training), as a strategy approach of the educational process through teaching software, capitalizes the design, shaping and analysis of cybernetic principles, within the

context of new computer and communicational technologies. We included in this chapter both the educational software teaching design with its basic stages (the definition of the objectives, the elaboration of an initial test, graph concept, concept matrix, the program's diagram, the making of the program) illustrated in the interactive lesson "Adventures...in developed sentence", and also the severe interactive software designing.

Because the training/teaching area represents a diversified questionable fan, the educational software will also be different. In chapter III (**Teaching Situations. Examples and Characteristics**) We have included educational software classifications made by reputed authors: D. Noveanu, R. Bibeau and P. Gorny, and illustrated learning situations based on CAT and adapted after Chen & Hsu and Wong & Williams.

These data have allowed the definition of educational software grouping designed and implemented within the present research subsumed the "interactive/tutorial educational software" concept, named by us IES/T. In the Education and Science Encyclopedic Dictionary is defined as "*a program used in the training/teaching process, having an incorporated strategy which through a flexible interaction secures the touch of the objectives for what it was designed by the user*" (Noveanu, E. Potolea, D., 2007).

From the analysis perspective in which the educational software is applied, IES/T, designed for third grade Romanian language and literature, it presents traits for direct teaching associated with behaviorist and cognitive theories in computer aided training and educational software.

In chapter IV (**Interactive Educational Software and Constructive Learning Contexts**) we have represented theoretical aspects and applied illustrations referring to constructivist paradigm in CAT. The initial research is grounded on constructivism and oriented in two analysis plans: exemplify and analyze learning situations built on educational software. They are based on observation knowledge, reception, memory and exercise, team work according to moderate constructivism through PowerPoint program. The exemplification and learning situation analysis according to cognitive constructivism allows the drafting of the students responses by using Visual Basic program.

Chapter V (**Psychological and Pedagogical Implications of Computer Aided Training**) approaches the psychological and pedagogical valences of CAT based on the topological pattern of the barrier room proposed by the psychologist K. Lewin who explains that during the learning process the student can meet difficulties and obstacles.

The formative value of the new computer technologies folds on a criteria analysis based on the following indicators: the authenticity of the created context, access to the world's real-expert

performances, authentic organized activities, multiple roles and perspectives, the building of knowledge through collaboration, the use of reflection to realize generalizations, the articulation of silent knowledge and the passage to the explicit one, guidance given by the teacher and authentic evaluation.

The theoretical step of this chapter is continued by the definition of favorable contexts which allow the formation and the practice of intellectual abilities and also the capitalization of teaching technologies.

Subchapter V.3. aims the CAT approach under the conditions of the teaching game capitalization. Here the functions of the teaching games are described (cognitive-informative function, incentive-motive function, formative-instructive function, trimming-restorative function, social and medicative function), and also accomplish a characterization of young school age especially 9/10 years old segment.

The teaching games inserted in IES/T were classified according to the following criteria: the content and the required objectives, the virtual lesson's moment of appropriation, the textual material, the imagistic, resonant and liveliness material, the number of participants in the game.

We have exemplified the interactive teaching games destined to develop communicative abilities and consolidate Romanian language and literature knowledge for third graders: "The squirrels and the peanuts", "The numeral tree", "Guess my riddle", "The noun game", "The pronoun and the Flinstones", "The sentence analysis with the twin clowns"- "Tom Sawyer' software".

The cyberspace teaching games, being included in different training situations, motivate the student to learn and the acquired knowledge represent an advantage for accumulating points. The student-computer interaction in the game-exercise has a powerful emotional load, a specifically dynamics of the age representing a favorite learning environment by the 'digital generation'.

