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За издавача
др Жељко Вучковић

Главни и одговорни уредник издавачке делатности
др Михаел Антоловић

Адреса редакције
Педагошки факултет Сомбор
25000 Сомбор
Подгоричка 4
Тел.: (025) 412-030, 460-595
Факс: (025) 416-461
e-mail: norma@pef.uns.ac.rs
Жиро рачун: 46300-603-0-2002047

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РЕЧ УРЕДНИЦЕ

Дубоко уверени да је развој науке могућ само слободном разменом идеја која није ограничена државним и националним границама, пред вама су одабрани радови компетентних стручњака из земље и иностранства. Прилози по својој тематици, одражавају како савремене тенденције концепта наставе и образовање учитеља ради већег постигнућа ученика, тако и актуелне теме из мултикултуралног образовања.

У овој свесци *Норме* у три тематске целине (Образовање наставника, Савремена школа и Методика наставе), објављени су радови 26 аутора, на енглеском језику. Из иностранства су радови колега из Словачке са Учитељског и *Природно-математичког факултета* Универзитета Матеј Бел *у* Банској Бистрици; из Македоније са *Природно-математичког факултета Универзитета у Тетову, и Природно-математичког факултета Универзитета Св. Ћирило и Методије у Скопљу. На страницама овог броја своје прилоге објавили су и професори са* Педагошки факултет у Сомбору и *Природно-математичког факултета Универзитет у Новом Саду и* Учитељског факултета у Јагодини. Један број радова представљен је на међународној конференцији која је под називом **Multidimensional Aspects of Learning and Teaching in Science and Mathematics Education (*MALT'14*), у организацији Педагошког факултета Универзитета *у Новом Саду*, одржана 3. и 4.октобра 2014. године у Сомбору.** Верујемо да одабрани радови представљају вредно научно и стручно штиво.

Овај број *Норме* **потписује нова редакција,** формиран је и репрезентативни уређивачки одбор који окупља еминентне представнике струке. Сматраћемо успехом уколико часопис *Норма* по завршетку мандата ове редакције добије место на листи референтних часописа и уколико успемо да приметно подигнемо стандарде научне продукције у Србији.

Проф. др Борјанка Трајковић

TEACHER EDUCATION

DANA HANESOVÁ[1]
Faculty of Education, University of Matej Bel
Banská Bystrica, Slovakia

PREGLEDNI ČLANAK
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DIACHRONIC AND SYNCHRONOUS VIEW AT RESEARCH STUDIES ABOUT TEACHING PROFESSION

Summary: The author presents an overview of recent research studies on teacher and teaching profession. In the introduction a thorough international professiographic research (No. APVV-0026-07) lead by a Slovak expert team focused on detailed analysis and reflection on teacher's everyday activities is described. What follows is a diachronic view of pedeutological research (research on teacher) over last decades (since 1960ties) elaborated with the assistance of the diagnoses offered by several educational reference manuals. The last part of the study shows synchronic picture of pedeutological studies in several European as well as other countries (America, Canada, Australia, and New Zealand).
Key words: research, teacher, teaching profession, education

Introduction

The recent educational reform in Slovakia brought along a discussion about the status of teachers in kindergartens and primary schools (Kosová, & Porubský, 2011). Raising amount of experts' attention has been paid to pedeutological research on teachers at all levels of schools. By pedeutology we mean a modern educational discipline - theory of teaching profession, dealing with the objectives, means, preconditions and conditions of professional activities of teachers as well as with physic and social expectations from them, their personality, education and carrying out their job.

Slovak experts in educational theory for pre-primary and primary levels consider the issue of developing teachers' professionalism to be one of the crucial societal topics in a Central European society, especially as it is a characteristic feature of the era of teaching profession crisis. The current teachers in all kinds of schools are searching for their profes-

1 dana.hanesova@umb.sk

sional identity, their real professional autonomy, the ability to generate the standards of performance and the ethical codex of teaching profession. The growth of their professional competences, as well as their professional knowledge and their emphasis on self-reflection has become the main aim of teacher education at the Faculties of Education.

In spite of a number of resources and references specifying the capabilities, competences, qualities and skills of teachers, the reality of the professional practice e.g. at primary schools has been only rarely the focus of thorough scientific research asking the following questions: So what does it actually mean to be a competent professional teacher? What should teacher education and teacher performance in practice consist of? Though these and other issues have been the focus of several regional, national and international research studies, one of the most important professiographic research studies associated with three Central-European countries was the project called "The Profession of 'Pre-primary Education Teacher' and 'Primary Education Teacher" within Dynamic Concept" (No. APVV-0026-07). It was designed and implemented by the team of Kasáčová at the Faculty of Education, University of Matej Bel (UMB) in Banská Bystrica in cooperation with the Faculty of Pedagogy and Psychology at the University Kazimierza Wielkiego in Bydgoszcz, Poland and the Faculty of Pedagogy at the University of Ostrava in Ostrava, the Czech Republic in the years 2007 - 2010. This project succeeded to confront the theoretical pedeutological thinking, the declared and required competences and capabilities of teachers defined in the profession standards with the specific, obvious everyday practice of teachers at the first two levels of education (levels ISCED 0 and ISCED 1). Outputs from this project present the final data from the comparison of the two categories of teachers (pre-primary and primary) and also to some extent from the comparison among these three countries.

The aim of this study is to present research tendencies not just in Slovakia, but in several countries all over the world. In the first diachronic part we focus on a generalized overview of specific historic phases of educational and pedeutological research abroad (primarily in English-speaking countries). In the second part we present a synchronic summary of research in individual institutions in several countries. In this overview we make use of some updated data from the bibliography published in 2009 (Hanesová, 2009) by the author of this study. Its aim was to provide more information regarding selected pedeutological research projects focused on the issue of professionalization of the teaching profession, on teachers' competences and especially on the real performance of the teaching profession in practice, on teachers' working time (especially the issue of work load, contentment with the role of the teacher or the effectiveness of teaching, etc.).

1. General Overview of Research on Teachers since the second half of 20th century

The following brief overview of the historic shifts in educational – and namely pedeutological - research in selected civilized countries was put together on the basis of analysis and comparison of data from research studies published in several editions

of the *American Educational Research Association's Handbook Series* (1963, 1973, 1986, and 2001) by AERA (American Education Research Association). Another source of data was the updated international reference manual *International Handbook of Research on Teachers and Teaching* published in 2009.

The first edition of the *AERA Handbook* (Gage, 1963) describes the educational research in the 1950's and at the beginning of 1960's. Its aim was to inform and thereby to improve the conceptual research work, especially research methodology. The research reports are divided into categories by grade level and subject matter, as well as by research methods. There is no chapter in the *Handbook which* is devoted to pupils and pupil learning. The *Handbook* focuses on theoretical orientations, research methods, major variables and areas of research on teaching, and research on teaching various grade levels and subjects. The publication lists a whole scale of research methods: statistics as a scientific method in research on teaching, experiments and quasi-experiments, measuring classroom behaviour by systematic observation, rating methods, testing cognitive skills and achievement, and measuring non-cognitive variables in research on teaching.

The following second edition of the *AERA Handbook* (Travers, 1973) represents the educational research in the 1960's and in the beginning of the 1970's. According to LeCompte (2009, p. 35), this edition "reflects the first edition's disdain for non-experimental research". Studies dealing with qualitative research and observation "are framed in terms of the cautions, issues and pitfalls that await their practitioners". In spite of this, the second edition of the *Handbook* can be seen as a kind of fore-shadowing of topics with a non-experimental research design. The shift towards a more critical epistemological approach is evident. Since the end of the 1960's and beginning of the 1970's the research starts to pay more attention to the pupils (their age, gender, cultural background – the factors/differences between pupils, statistical correlations between various pupil groups, etc.), their motivation or cultural deprivation. The *Handbook* indicates also several new problems, such as the subjectivity of the researcher, asymmetry of power or the need for a collaborative effort.

Major sections of the second edition of the *AERA Handbook* focus on research methods and techniques and research on teaching various subjects. The research methods mentioned in this publication are as follows: the move to the use of direct observation of early childhood teaching; the assessment of teacher competence; instrumentation of research in teaching; the analysis of qualitative data; and pitfalls in research (mainly with regard to experiments).

The third edition of the *AERA Handbook* (Wittrock, 1986) focuses on the educational research in the 1970's and the first half of the 1980's. It presents the paradigmatic and epistemological shifts from the social and natural sciences affecting educational research. It reflects the move from a focus on objective research to more 'inspirational' though more subjective scientific research. "Interpretivism, phenomenology, critical and post-modern theory, symbolic interactionism and constructivism provided alternatives to behaviourism and functionalism" (LeCompte, 1986, p. 33). In addition to researching macro-processes via questionnaires or tests and observation sheets the researchers focus

more on micro processes using more elaborate observation methods, video recording, diaries, and ethnographic interviews. Action research received its legitimate position among research methods. A collaborative form of research is highly recommended. The researchers investigate more intimate and sensitive issues than ever before.

This *AERA Handbook* (1986) focus on theory and method of research on teaching research into teaching and the teacher; the social and institutional context of teaching; and research on the teaching of subjects and grade levels. From a methodological point of view there is evidence of a significant shift towards the following thematic issues: paradigms and research programmes; the philosophy of research on teaching; measurement of teaching; quantitative methods in research on teaching; qualitative methods in research on teaching; observation as inquiry and method; and the synthesis of research on teaching.

The *AERA Handbook* published in 2001 (Richardson) shares with the trends of educational research in the 1990'. The authors of the research overviews tried to bring order to the chaos in the field of education in the 1980's and 1990's due to the amount of educational changes, new emphases and shifting standards. The procedural side of education has been examined more and more by the researchers, especially phenomena such as diversity, complexity, culture, dialogue, social justice, difference, the right to develop, etc. The research assumes knowledge and comprehension of the wider social and political context. The authors present arguments in favour of specific educational paradigms. The constructivist, socio-cultural and critical perspectives are legitimized.

The fourth *AERA Handbook* recognizes the impact of multiplicity and ethnic diversity upon teachers, learners and educational practice. At the same time more researchers consider the background and also a subject analysis of the teaching content. This edition of *Handbook* focuses also on new educational areas, such as physical education, health education, moral education and second language teaching/learning. The studies on teaching sciences are also influenced by constructivist approaches to learning/teaching. The part surveying the research on learners is expanded by adding topics from the area of diversity and special education. Concerning the research on teachers and their profession – the main point of our research – generally the main stress is on the relationships and the role of teachers in a culturally changing classroom and in the process of forming relationship between the school and community. In other words, the *AERA Handbook 2001* indicates a far broader perspective on teachers, learners, community and culture than the previously.

With respect to the research methods, the fourth edition of the *AERA Handbook* reflects the fact that qualitative research methods in educational sciences are no longer 'new'. It presents a wide range of ethnographic research studies, case studies, descriptive narratives, clinical studies, biographies and autobiographies. On the other hand, the *Handbook* reveals the truth about a great number of low quality qualitative research studies that began "to give some forms of qualitative research a bad name" (LeCompte, p. 43). So the response was a return to the use of the most precise quantitative methods, but also a shift to a mixture of quantitative – qualitative research.

Besides re-examining the qualitative methodological paradigm the evaluation of epistemological paradigms and the issues of purpose were re-discussed (this includes the validity of research, changes in ethnographic research due to diverse approaches to the concept of culture, etc.). One of the most significant features of this last edition of the *AERA Handbook* is the shift of its emphasis from changes influencing schools onto the educational process in schools, real life in the classrooms, activities of teachers and their correlations. It reflects the effort to search out the best solutions in order to secure academic success for all children. Much research confirms that many problems in education derive from deficient conditions outside the school.

The scope of topics that the fourth edition of *AERA Handbook* mentions, is actually quite wide, including the issues about the scientific foundations of research (traditional approaches to research on teaching); special topics in qualitative methodology (ethnography, validity, narratives); combination of social inquiry research methods; teacher assessment; subject matter; learners; educational policy; and social and cultural contexts and the role of the teacher.

From the methodological point of view there is an important move towards investigating the following themes: philosophical approaches, critical issues and current trends and the possible future of quantitative research; reconsideration of research paradigms in education; changing the conceptions of culture and ethnographic methodology; narrative research on school practice; validity of qualitative research; eclective research methodology; advances in assessment, and action research.

Pedeutological research studies carried out during the end of the 20th century and in the first decade of the 21st century are reflected also in a reference monograph *International Handbook of Research on Teachers and Teaching* written by British, Australian and American educational experts (Saha & Dworkin, 2009). It consists of studies focused specifically on the trends and themes of research on teachers:

a) The first group consists of a group of studies introducing pedeutological research: teachers as researchers, dissemination of knowledge about research on teachers to a wider group of teachers, trends in pedeutology as a science and also in educational systems, developments in quantitative research methodology.
b) Next group is formed by studies focused on the process of becoming a teacher: the research of teacher education programmes, teacher certification and credentials; the process from the focus on qualification to a commitment to teaching performance, the life-long continuing education of teachers, the role of mentors to pre-service and in-service teachers.
c) The studies about characteristics of teachers involve analysis of the status and prestige of teachers and teaching, the political orientations of teachers, dimensions of quality in teacher knowledge, teachers' values in the classroom, teachers' leadership skills, sex segregation and its influence upon the work of teachers.
d) Teacher behaviour is the focus of another category of pedeutological studies: studies about the classroom as the space of teachers' work, teachers and

democratic schooling, teachers and parents, teacher's commitment, teachers' beliefs regarding pupil learning and motivation, teachers and school textbooks, teachers' emotion regulation, the head teacher and teacher's relations, teacher's misbehaviour, mistreatment of teachers.

e) Category of studies about teacher life-cycle include tracking teachers, teachers' work, power and authority, teachers' salaries and benefits, burnout and teacher's resilience, the teacher and promotion.
f) Comparative perspective on teachers involves studies on teachers in diverse classrooms and cultures (e.g. in Cyprus, in Africa).
g) Research on various dimensions of teaching study styles, models and diversity in teachers' work, creating productive learning environments in culturally pluralistic classrooms, justice in teaching, ethics and teaching, teachers' expectations and labelling, teacher-student interaction, assessment and examinations, classroom management, teachers as role models, teaching in a multicultural classroom, teaching in large and small classes, teaching and learning in the ICT environment, effective teaching, teaching and nonverbal behaviour in the classroom.
h) Rest of the studies focus on teaching specific groups of students: secondary (vocational) and tertiary level, students with special needs, teaching gifted and talented children, teaching mixed-gender classes, the problem of boy's achievements in schools; teaching of individual subjects; or other issues connected with the teaching profession: issues of tracking pupils, testing and teaching to tests, value-added models of teachers' effects, teaching during educational restructuring and reforms, grade retention redux, teaching in an era of heightened school accountability.