Chapter VI (**Evaluating the Students by using Educational Software**) approaches computer aided evaluation and self evaluation. Customary in teaching practice, the three moments evaluation (initial, continuous and summative) is necessary for all learning phases. In computer aided evaluation and self evaluation this type of evaluating approaches techniques and strategies for designing evaluation sequences. Another type of evaluation practiced in our research was illuminative evaluation which folds on the studying of the innovative project "*the way it works, the way it is influenced by different school situations where it is applied; what advantages or disadvantages may be observed by those who are interested.*" ( Trow, Noveanu, E., Potolea, D., (coordinator), 2007). On the floor of this research I have approached the illuminative evaluation as a strategy in evaluation due to the following



aspects taken and adapted after Parlett and Hamilton (1991):

- The approached problem ( personal educational software) selects the proper evaluating methods;
- One method works better combined with other complementary to her;
- The data are collected through four complementary ways: coded observation, interview, questionnaire, tests, documents and contextual information analysis;
- The existence of smaller samples of investigated population (step by step classes with limited places) and the possibility to apply this steps for innovations which will be extended to a larger scale;
- A fully successful evaluation is one in which it is condensed a maximum quantity of valid experience and informative commentary about the studied system.

In the teaching inventory we have also included: the objectivity of the evaluating process, feedback quickness, testing adaptation and individualization, the control of the evaluation context, CAT self evaluation and the conditions of a proper school evaluation.

Illustrating the theoretical concepts can be found in the designing ways of the two types of tests used in the formative experiment: PowerPoint and Visual Basic interactive summative tests and software applications for the evaluating/self evaluating projects with the help of Zoho Challenge 2.0 template.

The second part of the doctoral dissertation called “**Experimental Approach. Research Presentation of Educational Software Capitalization within the Study of Third Grade Romanian Language and Literature**” begins with chapter VII (**Pre-experimental stage**). The study had as a purpose the emphasis of the teachers and parents’ opinions ( questionnaires and group-focus) on CAT for primary levels, and also the radiography of the software resources (sites and portals destined for students and teachers, educational software created by specialized companies or by teachers). They were available during the period of this research, to identify the possible solutions for the improvement of the learning results with the help of CAT in the study of Romanian language and literature. The pre-test consisted in applying a pedagogical test to third graders (4 classes) to establish the knowledge level. Between the experimental batch and the controlled batch (class 3 A and class 3 B) there weren’t recorded significant differences.

These are some of the general conclusions of the study:

- The offer of the educational software, quantitatively speaking, destined for primary levels on the Romanian market, is insufficient or far less diversified, and qualitatively speaking presents a series

of dysfunctions for pedagogical and computer designing;

- The profile sites, especially [www.didactic.ro](http://www.didactic.ro), due to the lack of teaching software for primary levels, are continuously expanding, and thus the teachers post more and more software applications by using PowerPoint;
- The computer designing for software applications used by the teachers is situated at a modest level because of the inability to take decisions and to offer training opportunities for teachers, also the teaching designing is based on obvious flaws; on the other hand most of the school masters approach the revision lessons/sequences in a discriminating way, these containing only two Romanian language elements, in the detriment of the literature ones, because of the difficulties in the IT level;
- The teachers who create their own educational software represent a small segment, an act of pioneering that slowly gains new followers;
- An obvious gap is represented by Romanian educational software, the interactive lessons, and only five sites offer this educational 'service'; the economical component includes only what is bought: encyclopedias, stories, games and cartoons.
- Parents give their opinions about CAT, considered efficient, but they have few data about it, their opinions are consequently reduced to teaching computer science, or the use of teaching software for 'main objects', 'sequential' or 'just starting with fifth grade', indicating a small degree of teaching software both at school and at home;
- The pre-testing students' results indicate the necessity to approach the teaching and learning of the Romanian language and literature by the use of educational software, their contribution for the "digital generation" is to be able to bring better school results for primary graders.

The data were used in the experimental stage designing, combining ideas from the opinions of those investigated with the results of those ideas.

Chapter VIII (**Experimental stage**) presents the experiment starting with the conclusions of the observant stage by introducing new elements for the teaching activity through CAT (personal educational software outlook) and implicitly new ways of intellectual work for students' level.

The general hypothesis necessary to organize and unfold the formative experiment was stated as followed: "If in the teaching and learning of third grade Romanian language and literature it is used personal educational software the school results are improved."

This hypothesis enforces the alignment of the experimental step on two main co-ordinates, suitable to the two distinct stages: the pilot experiment (intrasubjects design) and the large scale

experiment (intersubjects design):

- a) the drawing up and the testing of the interactive lessons and tests for the teaching and learning third grade Romanian language and literature;
- b) the monitoring of the effects produced by CAT.

Within the undertaken research we have used a methodological system that has included the following components: the investigation which was based on a questionnaire, group-focus interview, pedagogical experiment, observation method, the study of the products' activities method and the pedagogical test for knowledge.

**The subjects sample** of the pilot experiment was made of 23 third graders, and for the large scale experiment 41 third graders, two classes from General School No.1 Dej, were considered equivalent after the pre-testing, class 3 A and class 3 B.

**The content sample** includes software applications and it is made of a collection of 112 interactive lessons and tests designed in PowerPoint and Visual Basic and 19 summative tests done in Zoho Challenge 2.0 program.

We can specify that the created sample has a series of attributes, personal software applications, considered potentially helpful in the teaching-learning-evaluation curriculum contents. They were based on literary texts included in the student's manual Romanian language and literature - Aramis Ed., authors Tudora Pițilă and Cleopatra Mihăilescu, becoming a real virtual manual.

The main characteristics of these software are: interactivity, immediate feed-back, full text presentation, diversified types of exercises for understanding the text, re-played information in short sequences respecting the degrees of difficulties. We also inserted educational contexts for collaborative and cooperative learning.

The pedagogical experiment was unrolled during 2008-2010, with the following different stages and sequences: the ascertained stage finalized with the management of the pre-testing, post-testing and psychological and pedagogical stage, re-testing stage.

The display of the formative experimental stage was unrolled during November 2008 - June 2010 and it considered the intervention on the teaching activity for the experimental batch, while the activity from the witness batch rolled without any influence from the experimental variables stipulated by us. At the end of this period the post-test was administered and it had as main objective the comparative monitoring of the students' evolution in the experimental group and the controlled one to confirm the experimental hypotheses.

The re-testing stage was placed in September 2010 and it had as main purpose the checking of

the stability of the obtained results in the previous school year.

**The pilot experiment** had as purpose the creation and testing of the educational software to teach Romanian language and literature and it was unfolded in the school year 2008-2009 during two semesters, class 3 A from General School No.1 Dej, Cluj county. The subjects sample was made from 23 students.

For elaborating the strategy we aimed both the training resources ( from the school we unfolded the experiment) as well as the organization forms of the teaching activity. The proper places for CAT (classrooms, labs), the endowment with hardware equipment for the computers' room( server, an equal number of computers with that of the students, printer, scanner, Internet connection, interactive board), as well as the endowment of the classroom (4 computers connected to Internet, printer, scanner, video projector) represented a preliminary condition to assure the optimum terms to unfold the experiment.

These endowments allowed the teaching activities to be: frontal, individual, grouped/teamed or combined. According to this form of organizing the educational software we programmed the lessons in the above described locations based on a weekly schedule presented to the students.

The educational software will be efficient only by unfolding a laborious designing process which is made out of three major steps: theme establishing, pedagogical planning and computer achievement.

During the pilot experiment it has also been imposed a list of functional indicators ( adaptations after R. M. Gange and L. J. Briggs, M. K. Futrell and P. Geisert) for the planning idea, the evaluation and the quantitative and qualitative modifications, adaptations and correction of the created educational software:

1. The student was informed about what will be studied (operational objectives);
2. The computer's finalities (graphics, animation, color, sound) were (or not) used to catch and maintain attention;
3. The previous assimilated knowledge were (or not) updated;
4. Through initial testing the students were checked if they had already appropriated those elements which would constitute the object of learning;
5. The learning material sequence:
  - presenting the information referring to the work task;
  - examples of solved tasks;
  - work task;
  - the student's self evaluation.