2. More Detailed View of Research on Teachers in Selected Countries

As several studies (Schreiner, Spinder, & Vos, 1995; Schreiner, Spinder, Taylor, & Weterman, 2002) on partial educational issues indicate, certain phenomena such as history of the nation/region, its juridical status, economic development and social welfare, culture and traditions, ethnic and religious structure should be taken into consideration as the main forming influences upon the development of regional educational system and the status of teachers that is reflected in the selection of the research topics. Research studies focused on teachers in various countries reflect miscellaneous educational but also wider social issues, problems or challenges. Investigations into the teaching profession which were implemented into the national curricula or standards of the teaching profession or even into the international educational policy documents are of exceptionally significant value for the international community of teachers. In the following chart we present a view at some examples of educational institutions and their projects that have been to at least to some extent connected with research on the teaching profession, teachers' activities or the status of teachers:

Countries	Institutions	Projects/research on teacher profession	Added information
Austria	Bundesministerium für Unterricht und Kunst, Bundesministerium für Bildung, Bundes-ministerium für Finanzen, Bundesministe-rium für öffentliche Leistung und Sport, Institut für Un-ternehmensberatung und die Kooperations partner Institute for Social Research and Analysis (SORA), Klinische Abteilung Arbeitsmedizin am Allgemeinen Krankenhaus, Wien Klagenfurt Universität	Research of workload, contentment and health of primary and secondary school teachers *Arbeitszeit, Zufriedenheit, Beanspruchungen und Gesundheit der LehrerInnen in Österreich* in 2 phases: April – July; August – September) – diaries of teachers in 2-weeks long periods (notes about the beginning and the duration of each activity chosen out of a pre-prepared catalogue of activities). Teacher profession, workload of teach-ers.	1999 – 2000: Dobl-hamer, M. et al 2004: Posch, P.
Australia	Australian Education Union; Australian Association for Re-search in Education (AARE); Edith Cowan University, Department of Education	The characteristics of the profes-sion of early childhood teachers, professiograms, redefining teacher profession and teacher competence (ISCED 1 teacher of all subjects). In 2001 - project Teacher Competency Framework (Level 1): questionnaires, focus groups. The research resulted in the production of national standards of primary teachers (2002).	1990: Kroneman, M. (early years) 2001: Invargson, L.; 2002, 2008: Maloney, C.; Barblett, L.
Canada	Statistics Canada The Research Network on New Approaches to Lifelong Learning NALL -Centre for the Study of Education and Work (CSEW), participation of Ontario Insti-tute for Studies in Education, University of Toronto OISE/UT; The Work and Lifelong Learning Research Network WALL – grant scheme of The Social Sciences and Humanities Research Council of Canada (SSHRC)	Labor Force Survey (LFS): survey of teachers' profession: trends 1999 - 2005 – statistics: males/females, age of teachers, educational level of teachers, salaries, work load (in hours). Lifelong education: research of self-de-velopment of teachers (questionnaires, case studies). Publication: annotated bibliography.	1996 – 2002: NALL, 2002 – 2007: WALL - the Initiative for the New Economy (INE) Smaller, H. - York Univer-sity; Rosemary, C. – OSSTF; Hart, D. - OISE/UT; Liv-ingstone, D. OISE/ UT;Noormohamed, Z. York University 2006: Lin, J.
	Nova Scotia Teachers Union (NSTU) Queen's University (Social Pro-gram Evaluation Group), Saint-Mary's University (Nova Scotia) Ontario Institute for Studies in Education	Research of teachers' use of time (at home, at school, their interference). Research method: diaries. Research of workload and quality of teachers' lives in Canada (Canadian Teachers' Federation). Action research and the standards of the teaching profession.	1992: King, A.J.C.; Peart, M. 2000: Harvey, A. S.; Spinney J. E. L. 2001: Schaefer, A. (British Columbia) 2005

Countries	Institutions	Projects/research on teacher profession	Added information
Denmark	Aarhus Universitet -Institute of Psychology	Research of working situation of early childhood education teachers: diaries of teachers.	1979: Elklit, A.; Friis, T.
Estonia	Tallinna Ülikool	Trends of development of teachers' profession, trends in pedeutological research.	2005 – 2006: Ruus, V. R.; Loogma, K http: //www.ist-world.org
Finland	University of Oulu, University of Jyväskylä (in cooperation with the British University of York)	Research of early childhood education teachers: questionnaires about the practical performance of the teaching profession (1996). Comparison of approaches to professionalization of early childhood education teachers (Finland and England).	2 consecutive ethnographic research: 1994-96, 2001: Webb, R.; Vulliamy,G.; Hamalainen, S.; Sarja,A.; Kimonen, E.; Nevalainen, R.
France	ÉNS de Cachan, Institut catholique (PF); research laboratories (grants of C.N.R.S); since 1990: Universitaires de Formation des Maitres (UFMS)	De-centralized research of professionalization of teachers of primary and secondary schools	2000: Bourdoncle P.; ROBERT, A. et al.
Germany	Leibniz-Institut für die Pädagogik der Naturwissenschaften (IPN): Projekt QuiSS and GuiSS-ProSa (Professionalization of teachers' activities) Content area: sciences	Workload and working time of teachers. Professionalization of teachers – the activities of primary education teachers', development of support system and the system of evaluative methods.	1960: Frister,A.; Häker,H.;Hoppe,A. 1963: Graf, O., Rutenfranz, J. 1965: Nengelken, G.; Ulich, E. 1980: Műller-Limmroth, W, 1981: Mőller, H.; Sauper, R. 1985: Häbler, H.; Kunz, A.; 1988: Wulk, J.; 1990: Schäfer, E. 1999: team- Nordrhein-Westfalen; 2001: Forneck, H. J.; Schriever, F.2004: Janzen, M. 11 schools in Schleswig-Holstein

Countries	Institutions	Projects/research on teacher profession	Added information
Great Britain	BERA (British Educational Research Association in cooperation with ASPE (Association for the Study of Primary Education)	Innovations and changes in primary education – tasks, responsibilities and activities of primary school teachers, professionalization of teachers.	Webb, R. (Department of Educational Studies, University of York responsible for BERA – SIG ISCED 1 teachers'
	Cambridge University a Leicester University: Teacher Status Project	Opinions of teachers on their own profession and work, view of the public on the teaching profession, the comparison of the teachers' status and the status of other professions (e.g. research of real interactive teaching during L1 (native language) lessons, workload of teachers, practice of inclusive education, qualitative analysis of education in the context of migration, aging – ethnographical and narrative approaches). Importance for the governmental strategy of education.	2002-2006: Hargreaves, L.; McIntyre, D.; Everton, T.; Pell, T.; Hopper, B.; Rouse, M.;, Alexander, R.; Galton, M.;, Cunningham, M.; Oliver, C.
	Ofsted: Office for Standards in Education, Children's Services and Skill	Statistical research of achieving the standards according to the educational outcomes, working with disabled students, inducing novice teachers, lifelong professional education of teachers, results/success in subjects, education of minorities.	Note.: teachers' schedules at schools (curricular activities)
	Society for Educational Studies (SES)	Publishing activities focused also on the professionalization of teachers (and the research on teachers).	British Journal of Educational Studies
	The National Foundation for Educational Research	Support of educational research.	www.nfer.ac.uk
	TLRP (Teacher and Learning Research Programme), Roehampton University, King's College London)	Changing Teacher Roles, Identities and Professionalism : An Annotated Bibliography- texts on research on teachers (100 most important research studies on the status of teachers, their real life etc. in Great Britain and other countries since 2000).	2007
	Research Centre for Learning and Teaching	Research of teaching and learning.	www.ncl.ac.uk/cflat/
	VITAE project (Institute of Education, London University, University of Nottingham)	Activities and working condition of teachers' profession, their influence upon the students' performance.	
	University of Cambridge, University of Bedfordshire.	Approaches of the public to the teachers' profession – published in the collection of research reports: http://www.informaworld.com/smpp/title~content=t713707783~db=all~tab=issueslist~branches=22 - v2222, Issue 3 September 2007, p. 247 – 265.	2007: Everton, T.; Turner, P.; Hargreaves, L.; Pell, T.

Countries	Institutions	Projects/research on teacher profession	Added information
GB	Strategic Forum for Research in Education (SFRE)	Experts' forum on research in education, including research on teachers.	www.sfre.ac.uk
	University of York UK & Finnish partner Un Yliopisto - University of Oulu, University of Jyväskylä		Also: Finland
Hungary	Debreceni Egyetem	Teachers' skills in pre-primary education: systematic and historical overview of research on teachers.	2007: Lajos, K; Pál, R., Kelemen, R.
Japan	Akita University - Faculty of Education and Human Studies Center for Educational Research and Practice, Osaka University	Research of practical teaching in schools, development of literacy (also from the point of view of clinical school psychology). Research of attitudes of teachers towards their own teaching activities connected with the reform of integrated education.	2001: Hosokawa, K.
Latvia	Kauno Technologijos Universitetas	Professiogram of primary school teachers.	1998:Tamošiūna, T. (according to Čepukas, R.)
The Netherlands	Hogeschool van Am sterdam, Educatieve Hogeschool van Amsterdam	Research of new teachers' competences (method of development of scenarios in education).	2003, 2006: Snoek, M.
New Zealand	Portal Welcome to Education Counts: Teacher Status Project 2002-2006 (Ministry of education, Massey University) ICSEI - International Congress for School Effectiveness and Improvement	Statistics and educational research in New Zealand, teachers' performance (ISCED 0,1,2). Professional status of teachers (questionnaires and interviews). ICSEI – congress focused on the research of teachers' preparation, development of teachers' profession.	2002 – 2006: Cameron, M. Kane, R. – early childhood education 2008: ICSEI in Auckland
Norway & Sweden	Stockholm Institute of Education - Lärarhögskolan i Stockholm, Švédsko; Universitetet i Oslo	Reform policy and the performance of the teaching profession in 90ties (Scandinavia).	2008: Carlgren, I.; Klette, K.
Portugal	Universidade do Porto, Universidade de Trás-os-Montes e Alto Douro –Centre of Educational Research and Intervention (CIIE)	Professionalization of teacher's profession in comparison with other profession (90-ties) – ethnographic (sociological) research.	2007: Caria, T. H.

Countries	Institutions	Projects/research on teacher profession	Added information
Saudi Arabia	King SaudUniversity, Riyadh	Comparison of target competences of primary school teachers in state schools and in private girls schools in Riyadh.	1994: Bakr Al-Bakr, F.
Slovenia	Pedagoške in andragoške raziskave pri Znanstvenem inštitutu v Ljubljane	Models of improving the quality of teachers' work in the process of professional development. Teachers' preparation, lifelong education of teachers, models of raising the quality of teachers' professional performance, reflection in teaching profession, tools of measurement of teachers' effectiveness. Research of the current state with the aim to improve the tools of measuring and raising the quality of teachers' profession.	2001 – 2004: Kalin, J.
Spain	Universidad Alicante, Facultade Educación	Research of learning strategies of students of teacher education via records in diaries (15-days long periods).	2004 – 2006: Gilar, R.; Ángeles. M. de los; Ruiz, M.; Costa, J. L. C.
Sweden	Göteborgs Universitet - centrum Research and Innovation Service See also Norway	Professional competences of teachers; theory of practical performance, relations between theory and practice in teacher education; supervision of practical training of teachers; assessment of generic skills of teachers; authenticity and self-realization of teachers; creative teacher; new demands on teachers; relations between teachers and students; educational theories in teaching practice; influence of school architecture upon the work of teachers and pupils.	Bengtsson, K.; Claesson, S.; Franke, A.; Båth, S.; Andrén, U.; Bredmar, A.C.; Johansson, J.; Lilja, A.; Levinsson, M.
Switzerland	Regional municipal offices, professional organizations and national organization of teachers ECH/LCH –der Dachverband Schweizer Lehrerinnen und Lehrer; national research programme No. 33 SRED (Service de la Recherche en Education); CDIP/ EDK Schweizerische Konferenz der kantonalen Erziehungsdirektoren EDK Conférence suisse des directeurs cantonaux de l'instruction publique CDIP Conferenz	Further education of teachers, research of working conditions of teachers, workload of teachers.	In cantons: 1994: Fazis, U. a i.; 2000-2002 Forneck,H.J., Schriever, F., Gonik, Bucher; 2003: Trachsler, E.; Inversini, S.; Ulich, E.,Wűlster, M. The whole German area: 1997/1998, 1999, 2001, 2006): Landert, Ch.

Countries	Institutions	Projects/research on teacher profession	Added information
The U.S.A	AERA The American Educational Research Association, Washington	Educational research project (topics: professional development of teachers, effectiveness of teachers' preparation).	www.aera.net
	Carnegie Foundation for the Advancement of Teaching (since 1905) – independent educational research centre	Support of research activities towards the changes in education, raising the status of teachers, development of new models of reporting from practical training in classrooms, development of basic competences of teachers.	2002: Hinds, M.
	Project CLEAR	Assessment of the effectiveness of teaching according to the clarity of teachers' instructions: CLEAR = communication – learner – execution of the lesson – assessment – reflection.	70-ties.: Rosenshine & Furst, 1971, Land, 1980 a 1987,Cruickshank, Meyers, & Moenjak, 1975)
	The Holmes Group (consortium of the deans of colleges of education – approximately 100 research centres in universities		Reports on reform of teacher education
	NCCTQ National Comprehensive Center for Teacher Quality: cooperation of ETS (Educational Testing Services), Learning Point Associates & Univerzity Vanderbilt	Basic empirical (statistical) research of education and quality of teachers' performance, testing in social sciences, assessment of innovativeness in education, equality of education, comparison of the level of literacy of teachers: listening, learning, leading (ETS). Purpose: the connection of research with the educational policy. Comparison of the preparation of teachers in the U. S. A. and in other countries (Australia, England, Hong Kong, Japan, Korea, the Netherlands, Singapore). Correlation between the effectiveness of the teacher and the educational outcomes (especially in economically less supported schools).	www.ncctq.org, www.ets.org
	ILEARN – International Leadership in Education Research Network	Network of educational research institutions.	1986, 1994: Hargreaves, A. - Lynch School of Education, Boston College

Countries	Institutions	Projects/research on teacher profession	Added information
The U.S.A	NAEd - The National Academy of Education	Educational research – national level of research. Its outcomes used in new conceptions of education with implications in practical teaching (e.g. the use of text in pre-primary education, human rights education, the life of teachers, education in areas economically underdeveloped, extra-curriculum in socio-cultural context, discrimination in education, relations teacher-students, assessing the real performance of teachers in the classroom).	since 1965
	NBPTS (National Board for Professional Teaching Standards)	National standards for raising the status of teaching profession.	
	NCATE National Association for the Accreditation of Teacher Education (Nebraska); INTASC (The Interstate New Teacher Assessment and Support Consortium, 1987)	Model standards for novice teachers (5 domains: the knowledge of the needs of students and the environment, the subject expertise, the ability to plan, carry out and assess one's own teaching, to prepare a diagnosis and to evaluate, what is professionalism of teachers).	www.ncate.org: deficient research of quality of teacher education
	National Center for Education Statistics NCES (U.S. Department of Education, Institute of Education Sciences)	Professionalization of teachers (interest in teaching profession, working conditions, workload of teachers, commitment of teachers, profile of teachers): questionnaires of primary school teachers.	Statistical analyses„Schools &Staffing survey" 1987/88, 1990/91, 1993/84, 1997
	NCRTL National Center for Research on Teacher Learning	Preparation of teachers.	http://ncrtl.msu.edu
	The Institute of Education Sciences, Washington D.C: Special Education Research Program on Assessment for Accountability	Project CFDA – research assessing the transparency and accountability in the area of special educational science (research of development in mathematics, writing and reading skills).	since 2005
	Center for Working Families, University of California	Case studies, interviews, observations and 24-hours diaries of secondary school teachers.	2002: Barlett, L.– individual PhD research

Countries	Institutions	Projects/research on teacher profession	Added information
The U.S.A	Institute for Survey and Policy Research (University of Wisconsin-Milwaukee)	Project 'Time, work and family': working time of teachers (diaries of teachers) – every teacher carried out his/her own action research 1 day a week (Tuesday) - analysis of diaries and phone interviews.	1997-8:Drago, R.; Caplan, R.; Costanza, D.; Brubaker, T.; Cloud, D.; Harris, N.; Kashian, R.; Riggs, T. L.
	US-China Center for Research on Educational Excellence	Comparative study of professional research of effectiveness of schools in the U.S.A and in China – research of correlations between the educational outcomes and the quality of education (including the teachers' input).	
	Class Assignment and Teaching Assignments Study (WEAC, project STAR)	Research of problems connected with the size of classrooms, activities, assessment of their effectiveness, partially also the workload of teachers depending on the size of the classroom, stress and fluctuation of teachers.	
	Design for Inquiry: Instructional Theory, Research, and Practice in Art Education	Research of the effectiveness of education (teachers ' input).	Effective teacher requirements: 1983: Suydam, M., 1989: Richardson, A. G.; Arundell, A.; 1990: Young, M.
	University of Wisconsin-Eau Claire, Appalachian State University, West Virginia University	Research of teachers' effectiveness (outcomes, enthusiasm, involvement of teachers).	2008: Bulger, S. M. , Mohr, D. J., Walls, R.T. „Stack the Deck in Favor of Your Students by Using the Four Aces of Effective Teaching"
	Competencies and Traits of Successful Agriculture Teachers	Research of teachers professional competences and features (secondary vocational education).	2007: Roberts, T.G., Dooley, K.E., Harlin, J.F., Murphrey, T. P.

Summary

Each national/regional educational system has its own 'biography'. After having analysed and compared them from a synchronic and diachronic view, it can be stated that in some countries serious pedeutological research started already in the 1950s, e.g. in the USA with its long tradition of empirical work on teaching as an occupation. In several highly

developed countries the research on teachers' profession had huge theoretical significance in understanding teachers' identities and work. Looking at pedeutological research in Western and Central European countries (e.g. the described No. APVV-0026-07) together in one study has opened the way for comparison of daily activities of teachers.

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Сажетак: Аутор представља преглед новијих студија о професији учитеља и учитељима. У уводу се фокусира на детаљну анализу и опис свакодневних активности учитеља кроз међународно професиографско истраживање (бр. АПВВ-0026-07) које води експертски тим из Словачке. Следи диахронички поглед на педеутолошка истраживања (истраживања учи-

теља) у последњим деценијама (од 1960- тих) која су објашњена уз помоћ дијагноза које нуди неколико приручника из области образовања. У последњем делу рада је приказана синхронична слика педеутолошких студија у неколико европских и осталих земаља (Америка, Канада, Аустралија и Нови Зеланд).
Кључне речи: истраживање, учитељ, професија учитеља, образовање

SIMONETA BABIAKOVÁ,
MARIANA CABANOVÁ
Faculty of Education, University of Matej Bel
Banská Bystrica, Slovakia

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PROFESSIOGRAPHIC RESERCH AND THE PROFESSIONAL ACTIVITIES OF PRE-PRIMARY AND PRIMARY TEACHERS

Summary: The study is focusing on the professiographic research performed in Slovakia, the Czech Republic and in Poland in the years 2008-2011. The authoresses describe their research aim and methodology, focusing their interpretations on comparing the selected research findings between the respective countries.
Key words: professiographic research, pre-primary and primary school teachers, professional activities of teachers, professional activities

Introduction

The APVV-0026-07 project *The Profession of Pre-primary Education Teacher and Primary Education Teacher within a Dynamic Concept* deals with the following research issue: in terms of knowing theoretical approaches, trends and the changing social qualifications and ethical dimensions to the teaching profession, Slovakia lacks an exact empirical knowledge of the profession in its true form, everyday structure, variability during the school year, as well as according to the biodromal changeability of the individual teachers. The dynamic character of the pre-primary and primary education teacher profession is the result of multiple factors. The academic, legislative and static definitions of the standards are not able to cover them all. The primary question of the research was: What does the pre-primary and primary education teaching profession really consist of, which professional activities make up the profession, what is the time horizon of these activities, and what is the quantitative proportion of the actual professional activities? How can professiographic research and its international comparison improve the process of understanding these professions?

In the aim of the our paper is

- To determine the profile of the professional activities of the pre-primary and primary education teachers across the days of a working week.
- To determine the differences and variations between the professional activities of the pre-primary and primary education teachers across the working week, depending on the monitored seasonal phase of the research.
- To determine the profile of the professional activities during the out-of-school days (Saturday and Sunday).
- To detect which professional activities are performed by the teachers after 4-00 PM and later.
- To determine whether the profiles of all the examined categories vary for all the professional activities of the pre-primary and primary education teachers, depending on the length of school service.

Research Strategy, Method and Administration of the Research Tool

The research strategy within the main strategic plan was based on the repeated auto-screening done by the pre-primary any primary education teachers three times a year, using the method of daily images of the professional performance, preventing the introduction of individual, time, cross-section and other possible errors. Overall, the preparation stages and the actual research were designed in a quantitative-qualitative way.

The primary method of the conducted research was *the method of daily images recorded for the time analysis of an occupation.* It was focused on auto-observation connected with progressive or directly retrospective recording of the time duration of teachers' work activities during the working hours and during the hours off work. The strategy was identical for both profession categories of teachers.

For the implementation of this method we developed a *research tool* for recording the professional activities in two modifications: ***The professiography sheet for the pre-primary education teacher*** *and* ***The professiography sheet for the primary education teacher.*** *(Kasáčová et al, 2011)*

Our research used a developed and verified recording sheet for a daily image of the professional activities, applying it to a defined research field. The literature did not provide any suitable tools for recording the professional activities of pre-primary and primary education teachers. That is why we decided to develop our own research tool. It was conceived following the *structure of the teaching profession standards* (the principal researcher was one of its authors and coordinated its specification, for both researched categories). The tool was developed in the Slovak research team and then underwent a review by the international APVV team from an academic, as well as pragmatic and praxeologic perspective. However, we respected the design of the

customary structure of the teacher professiography, in order to allow for comparisons of the findings also in a retrospective summary. The original inspirations (Fűlőpová, 1999; Urbánek, 1999) were taken with a grain of salt, as we wanted to avoid giving way to previously used and precisely adopted tools, where even the authors themselves warned of their limits and drawbacks: insufficient depth of the investigation, uneven distribution of the collected data into the most commonly used activity which they offered i.e. instruction and teaching activities. Our aim was to, in a more analytical manner, understand this most saturated activity category that comprised 55-75% of the activities in all the teacher categories, and was not yet examined in a more detailed way. That is why we decided to use a finer time structure within the daily recording.

A very important role played also the *graphic design of the tool*. It should have made the process of data recording convenient, simple and not too demanding. The individual categories and the assigned activities were grouped into a well arranged table. The probands filled in the minute duration of the performed professional activities throughout the day. To keep it simple, we created hourly time intervals, beginning with 7-00 am and the last column of the table could be used to fill in the time duration of the activity the proband performed after 4-00 pm or later. (The primary education teachers had a slight problem with this, because the common hour overlapped with the duration of the actual lesson; however this was an advantage too, as the teachers had to think about the estimated time and could not rely on automatically simplifying the duration of the lesson). On the other hand, the pre-primary education teachers' situation was a bit different – due to the allocation into shifts, the "normal" working hours lasted even after 4-00pm, and thus this interval contained more of the common professional activities as the interpretations will show later on.

Characteristics of the Research Sample and the Survey Data Overview

A high amount of data was collected by the auto-screening procedures during the described period. To get an overview we first need to describe the research sample. For the research survey we used data batteries from a total number of 1076 participants consisting of: in the group of the **pre-primary** education teachers the three periods provided data from a total of 639 participants, and in the group of the **primary** education teachers we received data from 437 participants.

Based on the experience with such a complex research strategy consisting of multiple stages, we can point out that the most sensitive part of the research is the recruiting of probands as participants, and it emphasizes the dynamic character of this research. Very important is the readiness to cooperate, but also endurance. Equally important is the current situation of the teacher, as it changes according to the variable conditions of the participants themselves. The process is also influenced by personal reasons, demands and the workload resulting from this method of cooperation and a very important aspect

is good and constant communication. This was covered by the project researchers, where several persons engaged in a continuous recruitment, and one person - the project administrator, through a system of open contact constantly communicated with the teachers attending the education course and initiated the adopting of new participants.

Based on the structure of the participating countries, (Tab. 1) the national groups within the particular stages differed. In the global assessment the national structure included:

- Group PRE – **Pre-primary** teachers: 43.66% from the overall sample were Slovak, 33.18% were Czech, and 32.1% were Polish teachers.
- Group PRI – **Primary** teachers: 51.25% of Slovak teachers, 23.34% of Czech teachers and 25.4% of Polish teachers.

TABLE 1 The Overview of the Active Participants in the Particular Periods and Countries and their Total

	1st period	2nd period	3rd period	Total	1st period	2nd period	3rd period	Total
PRE-PRIMARY SR					**PRIMARY SR**			
No. of Participants	113	84	82	279 43.66%	95	84	45	224 51.25%
Total – N SK	**279** respondents				**224** respondents			
PRE-PRIMARY CZ					**Primary CZ**			
No. of Participants	41	107	64	212 33.18%	37	37	28	102 23.34%
Total – N CZ	**212** respondents				**102** respondents			
PRE-PRIMARY PL					**Primary PL**			
No. of Participants	50	50	48	148 32.1%	38	37	36	111 25.4%
Total – N PL	**148** respondents				**111** respondents			
Σ	204	241	194	**639**	170	158	109	**437**
%	34.92%	22.07%	30.36%	**100%**	38.9%	36.16%	24.94%	**100%**

Overview of the examined data

The processed data was collected using the auto-observation sheets - each of these included 27 activities in lines and under 9 columns; there were 8 time limited 1-hour segments (from 7.00 am-4.00 pm) and after 4-00 pm the time was freely allocated until late evening. Thus each day of the research allowed the recording of 243 items of nominal data. Logically, not each of the recordings contained all positive data. If the activity was not performed the data equaled zero. Every respondent supplied 14 sheets. This should give an idea of the volume of data with which we had to cope.

Each of the data collection stage recorded two weeks and these were then processed according to the selection methodology. The number of the sheets processed and their detailed overview for both research groups are presented in the following tables. For the overview of all the activities we used the average value of the totals and to evaluate the particular activities it was necessary to use the totals of the mean values that were stripped of non-standard, or incorrect and invalid cases. The number of *valid cases* was floating during the analysis of the particular activities and its selection was made on a statistical basis. However, for the global overviews we had to use all the collected data, so that the compared activities would work with comparable - hence complete data collected.

The following tables present the overview for both PRE and PRI groups of teachers undergoing the research, covering of all the processed daily images based on the individual days in a week, in their product of two weeks, in the particular phases and according to the national samples. In the **PRE-PRIMARY** group we collected and processed **8430 daily recordings** and in the **PRIMARY** group there were **6242 daily recordings.** The whole research included **14674** recordings in total. Theoretically, we statistically processed **3,565,296** data values on separate hours and time segments.

The curve of the recordings included in the PRE-PRIMARY group reached the peak point during the II. phase and in the PRIMARY group it gradually declined.

Comparing of the Professional Activities of Pre-Primary Education Teachers

We analyzed the most significant differences between the countries and data concerning the professional activities of the pre-primary education teachers. We compared the average times in terms of the workday, working week, seasons and the length of the probands' teaching experience.

The highest time load, from the perspective of all the monitored time intervals, is shown by the teachers from the Czech Republic. During the working week until 4.00 PM, the average time of the Czech respondents exceeds the working time specified for the nursery school teachers. These results are also caused by the different allocation of the direct education activities of the pre-primary education teachers within the respective countries. While the nursery school teachers in Slovakia follow the scope of their direct education activities set to 28 hours a week (Slovak Government Regulation No. 422/2009 of the code), in the Czech Republic the weekly scope is set to 31 hours a week (Czech Government Regulation No. 75/2005). During weekends, the Czech and Slovak pre-primary education teachers spend on average 3 hr and 25 min on the performance of the professional activities, and their Polish colleagues spend on average 4 hr and 14 min.

We were also interested in the statistically significant differences within the work load of teachers in all the three countries during the workdays.

TABLE 2 Statistically Significant Differences within the Time Load of Pre-Primary Teachers when Performing The Activities During The Workdays in The Respective Countries

	a1-aF (07.00 AM - 04.00 PM)	N	Monday		Tuesday		Wednesday		Thursday		Friday	
			mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	std. dev.
CZECH REPUBLIC	work. Time (min)		550.6	323.0	659.2	384.6	636.5	374.4	601.6	358.6	564.2	368.7
	Monday	214			**P = 0.0005 *****		**P = 0.0037 ****		P =0.0505		P = 0.4998	
	Tuesday	212					P = 0.2740		**P = 0.0459 ***		**P =0.0006 *****	
	Wednesday	212							P = 0.1356		**P = 0.0037 ****	
	Thursday	211									P = 0.0554	
	Friday	209										
	a1-aF (07.00 AM - 04.00 PM)	**N**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**
POLAND	**work. time (min)**		321.8	151.2	321.3	154.9	327.5	160.2	315.4	158.5	322	159.6
	Monday	148			**P = 0.4986**		**P = 0.4568**		P = 0.2627		P = 0.4621	
	Tuesday	148					P = 0.3940		**P = 0.2835**		**P = 0.4664**	
	Wednesday	147							P = 0.2117		**P = 0.3245**	
	Thursday	148									P = 0.3115	
	Friday	148										
	a1-aF (07.00 AM - 04.00 PM)	**N**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**
SLOVAKIA	**work. time (min)**		430.9	204.8	419.4	200.7	419.3	196.9	408.7	200.8	399.5	233.8
	Monday	277			**P = 0.2321**		**P = 0.2850**		P = 0.0855		P = 0.0077 **	
	Tuesday	279					P = 0.4406		**P = 0.2375**		**P = 0.0390 ***	
	Wednesday	277							P = 0.2006		**P = 0.0321 ***	
	Thursday	276									P = 0.1525	
	Friday	274										

We have been monitoring all the performed professional activities a1-aF, since the out-of-school, public and other activities that are not performed on a daily basis could cause the differences between the particular workdays. There are no significant differences for the Polish teachers for the particular workdays. In the case of the Czech respondents, we found a statistically significant difference between the teachers' time load on Monday and their work performance on Tuesday (P = 0.0005 ***) and on Wednesday (P = 0.0037 **). We also detected statistically significant differences be-

tween Tuesday and Thursday/Friday when monitoring the time spent on the performance of all the professional activities a1–aF during the working week until 4.00 PM The Slovak pre-primary teachers show a significant difference in their work performance between Friday and all the other weekdays, except for Thursday. (more result from the research Kasáčová et al, 2011, Kasáčová, 2011a, 2011b)

Based on the recorded data, we prepared performance curves of the pre-primary education teachers during the working week. The highest time load in terms of all the monitored time intervals was reported by the pre-primary education teachers from the Czech Republic. The time load of the Slovak and Czech pre-primary education teachers is influenced by seasonality. The Slovak pre-primary education teachers work most intensively during the spring period. The teachers from the Czech Republic report the highest work intensity during the autumn period. The seasonal differences with the Polish teachers are minimal. Differences related to the length of the teaching experience were found only among the Polish teachers.