6. The computer reacted to each response given by the student, offering a large spread of adopted reactions.

In each interactive lesson's evaluation we used a checklist that supervised the quality of the designed product, functionally constituting, on one hand, a specific orientation in the software's designing, and on the other hand an instrument for evaluating and testing the classroom's software. Consequently there were structural and content modifications:

- Building more efficient links (hyperlink and hypertext);
- The introduction of some elements in Visual Basic using PowerPoint to increase the interactivity between the student and the computer;
- Graphical modifications (creating the background with the help of open-source programs, menu buttons and personalized dividers);
- Replacing or creating a colored background for text cassettes, having a transparency percentage between 30% and 50%, to obtain a better visual perception and to give back an optimum contrast;
- Introducing different positive and negative backup pages;
- Constantly introducing mascots as animated gif which guided the student to resolve task works, keeping the same mascots ( for example the Flinstone family, the seven dwarfs, the characters from Pinocchio etc.) during a lesson to create the feeling of a story or/and a game;
- The teaching-learning literary context from the curriculum was initially approached through one educational soft, class testing imposed the creation of two interactive lessons by keeping the first slides which had the text and multiple exercises (on one hand the aimed objectives couldn't be reached, on the other hand the time to resolve the exercises was taking the students too long and fatigue or boredom appeared);
- The wav sound affixation imposed the use of audio caps ( the bird's twittering searching for the word in the 'nest', the mice squeaking associated with the correct sentences, the frogs' croaking to complete missing gaps etc.);
- The display of the obtained score.

During the pilot experiment we made and tested a total number of 137 teaching software, 27 were tested in the classrooms, remaining only 5 which were adapted over 85%, and 17 virtual lessons didn't comply the psychological and pedagogical computer teaching. Consequently the final result was made out of 112 teaching software, of which 107 personal designing, attending the content sample of the formative experiment. The knowledge tests (19) made in Zoho Challenge 2.0 completed the content sample.

**The large scale experiment** (the so-called experiment done after the pilot experiment, with the same pedagogical coordinates, having some differences: the quantitative and qualitative rebuilding of the sample content) was done during 2009-2010. The experimental group was consisted from the class 3 A students and the witness group by class 3 B.

The locations for the experiment are the classrooms and the computer science lab. Applying the educational software will have a high frequency during the 6 hours/week, 3 were done in the lab after a settled schedule with the school's principal, the computer science teacher and the head master who runs the experimental class.

The independent variable introduced in the experimental group (class 3 A) consists in factors controlled by the researcher - a set of lessons and interactive software which make the content sample. The dependent variable represents the school results.

The 112 educational software were copied on CD-s for the head master, folders were created on each student's desktop in which the 8 teaching units were inserted (The school, The country, The autumn, Customs and traditions, The winter, The spring, The summer, The childhood).

The first teaching unit was used to initiate the student in CAT and to organize the students. They were explained the safety measures in the lab and some PC performances: starting the central unit and the monitor, introducing passwords, opening the folders, saving the content, minimizing the document, activating the sound and the volume, connecting the audio caps, opening the internet using google.ro (on-line dictionaries, pictures), opening the e-mail and messenger personal boxes, closing each opened document, the computer and the monitor.

The formative experiment was made in two main organizing principles: small Romanian language and literature lessons (individual activities, group and frontal activities) and specific work group activity made out of 4-5 students, daily changed individuals. And so we realized 131 teaching activities based on software created during the 8 learning units. In the dissertation we detailed the activities unfolded in the learning unit called "The winter", the psychological, pedagogical and methodological co-ordinates being the same for each unit.

At the end of the formative experiment, June 2009, the post-test was administered, the same knowledge test, its purpose was to monitor the progress and the changes appeared in the acquisition of knowledge from the students in the experimental and controlled batches to confirm the experimental hypothesis.