Even though the time load of the pre-primary education teachers in the particular countries varies, the percentage proportion of the professional activities in relation to the respective activity categories is comparable between the countries.

Comparing of the Professional Activities of Primary Education Teachers

The research objectives, strategy and tool of the APVV 0026-07 project used in the Slovak part of the research, were identical also in the research into the professional activities of the Czech and Polish primary education teachers. We compared the research findings in all the three countries.

We were dealing with the average time of the work activities performed during one workday and we compared it within all the three countries.The teachers from the Czech Republic worked on average 8.5 hours, Slovak teachers 7.8 hours and the Polish ones 7.1 hours. In terms of the research objectives, we monitored the time reported during the workdays between 7.00 AM and 4.00 PM. The average time duration of a primary teacher workday in the Czech Republic is 7.2 hr, in SK 6.5 hr and in PL 6.4 hr In this case, the time of the Czech teachers is the one closest to the common working hours. When presenting the average workday duration, we take into account all of the reported activities. The off-school, public and other activities are also an essential part of the teacher profession, even though the teachers spend on them only around 20 minutes a day during the average workday duration within all the three countries.

We were also interested in the statistically significant differences within the work load of teachers in all the three countries during the workdays. We have been monitoring all the performed professional activities.. Even those not very usual activities might cause significant differences in the teachers' performance between the particular workdays.

TABLE 3 Statistically significant differences in the time load of teachers during the workdays from 7.00 AM to 4.00 PM of the Primary Education Teacher

	a1-aF (07.00 AM - 04.00 PM)	N	Monday		Tuesday		Wednesday		Thursday		Friday	
			mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	std. dev.
CZECH REPUBLIC	work. Time (min)		460.4	217.1	451	238.4	405.1	201.1	448.8	218.3	391.9	176.3
	Monday	102			**P = 0.2586**		**P = 0.0076 ****		P = 0.3373		P = 0.0005 ***	
	Tuesday	102					P = 0.0358 *		**P = 0.4801**		**P = 0.0056 ****	
	Wednesday	102							P = 0.0272 *		**P = 0.3017**	
	Thursday	102									P = 0.0047 **	
	Friday	102										
	a1-aF (07.00 AM - 04.00 PM)	**N**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**
POLAND	**work. time (min)**		327	138.0	316.9	127.2	312.96	119.7	333.2	141.1	310	136.3
	Monday	111			**P = 0.3654**		**P = 0.2934**		P = 0.4240		P = 0.1581	
	Tuesday	110					P = 0.4694		**P = 0.2795**		**P = 0.3042**	
	Wednesday	111							P = 0.2200		**P = 0.3468**	
	Thursday	109									P = 0.0974	
	Friday	111										
	a1-aF (07.00 AM - 04.00 PM)	**N**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**
SLOVAKIA	**work. time (min)**		413.7	155.3	396	175.7	399.6	181.6	383.3	177.6	362.5	176.3
	Monday	222			**P = 0.0711**		**P = 0.0851**		P = 0.0167 *		P = 0.0000 ***	
	Tuesday	222					P = 0.4455		**P = 0.2431**		**P = 0.0049 ****	
	Wednesday	224							P = 0.1867		**P = 0.0022 ****	
	Thursday	222									P = 0.0314 *	
	Friday	223										

The results clearly show that there are no significant differences in the work load of the Polish teachers in the particular workdays. The Slovak teachers report a significant difference in the work performance between Friday and the other days. In case of the Czech teachers, there is a significant difference between the work performance on Wednesday and Friday. The work load of the Slovak and Czech teachers during the workdays is similar, although the Czech teachers report a higher level of work

load on Tuesday and Thursday. (more result from the research Kasáčová, Babiaková, Cabanová, 2011; Kasáčová, 2011a; 2011b; Kasáčová et al, 2011)

To conclude, we can summarize that the average daily time spent by the teachers on all the professional activities without any limitation in all the three countries is 7.8 hours. The highest time value was recorded in case of the Czech teachers. The Czech and Slovak primary education teachers report the highest average performance in the spring, their Polish colleagues during the winter. The performance of the primary eduation teachers in all the three countries is balanced throughout the particular seasons of the year. Despite that the highest average performance in each of the countries was reported by teachers with a different length of experience, these differences are not cardinal.

Conclusion

The teachers of the pre-primary and primary education from Slovakia, Poland and the Czech Republic are in no significant way different. Nevertheless, there are differences between the primary teacher profession and the profession of teachers in the pre-primary education facilities. Their work is different mainly in the partial aspects and these were the very target of our analysis. We believe that the topical perspective on these two teacher professions can support the standardization process currently active in all the three countries. Our findings should also serve as a humble contribution to the international discussions on the professionalization of the teacher profession and particularly of the pre-primary and primary teachers playing the essential role in the development and education of children.

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Сажетак: Студија се фокусира на професиографско истраживања обављено у Словачкој, Чешкој и Пољској у периоду 2008-2011 године. Ауторке описују своје истраживачке циљ и методологију, са фокусом своје интерпретације на поређењем одабраних налазе истраживања између земаља.

Кључне речи: професиографско истраживање, будући учитељи и учитељи, професионалне активности наставника, професионалне активности.

BRONISLAVA KASÁČOVÁ,
MARIANA CABANOVÁ
Faculty of Education, University of Matej Bel
Banská Bystrica, Slovakia

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RESEARCH ON TEACHERS IN THE OVERVIEW

Summary: The study deals with a theoretical analysis of the researches on teachers, their profession, work and motivation for profession. It defines new trend in the process of professionalization, and find reasons, for arguments in the modern access to the profession of primary and pre-primary teachers. Presents the Pedagogical Research Concerning the Teaching Profession in the Territory of Czechoslovakia over the Past 20 Years.
Key words: Teachers, professionalization, research on teachers, educational research, profesiographic research.

Introduction

Research on teachers and their development has been influenced by the reform changes of education systems, teacher training reforms and the stages of the profession's development from the beginning of the 20th century up to the present. (Walterová, 2002) Locke provides a conceptual analysis of the professionalization as well as the deprofessionalization of the teaching profession and poses the question (2001 according to Hextall, I., et al. 2007) as to whether the professional disintegration actually started to appear as early as in the 1980s and 1990s. Based on research carried out in England and Wales, Australia and New Zealand, Locke (2005) states in his analysis that the answer to this question is not clear.

Trends in Teacher Profession Development

The development of the teaching profession has been characterized by dynamic changes (according to Hargeaves, 2002) since *the pre-professional period*, when the

teacher was considered a sciolist and almost no attention was given to him/her in terms of research. This continued in the *period of professional autonomy*, when the teacher's social status and interest in teacher-oriented research were gradually rising under the influence of democratic reforms and the growing trend towards improving the teacher's education level *up until the period of profession crisis. In terms of research,* what to the greatest extent contributed to the scientific knowledge of the teaching profession was *the period of deprofessionalization*. With increasing interest in pedeutologic research, several interesting research activities concerning the teaching profession were developed. From the 1990s up to the present there has been *the period of neoprofessionalism* where a new professional identity of the teacher is being searched for within a rich theoretical debate with empirical support. This period is marked by both quantitative and qualitative growth in the area of pedeutologic research.

Pedeutological Interdisciplinary Researches in the International Context

Teachers are subject to research focusing on various areas: key competences and personal characteristics, the indicators of suitability for the profession, teacher creativity, reflective practices, didactic and methodological skills, the time and psychological strain of the profession, motivational factors and many others (Hargreaves, 2000 according to Walterová, 2002; Kasáčová, 2009; Hanesová, 2014).

Based on the analysis of the research, Anderson and Burns (1989) warned as early as the 1990s that there were certain disputable, yet generalized ideas – *generalizations* about teachers and their influence on the practice of their profession, which are, constantly and in different forms, replicated in spite of efforts to refute them:

G_1 There is no universal definition of a good or effective teacher. The foundation of this statement is the fact that the range of the teacher's activities is so diverse that no teacher is able to fulfill all of them to the full extent. That is the reason why the existing efforts to prove the performance and effectiveness of the teacher's work based on some isolated variables (e.g. duration and type of preparation, practice ratio etc.) have been flawed and should be replaced by more accurate education-measurement criteria.

G_2 Teachers are mutually very different in many personal and professional characteristics, only some of which have influence on the effectiveness of the teaching process. This generalization is based on research findings indicating that teachers differ in their opinions, attitudes, motivation, interests, value preferences, aspirations, which, however, do not significantly correlate with the school results of the pupils. On the other hand there is a proven relationship between the personal characteristics – the teacher's personality qualities - and his/her performance in the classroom in direct contact with the reality of education.

G_3 The teacher's personal characteristics do not have direct influence on pupils' grades. Such "direct influence" has not been proven. There are instead indirect con-

nections concerning how the teacher's characteristics can influence his/her behavior in the carrying out of pedagogical activities. Subsequently, in pedagogical situations, this may manifest itself as an influence on pupils' performance through indirect support for pupils' personality potential.

G_4 Teachers develop through several well predictable phases, which are qualitatively different. During their professional development, teachers' characteristics manifest themselves with a different level of intensity, fade away or appear at a later time. That is why they differ in how much they are connected with the observed aspect i.e. the effectiveness of professional performance. (similarly Prášilová, 2007; Kariková, 2004; Kasáčová, 2005; Gavora, 2009)

Based on the nature and research subject of pedeutology as a multidisciplinary scientific discipline dealing with the theory, research and practice of the teaching profession, certain criteria need to be taken into consideration when describing and classifying pedeutological researches:

- ***the character*** of individual research projects is influenced by ***external*** *factors:* international and national history, education and teacher training traditions, the current needs of the whole society, international trends in forming the teaching profession etc. and ***internal*** *factors:* regional history, education reforms, the teaching profession's development, initial teacher training, the nation's cultural, economic and social level etc. (Průcha, 2006);
- ***the thematic*** focus of research defined on the basis of the prevailing scientific area: pedagogy, sociology and psychology. (Kasáčová, 2009; Hanesová, 2009a; Hanesová, 2014a);
- ***the goal and aim*** of the research, determining the type of research (quantitative, qualitative or combined) and research methods used (Švec, Š., 1998)

Teachers' Working Conditions and the Social Status of the Teaching Profession -Selected Research Projects on Teachers in Foreign Countries

Here we will outline selected research projects concerning teachers according their thematic focus and authors. The working conditions of teachers have been the subject of a number of research projects, where the most frequently used research tool is a questionnaire. This however detects merely the opinions of the respondents without mapping the actual reality of the school practice.

D. Hustler (et al. 2003) focused his research on *determining teachers' satisfaction* with completed continuing education, the perception of the continuing professional development by teachers, their attitudes towards education and their expectations for the future leading on from the continuing professional development. The fundamental research methods included a questionnaire and case study. By means of a questionnaire survey administered to a sample of 2,500 teachers and a case study ana-

lyzing the experience of teachers at 22 schools, the researchers found out that most of them were satisfied with the continuing professional education they had completed so far. The teachers highly appreciated the continuing professional development that was of significance for the school or class where they worked, but also took into consideration their previous knowledge at the same time. The findings indicated that the teachers were critical of the universal format of standardized surveys, which were considered suitable for everyone. Teachers felt that preference had been given to the needs of the school and national priorities in the past years and they thought it is necessary to give priority to those options of the teachers' continuing professional development that allow them to develop their personal interests.

C. Easthope and G. Easthope (2000) present the result of their research carried out from 1984-1994 in Tasmania. According to their findings, teachers are aware of an increase in their workload and its increasing complexity as schools are becoming more complex facilities, not only educational, but also community-oriented and socializing. The complexity increased even more when teachers tried to match their professional commitments with "economic and rationalistic policies" aimed at the commercialization of the school which they had to face. Woods, P. and Jeffery, B. (2004) worked on a research project dealing with the identity of teachers at primary schools in England.

In recent years something that has been discussed more and more often is the question of teachers' satisfaction or dissatisfaction in response to new reforms in the field of education and schooling. Therefore, attention needs to be paid especially to determining the opinions of teachers and managers on implemented changes. McCulloch, G., Helsby, G. and Knight, P. (2000), in their publication titled *The Politics of Professionalism: Teachers and the Curriculum*, present a research-based mapping of the history of the politics of professionalism in the second half of the twentieth century in the United Kingdom. They focus more closely on the influence of the national curriculum on secondary school teachers in the 1990s. The authors draw from various primary and secondary sources as well as from interviews with teachers and lawmakers. Their analysis points out to the limits and possibilities of using professional autonomy in the context of the national curriculum and deals with the question of whether teaching can still be considered a profession. Similarly, L. Evans (2007), in the work titled *Professionalism, Professionality and the Development of Education Professionals,* draws a direct relationship between the teacher's career development and his/her professionalism.

An international team based in England and Finland, consisting of Webb, R., Vulliamy, G., Hämäläinen, S., Sarja, A., Kimonen, E. and Nevalainen, R. (2004), published a study titled *Pressures, rewards and teacher retention: a comparative study of primary teaching in England and Finland* where they present the consequence of education reforms and political decisions concerning innovations at schools and their impact upon teachers' work and their perception of teaching as a profession. The authors build upon a survey based on case studies obtained in England and Finland. They identify *positive factors* which maintain teachers' interest in their profession, including

a responsible approach to children, professional freedom and understanding and helpful colleagues, and also *negative factors* which include increasingly demanding work, low salaries, deteriorating behavior of pupils and declining social recognition. They also present recommendations and methods to improve teachers' motivation and to retain their interest in continuing in the profession. R Webb. (et al 2004) with his team also drafted a comparative analysis of the perception of teacher professionality from the viewpoint of lawmakers and teachers in England and Finland, based on interviews with teachers in each country. The authors came to a conclusion that while reform programs were politically formed by standard-oriented "*commercialized professionality*" in England, the idea of "*increasing the influence and status of teachers*" was more dominant in Finland, focusing on improving the professionality as such. They state that the perception of teachers' own professionality changed in both countries, but in different ways, reflecting the past and current ideology, politics and practice. (Webb, R. et al 2004, p. 83).

In the publication *The Professionals: Better Teachers, Better Schools*, P. Revell (2005) draws on his own experience and research that included monitoring the development of 50 students in the course of their initial teacher training and interviews with teachers, pedagogues involved in teacher training and governmental agencies and used this information as a basis for studying the background of those who are involved in the education process and factors behind many people's decision to leave the profession soon after obtaining the required qualifications. A number of themes are dealt with here including "the type of teacher that schools need" or whether teaching can be defined as a profession in the current context.

An analysis of the professionalization of the primary education teacher profession in England and New Zealand was published by T. Locke (2005). The research project carried out comparatively in these two countries focused on studying the impact of education policy upon the work of primary education teachers and their professional identity. The authors characterized changes in education policy in connection with the onset of more significant restrictions on the teacher's autonomy. Teachers' perception of these changes concerning their concept of professionalization depended on how external responsibility requirements were filtered through the decisive property of this profession, namely teachers' altruistic interest in the well-being of children entrusted to them (p. 555).

Pedagogical Research Concerning the Teaching Profession in the Territory of Czechoslovakia over the Past 20 Years

Pedagogical research concerning the teaching profession in Slovakia and the Czech Republic had been ideologically affected for many years, yet it kept developing and sought to follow global educational trends. From today's perspective, older Czech-

oslovak research projects prove very interesting and motivating sources of knowledge. This is also confirmed by the number of research projects that were carried out in the territory of Czechoslovakia between 1948 and 1989. Hanesová (2014) briefly present them in a summary table according to their themes and authors. (see Hanesová, 2014)

Over the past 20 years, the focus has shifted from the general problems of academic teacher training (Kotásek, 1996) to analyzing the current condition and formulating fundamental teaching concepts, with innovations in teachers' work also being studied to a certain extent, for example narrative assessment. These topics can be found in studies and monographs by the authors mentioned above (Švec, Š. 1999; Švec, V. 2002; Spilková, V. 1997; Kosová, B. 1997, 2000; Kasáčová, B. 2004; Šimoník, O. 1994; Štech, S. 1994; Vašutová, J. 2007 and others).

A. Doušková (2009) aimed her research at students' competences at teaching practice lessons during the Bachelor's study program of Pre-school and Elementary Pedagogy. M. Černotová (2003) assessed the teaching practice lessons taught by students in the teaching study program and studied the opinions and attitudes of supervising teachers regarding the performance of students during the student teaching practice.

Novotová (2008) also carried out research into the competences of primary education teachers. Her work was based on the model of competences by J. Vašutová (2004), which she further modified. The goal of the research was to find out which competences teachers regarded as fundamental for performing the teaching profession and which they considered marginal. The research method utilized a non-standardized questionnaire and a 5-level scale was used to asses each variable. In the respondents' opinion, the most important competences of the primary education teacher include pedagogical, communication, diagnostic and intervention competences. Among the least important competences there are organizational, managerial and research competences according to the views of primary education teachers themselves.

The theme of research competences is discussed in the works of A. Seberová (2006, 2009). According to the author (Seberová, 2006), research competences open a new dimension in thinking about teachers' professional competences as they are related to the role of the teacher as researcher which is emerging as a more important and more frequently discussed topic. J. Dargová (2001) studied teachers' creative competences.

Pedagogic communication issues were the subject of research carried out by several authors (Gavora, 2007; Nelešovská, 2005; Mareš, Křivohlavý 1990) and teachers' opinions on didactic and socio-educational issues were also studied (Wiegerová, 2005; Nelešovská, 2005; Kotásek, Růžička, 1996). According to A. Seberová (2009, p. 213), qualitative research into teachers' life stories can be a source of inspiration for the interpretation of data from professiographic research. In the Slovak context, research into the life story of a female teacher was performed by P. Gavora (2002). The aim of the life story research was to obtain, by means of an interview, the information on the basis of which a theory could be formulated about the specific working condition of

this female teacher, what role models influenced her professional development, what successes and crises she experienced in her career, what ethical principles she applied in her profession etc. Gavora (2002) carried out a qualitative research based on the life stories of 11 teachers. In this case, its objective was to describe and analyze the motives behind the choice of the profession in a selected group of teachers. She identified the individual stages that accompanied the decision to become a teacher and the factors that had significant impact upon the genesis of the teacher: the family environment in childhood, personality traits at the young age, experience from school, role models, key persons, decisive events. Babiaková (2006) also used the qualitative analysis of personal histories of primary education teachers to identify pull and push factors concerning teachers in relation to their professional development and self-education.

Porubský (2007, p. 103) focused his research on the area of recognizing the subjective pedagogical theories of a female teacher. By means of a narrative interview, the research sought to discover the subjective pedagogical theories of the female teacher in connection with her class and preferred methods and forms of work in the field of developing student cognition.

In the Czech Republic, qualitative research on teachers was performed by R. Švaříček (2007). In his research, he attempted to capture the process of constructing the professional identity in two teachers. The aim of his research was to describe the process of creating the teaching professional identity, which reflects both professional and private lives of the persons involved, and to describe the stages of development and its crucial moments.

A stand-alone extensive chapter is dedicated to professiographic researches. One of the significant researches in the Czech-Slovak-Polish region between 2008-2011 was focused on the profession of pre-primary and primary education teachers. (Kasáčová, B. et al, 2011, Babiaková, 2012) The research findings from teachers' professional activities are confronted with the draft version of professional standards and with the legislative requirements on the performance of teaching profession in the respective countries.

Conclusion

The quality of teachers is one of the essential factors in education. A wide range of researches focused on education point out how significant the understanding of the profession of teachers is. The overview of the researches indicates why it is necessary to study and analyze the teacher profession from the scientific and research perspective. Currently, all the processes of teachers' development prove that teaching is a profession requiring a very high level of expertise. Besides developing the theory of teachers' profession, it is also important to study in detail the workload of teachers in everyday practice. Thus the professiographic research plays a significant role in this research process.

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Сажетак: Студија се бави теоретским анализама истраживања о наставницима, њиховим професијама, радом и мотивацијом за професију. Дефинише се нови тренд у процесу професионализације, и налазе разлози за аргументе у савременом приступу професији учитеља и васпитача. Представљено је педагошко истраживање у вези наставничке професије на територији Чехословачке у последњих 20 година.

Кључне речи: Наставници, истраживање о наставницима, педагошко истраживање, професиографско истраживање.

JANA STEHLÍKOVÁ
Faculty of Education, University of Matej Bel
Banská Bystrica, Slovakia

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EMPATHY AND ITS DEVELOPMENT IN PRE-GRADUAL PREPARATION OF TEACHERS

Summary: The aim of our research was to confirm, approve or disapprove the assumption that the „E – program of empathy development in pre-gradual preparation of teachers" intervention program has a positive impact on the changes in cognitive and emotional component of empathy in the experimental group of college students – prospective teachers. The results of experimental verification draw from the data collected among 123 respondents – 2nd and 3rd grade students of PF UMB in Banská Bystrica, majoring in the teaching of psychology in combination with some other approbation subject; experimental group consisted of 41 students and the control group was created by 82 students. We used IRI (Davis, 1996) as an instrument for carrying out the measurements. The variations in desirable significant changes on the level of all variables in IRI were found, based on the results of data analysis between the experimental group participating in the experiential intervention, and the group which didn't take part in any intervention program at the time - the changes being: the rise in the level of emotional empathy (EC), increase of cognitive component of empathy (PT), rise in „fantasy" factor (FS), and decrease in „personal dis-stress" factor (PD) in experimental group.
Key words: empathy, multidimensional model, emocional construct, cognitive construct, „perspective taking" factor, „emoctional concern" factor, „fantasy" factor, „personal dis-stress" factor, emphatic teacher, intervention program

Introduction

Empathy is a basic component of all existing psychological phenomena (Mlčák, 2008). In her formulation, C. Serin (2007, p.109) stresses the meaning of empathy: „Empathy represents one of the most peculiar and at the same time fascinating phenomenon of the social life; it is a complex, multilateral experience, which can be observed in various different contexts and can be analysed on various levels".

Empathy is considerably represented in counselling and therapeutic approaches, and is linked especially to the work of humanistic psychologist and psychotherapist, Carl R. Rogers.

C. R. Rogers (1975, p.4) describes the empathy as: „(the) process, which implies entering the private world of another one, where one feels at home; this process takes being sensitive in each moment to the ever changing feelings arising in another person, to their fear, anger, love or confusion and to everything the other person experiences. ...Being with the other this way means that for a time being we impersonalize from views and values which we uphold, so as to be able to enter the world of another being without bias and prejudice, although it is important not to get lost in a strange, peculiar world of the other one, so we could get back from that world with ease if we wish so".

B. Buda (1994, p.51) characterizes empathy as an „ability through the means of which a person within an immediate communication with another person can put themselves into another's shoe place of their mental state, and based on that they can understand and feel in another one those emotions, motives and efforts, which this person is not expressing in words in a direct way and which are not a consequences of the situation of the interpersonal relationship...".

A widespread multidisciplinary use of the term of empathy in the scienses of man is in a strong contrast to relatively low theoretical conduct and small research base.

We can observe that, in general, we have more practical experience with empathy, than the theoretical knowledge of empathy.

The main source of problems in the concepts of empathy in contemporary psychology is a fact that the term empathy is used to highlight two separate and independent phenomena: emotional (affective) empathy, and cognitive empathy. The emotional base of the empathy is stressed by several authors, such as Allport, Langer, Mind, Stotland, Berkowitz, Mehrabian, Epstein, Hoffman.

W. Kohler, G. H. Mead a J. Piaget, Hogan, Daymond, Kohut are among those authors who began to stress the cognitive aspects of empathy.

The cognitive concept of empathy puts emphasis on the mechanism of „thinking into" the mind (psyche) of other people. The empathy is understood as a perceptual ability, an ability of social insight, but also a communication process.

R. F. Dymond (1950, p.344) defines empathy as a „process of redeployment into the thinking and acting of another being, this redeployment happens in an imaginative way through the means of imagination."

We agree with the current knowledge, that support the multidimensionality of empathy, considering the findings of several psychological schools and approaches. Many authors, such as Smith (2006), Davis (1996), Čavojová, Verešová (2011) see empathy as a system of multiple constructs – primarily, a construct of emotional and a construct of cognitive empathy.

Baron-Cohen‘s and Wheelwright’s (2004) model of empathy reflects the overlapping of the affective and cognitive component of empathy, where they describe the affective component as experience of emotions evoked by perception of other people, and cognitive component as an understanding or anticipation of the content the other person could think, experience or act upon. Compassion as an emotion evoked by the suffering of another being is part of the intersection of these two components. The ability to reproduce the feelings and various tensions of the other person in ones’s self through the means of empathy seems to be a main tool of understanding and feeling-in.

Smith (2006), too, connects the empathy with two constructs – a mental change of perspective, and a mediated emotional sharing.

Some authors assume that the cognitive empathy is a pre-requisite for the development of emotional empathy (Staub, 1982), others suppose the existence of complicated interactive relationships among them (Hoffman, 1987, Smith, 2006).

Verešová (2011, p.2) says: „there should be a balance between the emotional empathy on the one side, and the cognitive empathy on the other one. Some experts ponce that the ability to extrapolate the cognitive states and emotions of other people can be used also in selfish, rather than pro-social direction, resulting thus into competitivness of a man, or avoiding behaviour. It seems that the important moderator of empathy in the behaviour of a man is the moral tenets which a child is lead to within his education (...)“.

Empathy within a multidimensional concept is understood as a phenomenon, representing also other dimensions, components besides the emotional and cognitive ones.

In contemporary psychology, the most worked out concept of empathy is the multidimensional concept of M. H. Davis (1983), who holds that empathy can be operationalized and measured as a set of hierarchically organized constructs – the so called hierarchical structure of empathy. He has constructed athe IRI scale, its aim being the measurement of 4 basic components:

1. *Perspective taking* – a tendency to take a stand of other people in everyday life, excluding the egocentric thinking.
2. *Empathic concern* – manifestations of liking, warmness, compassion and concern in the misfortune (adversities) of others, often resulting in altruistic behaviour.
3. *Fantasy* – a tendency to imaginatevely redeploy into the feelings and acting of fictional characters from books, films etc.
4. *Personal dis-stress* – reflects the level of feelings of anxiety and restlessness in interpersonal interactions, an individual discomfort.

M. H. Davis (1996) conceives the empathy as a set of semantically distinct but overlapping constructs, which are related to cognitive, emotional and behavioral reactions of an individual who can observe the experiences of another person.

We believe that the acceptance of the multidimensional concept of empathy is essential, from the perspective of the development of theories of empathy. Therefore, the aim of our research has been to verify the effectivity of the „E – programme of empathy development" intervention programme in the context of expected changes – the rise in both the cognitive and emotional components of empathy.

We have expected that the designed „E – programme of empathy development" intervention programme in pre-gradual preparation of teachers will primarily develop the affective and cognitive components of empathy, but also other social skills and competencies necessary for the practice of the demanding profession of a teacher.

„The higher level of empathy in the structure of teacher's personality has a crucial significance, as it creates a base of all effective interaction with pupils and students. Teacher performs the so-called emotionally conditioned work (emotion work) that can be defined as an activity requiring the expression and proper regulation of negative and also positive emotions. The pedagogical mastery of the teacher lies in his high level of sensitivity – empathy to students, which often transfer their own negative experience and emotions onto the teacher." (Mlčák, 2010, pp. 124-125).

For the contemporary schools, the intervention programmes or other methods that develop the professional competencies of teachers are important because of them being the preconditions of optimalization of their effect, they influence significantly the rise of the effectivity of the school's own work (Fontana, 1997, Kasíková, 2010, Kyriacou, 1996, Mareš - Křivohlavý, 1995), and they influence the management of complicated interpersonal relationships at school (Helus, 1992, Hrabal, 1992, Hřebáč, 1998).

The teacher works within a complex relational interaction. Most of all, it is an interaction with individual students, with the class, parents, his own colleagues – teachers, with the school administration and management... every single one of these interpersonal relationships puts different demands and requirements on the teacher.

We have tried to design an intervention program, developing various modifications of necessary skills and abilities, especially those developing the empathy.

We have specified the partial aims of our research as follows:

1. To find out whether the intervention program of the empathy development has an impact on the rise of level of the cognitive component of empathy in college students, the prospective teachers.
2. To find out whether the intervention program of the empathy development has an impact on the rise of level of the emotional component of empathy in college students, the prospective teachers.
3. To compare the level of single individual variables in both the experimental and control groups, after the realisation of the „E – program of empathy development" intervention program.
4. To figure out the stability of potential changes in single individual variables five months after the program.

In relation to multidimensional concept of M. H. Davis (1983), with the so-called hierarchical structure of empathy we have expected that the „E – program of empathy development" intervention program increases significantly the level of cognitive empathy in „perspective taking", „empathic concern" and „fantasy" scales, and that the programme decreases the emotional empathy level in „personal dis-stress" scale.

Methods

The methodology of our experimental and verification research draws from the so-called comparative strategy. We have used the design with one experimental group – comparation in time (the level of abilities or performance before and after the research realisation) and the intergroup experimental design with two groups – a comparation between both the experimental and control groups (Komárik, 2002).

The observation of the levels of abilities or performance within a time-span before and after the intervention program's realization, and the statistical testing of the significance of the difference through the means of paired t-test are the indicators of the rise in the level both of the abilities and performance (gradual test).

Another indicator of the rise in the level of abilities and performance is the observation of the levels of abilities or performance in the experimental and control groups after the realization of the program, and statistical testing of the significance of the difference through the means of paired t-test (paralel experiment).

Participants

Due to the technical demandingness of the intervention program (limited number of students in the training group) the research sample consisted of 41 respondents in the experimental (divided by the technique of raffling into two sub-groups of 20 and 21 students respectively) and 82 respondents in the control group. There were 7 male respondents in the experimental group, and 12 male respondents in the control group.

The experimental group consisted of the students of 2nd and 3rd grades of the Pedagogical and Human Sciences faculties of University of Matias Bel in Banská Bystrica; the students' major subjects being psychology, pedagogics, Slovak language, English language, history, arts, physical education, ethical education.

The control group consisted of the students of 2nd and 3rd grades of the Pedagogical and Human Sciences faculties of University of Matias Bel in Banská Bystrica; the students' major subjects being psychology, pedagogics, Slovak language, English language, history, arts, physical education, ethical education, who haven't taken part in any pro-social intervention programs during the research period.