During the first semester of the 2010-2011 school year (September) the re-testing took place in the experimental and controlled batches, to validate the previous school year's experimental

interventions (2009-2010), to identify the long term knowledge acquisition, to consolidate them and to reconfirm the research's hypothesis. Thus the evaluation test was given to all the students in the experimental batches, forth graders at a beginning level.

The work instrument that we used was applied both for the pre-test and the post-test as well as for the re-test.

After the pedagogical intervention we obtained a global image of the work methods used through CAT, as shown in chapter IX (**The results of the research**).

The analysis of the students activities, from the experimental and witness groups, was based on the numerical database from the pre-test, post-test and re-test, the numerical data were statistically processed into tables, graphics, structural and comparative diagrams, and we determined the numerical characteristics, data analyzed with the help of SPSS 15 program.

The observation, as a qualitative method included in the research, was presented through the opinions of the teachers as participants in the experiment and the opinion of the researcher on the activity and the students' behaviour.

During the three sequences we saw a significant improvement of the students results from the experimental batch. We conclude that, based on the qualitative and quantitative analysis of the re-testing results, the teaching experiment based on CAT with personal software is able to produce a significant learning progress and the research hypothesis was confirmed.

The references and the web references used as information resources are presented in the end next to the annexes. The latter have questionnaires used in different stages of the research, gratings and checklists to monitor the progress done by the students, pedagogical tests, the details of the content and subjects samples, data tables issued after the statistical instruments were applied.

## **GENERAL CONCLUSIONS**

According to the registered results we can shape a series of conclusion:

- The educational software determines a new learning experience centered on the student, and it transforms the student from an object into the subject of the education;
- The application of the personal teaching software is a teaching-learning-evaluation method plainly superior to the traditionally learning method or to the CAT method with software taken from different sources;
- The CAT method applied trough personal virtual lessons becomes en educational reality only if it is

conditioned by multiple factors: a teaching line defined by the choice of some coherent learning strategies, relevant pedagogical products, technical abilities in computer science, hardware and software endowment for the school, interdisciplinary team work;

- The designing and the personal software application represent a new step for CAT with all its impediments: a lot of time allocated by the teacher, logistic difficulties in the computer area;
- Educational software lead to an increased exercise number, by taking daily tasks, repetitive tasks, and in short time the number of flaws drop significantly;
- Personal CAT software encourages the students to have an opened mind towards learning, and it stimulates interest by acting as a learning facilitator;
- The students have time to think about the new ideas and resolve the tasks using IES/T when the concepts do not correspond with the reference frame;
- The students are aware of the difficulties that appear and they refer to the start page or the punctual information page to increase or decrease their number of flaws when searching the solution;
- The memory activities astound through efficiency and quickness, the visual elements are placed as holders for the storage of the logical content and reference points for versification;
- The narrative texts illustrated visually and acoustically placed in the teaching software arouse the interest for this type of reading, but it also provokes the application for reading similar texts from the school's library, and in fact the interest for reading was stimulated;
- An obvious progress is recorded in vocabulary, the texts are accompanied by synonyms and antonyms identification exercises, immediate feed-back from the task work, accompanied by rewards, and thus the students' vocabulary was improved.

The CAT evaluation-self evaluation dyad eliminates negative neuropsychological contexts which influenced marking and it assures immediate feed-back both from the student and the teacher. Personal evaluation benefits allow the student to improve his/her activities. And so we identified the following aspects:

- Practical discovery done by the students and by the teachers bring benefits to the teaching process;
- A change was brought in the student and teacher's point of view on the evaluation that had an improving function, not a penalization one;
- The way in which the student is evaluated influences the school performance, the educational software evaluation eliminates the hierarchy and the student is able to compare his/her performances;
- The reflection on the obtained results is effective through the analysis of the ways that conducted to



success (or not);