Instruments

We chose the following reasearch instrument:

IRI - Interpersonal Index of Reactivity (Davis, M. H., 1996)**,** which captures the multidimensional nature of empathy, the empathic answers (responses) include both the affective and cognitive components. 28 items categorized into 4 subscales, each containing 7 items, comprises this scale:

1. **EC empathic concern** – measures the compassion, warmth, liking and concern for others, who find themselves in adversities.
2. **PT perspective taking** – measures the tendeny to take, accept the view of others, that is based in non-egocentric thinking, measures the cognitive aspect of empathy.
3. **PD personal dis-stress** – measures the tendency to experience the feelings of anxiety, discomfort in percieving the others who found themselves in critical situations.
4. **FS fantasy** – measures the tendency to imaginatively redeploy into the experience and behaiour of fictional characters in books, films, and to be aware of their situation.

All four subscales have sufficient internal and retest reliability (the internal reliability ranging from 0.71 to 0.77; the retest reliability ranging from 0.62 do 0.71).

Procedure

The research and the realization of the experiment, coupled with the results and the efficiency of the intervention program verification continued from the September 2012 to May 2013.

The program itself has been conducted once a week (the experimental group one meeting on Tuesdays, experimental group two meeting on Wednesdays) in the total duration of 3 hours, that is 30 meetings in the span of 90 hours (part of that were also some field activities).

Results

The collected data were processed using the Statistical Package for Social Sciences (SPSS) for Windows. We have used the following statistical methods: descriptive data analysis, Mann-Whitney test for two sample test, Wilcoxon‘s two sample comparison test. We chose p=0.05 as a level of statistic significance.

A. The results of research findings for the emotional concern (emotional component of empathy) and perspective taking (cognitive component of empathy) components.

Table 1. *Basic descriptive indicators (M, SD, AM) of three measurements of the level of EC and PT variables in both the experimental and control groups*

Group		EC1	EC2	EC3	PT1	PT2	PT3
experimental	Mean	11,83	17,93	17,83	12,10	17,44	17,10
	N	41	41	41	41	41	41
	Std. Dev.	2,036	1,555	1,580	1,868	1,184	1,261
	Median	12,00	18,00	18,00	12,00	17,00	17,00
	Maximum	16	20	20	18	20	20
	Minimum	8	15	14	8	15	15
control	Mean	11,52	11,68	11,67	11,71	11,72	11,62
	N	82	82	82	82	82	82
	Std. Dев.	1,476	1,404	1,352	1,511	1,443	1,376
	Median	12,00	12,00	12,00	12,00	12,00	11,00
	Maximum	16	16	16	16	16	15
	Minimum	8	9	9	9	9	9

Table 2. *The significance of variations (differences) in the level of observed variables – EC and PT – between the experimental and control groups using Mann-Whitney testing*

Variable	Group	N	Median	Mann-Whitney U test	p
EC1	experimental control	41 82	12 12	1525.500	.393
EC2	experimental control	41 82	18 12	7500	.000
EC3	experimental control	41 82	18 12	11.500	.000
PT1	experimental control	41 82	12 12	1501	.317
PT2	experimentálna kontrolna	41 82	17 12	6500	.000
PT3	experimentálna kontrolna	41 82	17 11	7500	.000

On the grounds of the results from Mann-Whitney test we can conclude that the statistically significant difference manifested in the change of emotional concern (EC) subscale level and the change of perspective taking (PT) subscale level was proved in the first post-test (after the intervention program) $p<0,001$ and in the third measurement (5 months after the intervention program) at the level of significance $p<0,001$ between the experimental and control groups.

We made sure that after the first measurement (in pre-test) of the emotional concern (EC) subscale (befor the intervention program was realized) both the experimental and control groups didn't differ significantly, since $p=0,393$, that is $p>0,05$. In athe same way, both the experimental and control groups didn't differ significantly after the first measurement in perspective taking subscale (PT), since $p=0,317$, that is $p>0,05$, which we perceive as a positive indicator.

Table 3. *The significance of variations in emotional concern and perspective taking variables in an experimental group in pre-test and post-tests, Wilcoxon test*

	Group	M	AM	SD	T	p
EC pre	1	12	11,83	2,036	-5,610	.000
EC post1	1	18	17,93	1,555		
EC pre	1	12	11,83	2, 036	-5,618	.000
EC post2	1	18	17,83	1,580		
EC post1	1	18	17,93	1,555	-,832	.407
EC post2	1	18	17,83	1,580		
PT pre	1	12	12,10	1,868	-5,485	.000
PT post1	1	17	17,44	1,184		
PT pre	1	12	12,10	1,868	-5,520	.000
PT post2	1	17	17,10	1,261		
PT post1	1	17	17,44	1,184	-2,841	0.006
PT post2	1	17	17,10	1,261		

Legend: 1 – experimental group, pre – pre-test, post1 – post-test after the intervention programme being realized, post2 – post-test 5 months after the programme's realization, N= 41

We can conclude, drawing from the results of Wilcoxon test, that the statistically significant difference manifested in the change of EC level and in the change of PT level in the experimental group was proved in the second measurement, that is in the first post-test (after the intervention program) $p<0,001$ and in the third measurement, that is the second post-test (5 months after the intervention program) on the level of significance $p<0,001$.

Table 4. *The significance of the differences in EC and PT variables in the control group in pre-test and post-tests, Wilcoxon testing*

	Group	M	AM	AD	T	p
EC pre	2	12	11,52	1,476	-1,555	.109
EC post1	2	12	11,68	1,404		
EC pre	2	12	11,52	1,476	-1,610	.095
EC post2	2	12	11,67	1,352		
ECpost1	2	12	11,68	1,404	-,173	.951
ECpost2	2	12	11,67	1,352		
PT pre	2	12	11,71	1,511	-,133	.913
PT post1	2	12	11,72	1,443		
PT pre	2	12	11,71	1,511	-,929	.382
PT post2	2	11	11,62	1,376		
PT post1	2	12	11,72	1,443	-1,706	.134
PT post2	2	11	11,62	1,376		

There were no significant variations in the control group between the first measurement (pre-test) and the second one (post-test1) in the emotional concern variable, p=0,109, that is, p>0,05; there were no significant variations between the second and thirs measurements (post-test1 and post-test2), since p=0,951, that is, p>0,05; and the variations between the first (pretest) and third (post-test2) measurements showed no significance as well, p=0,095, that is, p>0,05.

We haven't observed any significant changes between the individual measurements in perspective taking variable in the control group, the value of p=0,913 that is p>0,05 measured tween the first and second measurement, and between the second and third measurements the value p=0.134, that is, p>0,05 has been observed - p=0,382.

B. The results of research findings in „personal dis-stres (PD)" and „fantasy (FS)" subscales

Table 5. *Statistical description of the „fantasy (FS)" and „personal dis-stress (PD)" subscales in pre- and post-tests in both the experimental and control groups*

Group		FS1	FS2	FS3	PD1	PD2	PD3
Exp.	Mean	12,49	15,73	15,41	14,05	9,68	9,93
	N	41	41	41	41	41	41
	Std. Deviation	1,791	1,582	1,565	2,449	1,877	2,005
	Median	12,00	16,00	15,00	14,00	9,00	9,00
	Maximum	17	18	18	19	17	18
	Minimum	8	12	12	8	8	8
Cont.	Mean	11,84	11,79	11,71	12,99	12,60	12,67
	N	82	82	82	82	82	82
	Std. Deviation	1,895	1,810	1,842	2,831	2,748	2,699
	Median	12,00	12,00	12,00	12,00	12,00	12,00
	Maximum	16	16	16	20	20	20
	Minimum	8	8	8	8	8	8

Table 6. *The significance of variations in the level of fantasy (FS) and personal dis-stress (PD) subscale variables between both the experimental and control groups, Mann-Whitney test*

Variable	**Group**	N	Median	Mann-Whitney U test	p
FS1	experimental control	41 82	12 12	1347.500	.067
FS2	experimental control	41 82	16 12	208	.000
FS3	experimental control	41 82	15 12	261.500	.000
PD1	experimental control	41 82	14 12	1248.000	.019
PD2	experimental control	41 82	9 12	545.000	.000
PD3	experimental control	41 82	9 12	589.500	.000

On the grounds of Mann-Whitney test results, we can observe that the statistically significant variation, manifested in the „fantasy“ subscale level change, was proved in the first post-test after the intervention program has been realized, p<0,001; and in the third measurement, that is, in the second post-test 5 months after the intervention program has been realized, at the level of significance p<0,001.

There was no significant difference in both the experimental and control groups in the fantasy subscale before the intervention program took place, p= 0,067, that is p>0,05; in personal dis-stress subscale we have observed the statistically significant variation between the experimental and control groups before the realization of the intervention program, that is in the pre-test, as p=0,019, t. j. p<0,05.

It can be explained also by the fact that the personal dis-stress represents a subscale that is susceptive by the momentary situation of the respondents, by the momentary stress. There just could be persons in the experimental group which experienced some difficult, demanding stressful situations – they might have experienced momentary dis-stress, but from the verification viewpoint we can say, that we have observed the higher value in „personal dis-stress (PD)“, this was quite a challenge for us to teach the students how to process and eliminate the negative emotions associated with the dis-stress.

Table 7. *The significance of variations in fantasy (FS) and personal dis-stress (PD) subscale variables in the experimental group in pre- and post-tests, Wilcoxon test*

	Group	M	AM	AD	T	p
FS pre	1	12	12,49	1,791	-5,267	.000
FS post1	1	16	15,73	1,582		
FS pre	1	12	12,49	1,791	-5,285	.000
FS post2	1	15	15,41	1,565		
FSpost1	1	16	15,73	1,582	-3,357	.001
FS post2	1	15	15,41	1,565		
PD pre	1	14	14,05	2,449	-5,257	.000
PD post1	1	9	9,68	1,877		
PD pre	1	14	14,05	2,449	-5,190	.000
PD post2	1	9	9,93	2,005		
PD post1	1	9	9,68	1,877	-2,637	.010
PD post2	1	9	9,93	2,005		

The results of data analysis of the Wilcowon test, as Table 7 suggests, indicate the manifestation of the significant difference in the experimental group, between the pre-test and the first post-test (before and after the intervention program has been realized) p<0,001; between the pre-test and the second post-test (before and 5 months after the intervention program has been realized) p<0,001 in both of the variables observed: the fantasy (FS) and personal dis-stress (PD) subscales.

There were significant changes found in the fantasy subscale between the individual post-tests (after the intervention program and 5 months after the intervention program), as p=0,001, that is, p<0,05 – that was a change in time which we perceive and interpret as a natural one. Certain differencies were also found in the PD personal dis-stress subscale betwen the individual post-tests, as p=0.010, that is, p<0,05.

Table 8. *The significance of variations in fantasy (FS) and personal dis-stress (PD) subscale variables in the control group in pre-test and post-tests, Wilcoxon test*

	Group	M	AM	AD	T	p
FS pre	2	12	11,84	1,895	-,647	.605
FS post1	2	12	11,79	1,810		
FS pre	2	12	11,84	1,895	-2,043	.066
FS post2	2	12	11,71	1,842		
FSpost1	2	12	11,79	1,810	-1,528	.197
FS post2	2	12	11,71	1,842		
PD pre	2	12	12,99	2,831	-4,487	.000
PD post1	2	12	12,60	2,748		
PD pre	2	12	12,99	2,831	-3,661	.000
PD post2	2	12	12,67	2,699		
PD post1	2	12	12,60	1,748	-1,177	.326
PD post2	2	12	12,67	2,699		

There were no significant changes in the control group between the individual measurements in fantasy (FS) subscale, that is, between the first measurement (pre-test) and the second measurement (post-test1) of the fantasy subscale there were no significant variations, p=0,605, that is, p>0,05; as was the case with the second (post-test1) and third (post-test2) measurements – there were no significant changes, as p=0,066, that is p>0,05. There were no significant changes, too, between the pre-test and the second post-test (post-test2), p=0,197, that is, p>0,05.

We haven't noticed any significant changes in personal dis-stress variable between the individual post-tests; p=0.326, that is, p>0,05. But we found significant changes between the pre-test and the second measurement, as p=0.000, that is, p<0,001. We explain this finding as the fact that the personal dis-stress factor is a specific variable which is influenced by the number of external and internal determinants; its fluctuations in time are acceptable from our viewpoint (a momentary situation, a previous traumatic experience, physical and mental condition...).

We have found out the manifestations of significant differences in the single individual measurements of the levels of both the „fantasy" (FS) and the „personal dis-stress" (PD) subscales in the experimental group. The significant differences (variations) show stability in time even 5 months after the intervention program.

Discussion

Our research task was to verify the intervention program „E – A program of empathy development“ in an experimental group of students – college students - the prospective teachers.

Though some studies from the area of social work or nursing note either neutral or even negative influence of training programmes on the level of empathy (e.g. La-Monica, Wolf et al., 1987, Vinton and Harrington, 1994), or they refer about the minimal positive impact of training programmes on the level of empathy (e.g. Corcoran, 1982, Herbek and Yammarino, 1990).

We can state, from the results of the data analysis between the experimental group taking part in the experiential intervention, and the group that didn't take part in any intervention program, that we can note some desirable significant variations in the level of all four variables: the rise in emotional empathy (EC) level, in the sense of increase of the cognitive component of empathy (PT), as well as in the increase of fantasy (FS) factor and in decrease (decline) of the personal dis-stress (PD) factor in the experimental group.

S. L. Hatcher and her colleagues (Hatcher, Nadeau, Walh, 1994) administered the IRI questionaire (M. H. Davis) in 104 pupils and students of secondary schools and colleges, before they took part in the Rogerian training of skills supported by peers, and after the training. The students resolved the identical model situations that were supposed to develop their empathic skills, during the training in 7 smaller groups.

According to M. H. Davis (1983) the emotional concern (EC), perspective taking (PT) and fantasy (FS) subscales all increase with age, whereas the personal dis-stress (PD) subscale decreases with age, influenced by the personal maturity. The scores in EC, PT and also the so-called average empathic score significantly increased in students, after the Rogerian training. Therefore, the authors of the study could verify the hypothesis that empathy in students due to their training could be improved. The score in personal dis-stress subscale hasn't changed after the training. At the same time, it has been proved that college students increased their empathy due to tehir training in a more significant way than the secondary school students.

P. I. Erer (1997) compared the cognitively oriented program of empathy and the emotionally oriented training program of empathy in helping professionals – both realized in 51 students of social work, who worked with clients as part of their professional preparation. The cognitive empathic program led by the supervisor, with the real clients, targeted especially the thorough and exact cognitive understanding of clients‘ problems. Students have verified the cognitive hypotheses constructed on the base of the testimonies by clients, and they verified these with the help of supervisor afterwards. The emotionally oriented training program, in contrast, emphasized the emotional experiences while students discussed with their clients and the supervisor's feed-back has been more individualized. The author found no statistically significant variations in the results of emotional empathy, before and after both forms of empathy

training. She, though, believes that the qualitative analysis of students and supervisor‘s testimonies suggests the increase in their empathy.

Even though the intervention program we have designed and verified proved useful and efficient in observed variables, we realize that the conclusions of every research need to be assessed objectively in the context of various research limitations.

In our research we delineate the following limitations:

1. Due to the technical complexity and demandingness of the intervention program the research sample consisted of the limited number of 41 responents in the experimental group of students.
2. So-called self-reporting approach, based on the subjectively distorted self-expressive questionairy items that measure the tendencies to empathic behaviour.

The methodological limitations of this research can be overcome only by further research that will correct and expand the research findings.