- The students resolve their working tasks by using IES/T in a relaxed way and constantly self evaluating themselves, some expressing their own disappointment or satisfaction by epithets, labels, onomatopoeia, mimics and gestures when the feed-back appeared on the screen, the perception over mistakes being constructive;
- Permanent evaluation, objective and fast encourages the problem resolving, the students no longer search for the teacher's approval or disapproval, he/she being asked for only at the end of the working task through indirect calling: "I'm done!", "I'm so good!", "Ready!" etc.
- Negative factors were avoided in the correct evaluation, such as Halo effect, Pygmalion effect etc.
- Summative interactive tests designed as quizzes give immediate evaluation, as well as a data base for the evaluated knowledge, both for the student and the class;

#### **Conclusions regarding the students who participated in the experiment**

- During the activities the students prove an increased motivation;
- They are stimulated to get involved into resolving the work tasks by using elements of games, virtual mascots, visual and auditory stimuli, rewards, penalizations and bonuses in a diversified range, going through the entire learning sequence, becoming motivated to possess new information;
- Individualizing learning gives the possibility to cover the teaching software on their own rhythm and the student competes with his/her own possibilities, but also with the others, and a larger autonomy in learning is produced;
- Heterogeneous groups, changed daily, rise the team communication, collaboration and co-operation, and eliminate individual competition favoring the team one;
- The improved activities done with only one student lead to a privileged and envied condition, having as result the increase of self-esteem for only one child;
- The time and effort perception drops , the students asking for other interactive lessons and not just for Romanian language and literature;
- New relationships are established between the student and the teacher, based on mutual trust, a free communication and the teacher no longer has the single informative role;

#### **Conclusions regarding the teacher-creator and user of educational software**

- CAT gives a new meaning to the expression 'educational actor', the teacher has different roles in digital education: content expert, technician, trustee, resource, author and evaluator;
- The obtained results are encouraged by using a program in which the teacher builds educational software contexts to obtain school performances, brings up new strategies to increase and develop

the student's learning process;

- The image, the sound and the animation are used to attract attention on the monitor;
- IES/T allows content modifications, supplementary tasks, differential approaches, adaptation based on experience and interest for the students to learn;
- The systematical collection of IES/T into personal folders (CD, Memory Stick) facilitates an optimum knowledge clamping, trains the student into faster and more effective revisions;
- The animated characters guide the student to cover the educational software, and it also represents a learning motivation;
- The evaluation and self evaluation allows operational modifications based on the two designing levels: pedagogical and computerized optimum functioning;
- The personal educational software represents a rethinking educational process for optimizing the development of the information technology;
- An increased efficiency is obtained in knowledge evaluation and self evaluation by using quizzes done in Zoho Challenge 2.0.

Agreeing with the above mentioned conclusions here are some **educational suggestions** having the purpose to guide the teaching activity. Thus we have considered the following **institutional level** co-ordinates:

- The inclusion of courses and modules for the teachers to help them design educational software;
- Creating multiple interdisciplinary teams within each school to implement programs to help design software and to monitor teaching and learning CAT activities;
- Showing on the school's website, with specific links, the personal educational software, according to subjects;
- Institutional management reorientation towards CAT by imposing a schedule for the computer science lab, connecting the classrooms to the internet, and motivating teachers to create educational software;
- Creating pedagogical tests using open-source programs such as Zoho Challenge, Hot Potatoes etc. and a data base;
- Planning meetings to analyze the software products CAT activities;

For the **teachers' level** who work in the primary levels all these elements are able to bring a strong support to increase school results:

- The preoccupation for the designing, guidance and achievement of the training-learning CAT

process;

- The involvement in activities and courses to obtain and/or perfect IT knowledge, direct or on-line collaboration with other software authors;
- Stimulating the use of software and hardware resources to create individualized educational contexts, pointing out the student-computer interactivity, software teaching support to encourage team work, and new ways for the student to express him/herself;
- Creating personal software will determine a positive psychological climate;
- Creating software, writing the programming language and the full making of the teaching software;

CAT is the key for the growth of school performance, a new performance that stimulates the learning of Romanian language and literature.