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Сажетак: Циљ нашег истраживања био је да потврди, одобри или не одобри претпоставку да је „E - програм развоја емпатије у иницијалном образовању наставника“ програм интервенције који има позитиван утицај на промене у когнитивној и емоционалној компоненти емпатије у експерименталној групи студената - будућих наставника. Резултати експерименталне верификације која је настала из прикупљених података од 123 испитаника - 2. и 3. године студената ПФ УМБ у Банској Бистрици, смер за наставу психологије у комбинацији са неким другим предметом; експериментална група се састојала од 41студента, а контролна група је обухватила 82 студента. Користили смо IRI (Davis, 1996) као инструмент за мерење.

Варијације у жељеним значајним променама на нивоу свих варијабли у IRI пронађени су, на основу резултата анализе података између експерименталне групе која је учествовала у искуственој интервенцији и групе која није учествовала у било ком програму интервенције у то време - променама које су: пораст нивоа емоционалне емпатије (EC), повећање когнитивне компоненте емпатије (PT), раст у фактору „фантазије“ (FS), и смањење у „личном ди-стрес“ фактору (PD) у експерименталној групи.
Кључне речи: емпатија, емоционални конструкт, когнитивни конструкт, фактор „перспективно узимање“, фактор „емоционална брига“, фактор „фантазија“, фактор, лични дистрес“, емпатични фактор, интервентни програм

CONTEMPORARY SCHOOL

BORJANKA TRAJKOVIĆ,
KARLA SELIHAR
Faculty of Education in Sombor,
University of Novi Sad
Sombor, Serbia

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SCHOOL LIBRARY AND DEVELOPMENT OF STUDENTS' INFORMATION INTELLIGENCE

Summary: School can be considered as a natural environment for preparation of youth for adequate, critical and productive approach to the information from different sources. Student is engaged in important decision-making processes as to which Web page to access, which information to collect and how to evaluate information further. The role of school librarian is to adequately direct students how to use information, according to the planned and thoughtfully devised school tasks. Librarian also prepares students for qualitative critical approach to the Internet information, and use of that information independently from school studies.
Key words: school, library, the Internet, the availability of information, development of critical thinking, evaluation of Web page

Introduction

School is by definition the place for mastering content and problems related to different fields of human knowledge. In the cognitive sense, it is about the basic information within the boundaries of educational programs of elementary and secondary schools, as regulated by the relevant institutions. At the same time, the school is a natural environment for preparation of young people for adequate, critical and productive access to information from various sources, in order to help them towards better understanding and mastering of school curriculum and associated problems.

School library and information education

School library is by definition a place of librarian-informational and cultural-educational activities of each school. It collects/ processes and distributes books and

other informative material to students and teachers. *IFLA / UNESCO guidelines for school library* and *Manifesto for public libraries: the role of school libraries in teaching and learning for all* - published in the year 2000 highlights the following tasks of school libraries:

- Providing information and knowledge necessary for successful participation in modern society based on information and knowledge, and
- Enabling students to acquire learning skills throughout their entire life, develop their creative imagination and preparing them to be responsible citizens.

According to Pulman's digital guides from year 2000, more than 90% of schools in European Union already had unlimited access to the Internet, whereas in our country only a small number of schools have computers or Internet access in the library. The basic fact, which seems to be forgotten, is that the school librarian and teacher make young people literate, and that the library is natural location to develop information literacy, and this is as important as cultivating "lifetime" of future readers.

In the proposed program activities that are essentially the part of the annual plans for librarians, one of the most important is a program for education students to use information from the Internet. Students, who are encouraged to practice critical thinking during teaching process, will apply these skills when searching for information not only from the textbooks but also from other sources of knowledge. Internet is a media which can offer to gifted students abundance of diverse information, which they can obtain independently following their own interests. However they have to be properly trained and prepared for it.

Tasks that are set before the students are adjusted according to their age and other personal features. Intellectually gifted children are provided with appropriate support to develop abilities, skills and knowledge which they need for acquiring information independently from the Internet, for their qualitative selection and use. These students show strong interest in obtaining new information about the different areas of knowledge and they show a tendency to search for new information on their own accord.

An individual who accesses Internet is engaged in important decision-making processes on which Web page to access, which information to gather, and how to evaluate and further use collected information. For these activities a significant factor is critical thinking, because when people think critically, they are actively involved in the process of cognition and become immune to the various external pressures and manipulations. Within this process librarian has an important role as a guide and an advisor.

Librarian – Guide to information literacy

In school librarian's annual work plan and program, activity agenda is very precisely defined. Mandatory part of the program is to introduce students to information technology in the different segments of the library activities. If the most important

activity of library is providing information and services, than the development of the ability, skills and knowledge how to discover information using new technologies is the basic direction which librarian has to follow when working with students.

At a present day students want information which is quick and direct, complete and adequate, easily accessible and understandable. Various new media and information sources shall have a role of conduit of the teaching content from the sources of knowledge to the user, and will be available to teachers and students not only in the school library or media-library, but also in the IT cabinet.

A student who has mastered information literacy has the following abilities and skills:

1. Can effectively and successfully validate information:
   - is aware of the need for reliable information,
   - is able to formulate necessary questions to perform information search,
   - identifies the various potential sources of information.
2. Can evaluate the information critically and competently:
   - determines the accuracy and relevance
   - differentiate between facts, points of view and opinions – to identify the incorrect information that can lead to misconceptions (deceptive information)
   - select the information relevant to the problem or question sought to be resolved
3. Can use information creatively and effectively:
   - organizes information for practical application
   - uses information in critical thinking and problem solving
   - presents and makes accessible information (spread information further) in the appropriate format.

In contemporary Serbian electronic publishing, there are numerous publications for children of school age which offer great help in overcoming compulsory school curriculum in different subjects. Such multimedia approach, makes teaching content attractive and fun, making school and library more interesting for students. This represents a new educational dimension which motivates students for independent learning and enables them to acquire knowledge not only in certain subject, but also in the field of informatics.

With emergence of the new information and communication technologies, and with the potential they offer, all the activities and development planning for the school library should be directed towards their transformation into school libraries into information centers. This would allow the implementation of modern achievements in pedagogy science, and only then would library become irreplaceable element of educational process.

Peter Brophy in his cult book *Library in twenty first century* (Brofi, 2005), emphasizes the importance of school library as a central point not only for providing a range of information sources that support teaching, but also an instrument of student's personal and social progress. Its information resource centers are recognized as part of the state information network, and the purpose of library, Brophy writes, is to facilitate teaching and learning and facilitate students mastering the skill of learning and skills of information manipulation. Thus in modern teaching library the information services are placed firmly in the center of the learning process.

Information skills can only be built on basis of reading skills - child that is passionate reader has a considerable starting advantage in comparison to other children, regardless of the medium in which is information presented. It is not enough for children to be literate to be able to play significant role in today's world, they have also to develop affinity towards the books, reading and information. The most efficient way to achieve this would be to have centralized source of books and other information accessible to all children and teachers - and that source is school library.

Able users develop a strategy for information search, selection and information use. These strategies are based on three types of skills: reading, information manipulation and technical skills. These skills are developed independently of each other, but they are often used simultaneously, since their boundaries overlap. Essentially skills can be acquired by reading and the two other congenial requirements: development of reading habits early in individual's life and his copious reading – either in order to obtain desired information or for the personal satisfaction.

Essentially, library has to be a focal point of the required information and its use; it has to facilitate relationship between information provider and its user. A successful library manages its services with aim to maximize the benefits for all who utilize it, but first and foremost the end user.

In most cases school library today neither is able to respond to the demands of modern education, nor is it able to satisfy interests of students or teachers. However, various initiatives exist, successfully attempting to update, enrich and ease the learning process. Some libraries have, by entering the audio and visual materials, videos, compact discs and DVDs created and assembled an audio-video collection. This new content does not fit into all embracing term 'library' and the service it is suppose to provide.

Setting up of the new style school library needs to be supported by the public libraries (by giving professional advice) and local community (by providing resources). Although typologically different, public libraries are in position to offer professional advice (trained staff) and technology expertise (information technology) to support school libraries in many areas and answer many questions. For example: to demonstrate practical solutions of computer library tasks, to form various databases, to advise about setting up and filling up of specific funds for students with special needs (for the so-called development groups of children), to undertake advisory role in the procure-

ment of computer equipment and involvement in the unique local and regional library - information network. Both types of libraries strive towards achievement of the same goals - education and training of young people. This common goal, with books as a focal point and basic resource of educational processes, requires continuous cooperation and mutual contact between both types of libraries.

Local community shapes and helps the educational system; therefore funding of school library is based on the same principles as the financing of the entire educational system.

Mediatheque - School Internet library

The scope of future activities of the school libraries also depends on adopted strategy i.e. clearly defined goals and priorities shaped by the school curriculum, changes in society (family structure, demographic trends and cultural diversity), increase in users informational needs and financial support provided by the local community. Therefore, like public libraries, by using communication and information technology, in near future school library will be able to offer information to all members of the community equally.

Modern equipped school library / mediateka should have:

- computer workstations with Internet access (designed for children and adapted to the height of children of different ages)
- catalogues available to the public tailored to various ages and students' levels
- tape recorders
- CD-ROM players
- scanners
- video players

And further:

- mandatory access to electronic sources of information associated to the school curriculum,
- Internet access, a separate bibliographic and textual databases, as well as educational software packages on the CD-ROMs and DVDs,
- selection of categorizing system to be used for classification and cataloguing of the sources (according to accepted international and national standards for bibliographic reporting), and
- inclusion of library catalogues in the wider network (worldwide practice is to link all libraries to the central catalogue system). This increases the efficiency and quality of book processing and enables combining of sources achieving greater productivity.

In order to successfully perform tasks required, a school librarian, as recommended in *IFLA / UNESCO guidelines for school libraries,* has to:

- analyze the need for information and information sources for all participants in school educational process,
- formulate and execute programs for improvement of the library service,
- shape the procurement programs for library sources and engage in building of automatic library systems.
- catalogue and classify library material,
- guide library users how to utilize library resources,
- teach library users information knowledge and skills,
- help students and teachers in utilizing of library resources and information technology,
- answer reference questions and respond to the requests for information using appropriate sources,
- promote reading and cultural events programs,
- participate in planning the execution of school curriculum,
- participate in the preparation, execution and evaluation of teaching activities,
- advocate that the assessment of the performance of the library services is integrated into overall school assessment,
- build partnerships with other organizations,
- prepare and implement the budget,
- develop strategic planning, and
- manage and train library staff.

Therefore, only highly educated and knowledgeable librarian can respond to the demands of modern school library, keeping in mind that technological changes in the field of mass communication determine and require recognition of the environment needs and in accordance with this, require new forms and types of services of the library as an institution. Accordingly, the strategic direction for development of the school library would be gradual functional transformation into the information and media center. Only such modern *mediateka* would be able to cultivate future generations of information intelligent beings, with developed "research spirit". Information literate students become persons capable of independent learning, feel confident and have a belief in their own problem-solving skills. In addition, they are aware of important information and are able to manage technology solutions in order to unearth the information and communicate it to the others. Moreover, they adhere to high standards in their work and produce quality products.

Modern school library in future should become the "intellectual center." Only then library would be able to train a generation of young people, flexible and with ability to adjust to change and to function both as individuals and active parts of the community.

Conclusion

This paper deals with the strategic development of school library and its transformation into information and media center, in order to educate future generations of information intelligent human beings. Only highly educated and knowledgeable librarian can respond to the demands of modern school library, keeping in mind technological changes in the field of mass communication. The paper stipulates what modern-equipped school library- mediateka should possess and what abilities and skills students will have acquired by gaining information literacy.

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Сажетак: Овај рад се бави стратешким развојем школске библиотеке и њене трансформације у информациони и медија центар, у циљу едукације будућих генерација информационо интелигентних људи. Само високо образовани библиотекар може да одговори на захтеве модерне школске библиотеке, имајући у виду технолошке промене у области масовних комуникација. У раду је прописано шта модерно опремљена школска библиотека- медиатека треба да поседује и које ће способности и вештине студенти поседовати стицањем информациону писменост.

Кључне речи: школа, библиотека, интернет, доступност информацијама, развој критичког мишљења

MAGDALÉNA NEDELOVÁ
Faculty of Education, University of Matej Bel
Banská Bystrica, Slovakia

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PERFORMANCE ASSESSMENT OF CRITICAL THINKING SKILLS IN SCOPE OF AHELO GS SLOVAKIA

Summary: In recent years the increased attention has been paid to general intellectual or cognitive competencies and skills, which, even if they are not so directly tied to a particular curriculum or course of study, are nevertheless thought to be salient outcomes of postsecondary education. Acknowledging this creates a need to develop and implement a testing paradigm that measures and stimulates these skills. That new paradigm is the field of performance assessment, represented here by CLA performance task designed to measure analytic reasoning, problem solving and written communication skills. In spite of a limited reliability of the AHELO GS feasibility study findings, the Slovak students' results in performance assessment indicates serious shortcomings in all the three evaluated dimensions and the need to create more opportunities for students to develop and practise these skills.
Key words: critical thinking, performance task, AHELO

Introduction

The emphasis on critical thinking in today's global educational policy and mainstream constructivist pedagogics results from rapid social changes in recent decades. Expansion of scientific knowledge along with informational and technological revolution substantially amplified the volume and accessibility of information, as well as demands for their cognitive processing. This requires adopting new strategies of searching for and selecting information, critical evaluation of the content and verifying the reliability of sources. Whereas individual and collective choices become much more numerous, complex and conflicting, the ability to think critically - ask pertinent questions, recognize and define problems, identify arguments on all sides of the issue,

search for and use relevant data and arrive in the end at carefully reasoned judgement - is gaining increasing importance.

Current pedagogical views of critical thinking are based on cognitivist and constructivist learning theories, which emphasize the importance of active involvement of learners in constructing knowledge for themselves and building new ideas or concepts based upon current knowledge and past experience. In recent decades, there has been an unflagging tension between traditional rationalist and postmodern constructivist conceptions of knowledge, truth, reality and objectivity. Searle (1993) asserts that proper critical thinking involves a handful of assumptions that let us gauge whether or not a conclusion is legitimate. To engage in critical thinking, one must grant that (1) reality exists independently of our representations of it, (2) language can be used to communicate meanings from speakers to hearers, (3) truth is a matter of accuracy of representation, and (4) knowledge is objective. In other words, we are engaged in a search for truth, this truth concerns a reality that exists independently of our particular motivations and prejudices, and the knowledge claims that we make are objectively testable by standards of rationality.

Critical thinking

Higher order skills and critical thinking skills are established as two overlapping concepts whose definitions vary depending on authors. In the original Bloom´s taxonomy of educational goals, the term higher order skills is traditionally connected to the three highest levels of cognitive processes - analysis, synthesis and evaluation. In the revised version of the taxonomy (Anderson, Kratwohl, 2001), the synthesis is replaced by creative thinking. The relation between critical and creative thinking is still a matter of professional argument. However, a great number of theorists (e.g. Bailin, 1999; Facione, 2000; Brink-Budgen, 2010) argue that these are two parallel and intertwining processes. According to Halpern (1998), any creative solution to a problem, the initial recognition that there is a problem to be solved, the identification of the nature of the problem, and the determination of how to proceed, all involve critical assessment. Even critical thinking is not merely analytic, selective, and confined to frameworks. When generating new theories or hypotheses to explain phenomena in science, or generating counter-examples and constructing counter-arguments in informal reasoning, creative thinking must be present.

Another concept closely related to critical thinking is metacognition. Some researchers have argued that the link between critical thinking and metacognition is self-regulation. For example, the APA Delphi report (1990) includes self-regulation as one component skill of critical thinking. Schraw (2006) draws connections between metacognition, critical thinking, and motivation under the umbrella of self-regulated learning, which is defined as “our ability to understand and control our learning environments”. It refers to the self-awareness and planning functions that guide the use of

thinking and learning skills (checking whether progress is being made toward an appropriate goal; ensuring accuracy; making decisions about appropriate learning strategy, the use of time and mental effort etc.).

From the cognitive psychology point of view, the concept of critical thinking encompasses two dimensions - a dimension of cognitive skills and a dispositional dimension (Bailin, 1999; Ennis 1996; Facione, 2000; Halpern, 1998). In 1990, a cross-disciplinary international panel of 46 experts completed a two-year, multi-round, strict-method Delphi research, which resulted in a robust conceptualization of CT for purposes of instruction and educational assessment. Here (APA, Delphi Report, 1990), the critical thinking is defined as „purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based". Dispositional dimension to critical thinking represents affective, habitual and attitudinal dispositions to CT (inquisitiveness with regard to a wide range of issues; concern to become and remain well-informed; trust in the processes of reasoned inquiry; self-confidence in one's own abilities to reason; open-mindedness regarding divergent world views; flexibility in considering alternatives and opinions; fair-mindedness in appraising reasoning; honesty in facing one's own biases, prejudices, stereotypes, or egocentric tendencies; prudence in suspending, making or altering judgments; willingness to reconsider and revise views, where honest reflection suggests that change is warranted) (APA, Delphi Report, 1990). A developmental perspective suggests that skills and dispositions are mutually reinforcing and, hence, should be explicitly taught and modelled together (Kitchener, King; 1995). Educational success requires both- developing CT skills and nurturing consistent internal motivation to use them.

Skill	Subskills	Examples
Interpretation	Categorizing Decoding significance Clarifying meaning	To determine a useful way of sorting information; to interpret the data presented in graphs, tables and charts; to develop a distinction which makes a conceptual difference clear or removes a troublesome ambiguity.
Analysis	Examining ideas Detecting arguments Analysing arguments	To compare or contrast ideas; to identify the author´s chief claim, the reasons and premises the author advances on behalf of that claim; to develop a graphic representation of inferential flow in reasoning.
Evaluation	Assessing claims Assessing arguments	To recognize the factors which make a credible authority on a given topic; to check for identifiable formal and informal fallacies, to evaluate the quality and applicability of analogical arguments.
Inference	Querying evidence Conjecturing alternatives Drawing conclusions	To judge that information relevant to establishing the acceptability of a given statement is required; to develop a set of options for addressing and resolving the problem; to project alternative hypotheses regarding an event.

Skill	Subskills	Examples
Explanation	Stating results Justifying procedures Presenting arguments	To state one´s reasons for holding a given view; to keep a log of the steps followed in working through a difficult problem or scientific procedure; to anticipate and to respond to reasonable criticisms.
Self-regulation	Self-examination Self-correction	To examine one´s views with sensitivity to the possible influences of one´s personal bias or self-interest; to design reasonable procedures to remedy or correct revealed mistakes and their causes.

Table No.1: Consensus categorization of core CT skills and subskills (loosely by APA, 1990)

Enhancing CT in terciary education

There is a large amount of empirical evidence on the impact of instructional interventions on the development and enhancement of collegiate students´ critical thinking skills and dispositions (Pascarella, Terenzini, 2005; Yuan, 2008; Niu, 2013). It is broadly believed that CT is applicable across a range of disciplinary areas and related skills are teachable and learnable. According to Dumke (1980), instruction in critical thinking in terciary education is to be designed "to achieve an understanding of the relationship of language to logic, which should lead to the ability to analyse, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences". Instructional approach to enhancement of students´ critical thinking skills and dispositions involves problem-solving and inquiry-based learning activities encouraging students to formulate and test their ideas, draw conclusions and inferences, and pool and convey their knowledge in a collaborative learning environment.

Experts diverge in their opinions whether critical thinking is a set of generic skills that apply across subject domains or it depends on the subject domain and context in which it is taught. The generalist view, represented by Siegel (1988) contends that skills in inductive and deductive reasoning, and understanding of the formal and informal fallacies of language and thought are transferable between different contexts and it is possible to teach them in specialized critical thinking courses. Specifist position argues that CT is dependent on subject matter and it should be learned by tackling concrete problems in specific disciplines (Halliday, 2000; Smith, 2002). In his metaanalysis, Abrami (2008) summarizes the available empirical evidence on the effect of different instructional approaches on students´_development and effective use of CT skills and dispositions.[1] There were three main findings resulting from the study:

1 In the **general** course, CT skills and dispositions are learning objectives, without specific matter content. The **infusion** of CT requires deep and well-understood subject matter instruction in which students are encouraged to think critically. Importantly, in adition, general principles of CT are made explicit. The **immersion** approach is similar to infusion but CT principles are not made explicit. The **mixed** approach consists of a combination of the general approach with either the infusion or immersion approach. Under it, students are involved in subject-specific CT instruction, but there is also a separate thread or course aimed at teaching general principles of CT.

(1) principles of critical thinking are to be taught explicitly (it cannot be expected that students will derive them on their own from the classroom instruction), (2) transfer of critical thinking skills into a new context is questionable if students do not have repeated opportunities for practice that would increase their sensitivity to problem structures in various contexts of problem situations, and (3) the biggest effect is achieved by classroom instruction led by teachers who have gone through a special advanced training in preparation for teaching CT skills.

In recent years, there has been increasing attention paid to the role that argumentation plays in higher education. The research has highlighted the importance of argumentation in obtaining scientific knowledge (Schwarz et al., 2003) and development of cognitive habits (Kuhn, 1992). According to the authors Jim'enez-Aleixandre and Erduran (2008), using argumentation methods in the process of instruction supports development of cognitive and metacognitive skills, communication competencies, skills of speaking and writing the language of science and forms habits and dispositions necessary for critical thinking (a habit to question one's own beliefs, identify prejudices and biases in one's own argumentation; avoid emotionally charged words, vague and ambiguous expressions; habit of accurate reconstructing someone else's ideas, avoiding misinterpretation of reality for one's own needs etc.)

AHELO GS assessment design

Project AHELO (Assessment of Higher Education Learning Outcomes) represents historically first attempt to directly assess the outcomes of higher education on an international level. The basic idea of the project came into life at the meeting of OECD ministers of education in Athens in 2006. Within the project feasibility study, it was necessary to propose assessment tools and verify their functionality in an international context. The goal of pilot testing was to find out if it is scientifically and practically feasible to reach comparable results in spite of language and cultural differences of the involved countries and a curricular diversity of higher education institutions and study programs. Assessment of Higher Education Learning Outcomes focused on three areas: Economics, Engineering and Generic Skills. The Slovak Republic joined the project at the end of 2010 and Slovak students took part in testing in all three strands. Pilot testing in Slovakia took place in the course of April and May 2012. The author of the article was a member of a national team in charge of AHELO GS realization in Slovakia.

In the scope of feasibility study, broad field of generic skills assessment was limited to assessment of critical thinking and problem solving skills. Two independent organisations were commissioned by OECD with construction of the assessment tool: Council for Aid to Education (CAE) and Australian Council for Educational Research (ACER). Both organisations entered the project with their own strong ideas regarding the issue of the assessment method. Finally, two fundamentally different assessment approaches were embodied in the AHELO GS assessment design: Performance Task

(Constructive Response Task, CRT) and Multiple Choice Test (MCQ). Participants were randomly assigned one of the two CRT alternative tasks and one of the four modules of MCQ and they had 120 minutes to solve them (90+30). It is not our intention to provide here a full insight into the technical procedures and assessment methodology used in AHELO GS. There is even a confidentiality agreement that prevents us to do so. However, we were allowed by OECD to use the national raw data collected within AHELO feasibility study and realize its independent analysis. In this paper we are going to focus mainly on Slovak student´s performance in the constructive response task (Catfish PT) that has been decommissioned by CAE shortly after the AHELO implementation and it is publicly available in AHELO Feasibility Study Report, Volume 1 (OECD, 2012).

Performance task

Multiple-choice and short-answer tests remain the dominant testing regime, not only for facts, but also for critical thinking skills. To measure student´s understanding of correlations and causality, the multiple choice test requires students to select an answer from a list of four or five provided options. In the performance assessment, students are presented with a research report in which the author incorrectly concludes that there is a causal relationship between the two variables due to a strong correlation between them. The student must not only recognize the fallacious reasoning but must understand how the concepts are confused and explain why the argument fails. This level of fidelity to real-world experience is often viewed as a major advantage of performance assessments over multiple choice tests (CAE, 2012).

In CLA performance tasks designed by CAE, students are asked to answer several open-ended questions about hypothetical but realistic situation. In addition to directions and questions, each PT has also its own Document Library that includes a range of information sources, such as letters, memos, summaries of research reports, newspaper articles, maps, photographs, diagrams, tables, charts or interview transcripts. Students are instructed to use these materials in preparing their answers to the PT´s questions within the allotted 90 minutes. PT requires students to weigh, organize and synthetize information from several sources; distinguish rational arguments from the emotional ones and facts from opinions; understand data in tables and figures; deal with inadequate, ambiguous or conflicting information; spot deception and holes in arguments made by others; recognize information that is and is not relevant to the task; and identify additional information that would help to resolve issues.

In the Catfish PT, a student is assigned a role of an advisor to the mayor of a town who asks him/her to prepare background materials for the town council meeting summoned because of a discovery of a deformed fish in the Milltown Lake. There is information available from different sources – two newspaper articles, a letter, a map, an expert report and a transcript of a radio interview. There are three alternative theories regarding the occurrence of a deformed catfish: inbreeding, parasites or chemical contamination. The student's task is to find the most solid arguments in the available

information sources, both in favour and against each of the theories, decide which of them is the most plausible and propose optimal solution to the problem.

As opposed to most traditional forms of testing, performance task do not have clear-cut right or wrong answers. Rather, there are degrees to which a person is successful or unsuccessful. Each response to performance task was assessed by two trained scorers on a scale of one to six in each dimension (See Table No.2), with one being the lowest and six being the highest[2].

Dimension	Assessment Focus
Analytic Reasoning and Evaluation (AR)	Interpreting, analyzing, and evaluating the quality of information; identifying information that is relevant to a problem; highlighting connected and conflicting information; detecting flaws in logic and questionable assumptions; explaining why information is credible, unreliable or limited.
Problem Solving (PS)	Considering and weighing information from discrete sources to make decisions that logically follow from valid arguments, evidence and examples; considering the implications of decisions and suggesting additional research when appropriate.
Writing Effectiveness (WE)	Constructing organized and logically cohesive arguments; strenghtening the writer´s position by providing elaboration on facts and ideas.

Table No.2: An overview of PT assessment focuses (by CAE)

Research sample

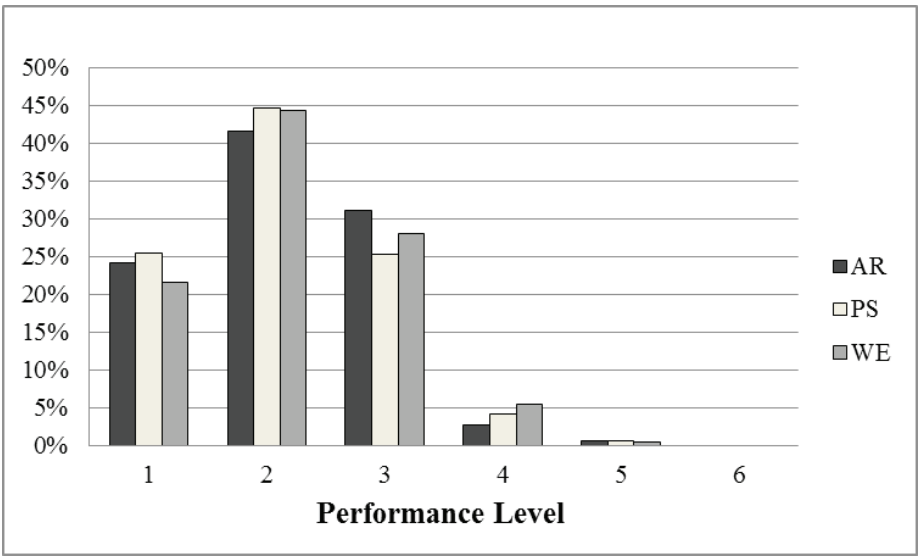
There were 16 Slovak HE institutions participating in the AHELO GS. The research sample consisted of 1544 students in the final year of their bachelor degree studies (60% of them females, 75% of them in the age of 21-23 years). 94% of these students were full-time students. At schools with student population very much larger than 200, a random sample was used to select a representative group of participants. When institution had close to or less than the target sample size, a census of students was used. Only volunteers took part in the testing, and the overall participation rate was 58%. In the first part of this study we are analyzing only Slovak students´ performance in Catfish PT (N=780).

Results

Every response to the Catfish PT was assessed by two trained evaluators in three dimensions (AR, PS, WE) on the point scale 0-6. The score for each dimension is calculated as a mean of both evaluators' score (scale 0-6). The total score is a sum of average scores of both assessors in the three assessed dimensions (scale 0-18). Stu-

2 CAE AHELO GS Performance Task Scoring Rubric is publicly available in AHELO Feasibility Study Report, Volume 1 (OECD, 2012).

dents who did not show a sign of analysis in their answers (performance level 0, N=50) were not included in the calculations below. These answers indicate low motivation for testing rather than real level of critical thinking of a student, and thus we consider them as non-scorable, in line with the recommendation of the authors of the assessment tool (CAE, 2012).



Graph No.1: Proportion of responses assigned to performance level 1-6

The graph No.1 shows the proportions of students' responses in Catfish PT in the three assessed dimensions on six different quality levels. The responses are assigned a performance level based on their real scores. The scores of threshold responses (0,5; 1,5; 2,5; 3,5; 4,5) were rounded down when assigning them into the performance levels. In the sample of Slovak students, we have not registered any responses meeting the criteria for the performance level 6. As we can see in the Graph No. 1, the most represented performance level in all three dimensions is **Level 2** with the following description: **(1) AR:** Student identifies very few facts or ideas that support or refute arguments presented in the Document Library. Disregards or misinterprets much of the information. Does not make claims about the quality of information and presents some unreliable information as credible. **(2) PS:** Student provides or implies a decision, but very little rationale is provided or it is based heavily on unreliable evidence. Briefly proposes a course of action, but some aspects do not follow logically from the conclusion. May recognize the need for additional research, but any suggested research is vague or would not adequately address unanswered questions. **(3) WE:** Student provides limited, invalid, overstated, or very unclear arguments. May present information

in a disorganized fashion or undermine own points. Any elaboration on facts tends to be vague, irrelevant, inaccurate, or unreliable (e.g., based entirely on writer´s opinion). Sources of information are often unclear.

HE Inst.	N	Mean	Min	Max	Med	St. Dev	Mean AR	Mean PS	Mean WE
1	72	6,722	3,0	12,0	6,5	2,215	2,271	2,215	2,236
2	40	6,888	3,0	11,0	7,0	2,338	2,313	2,225	2,350
3	27	8,537	5,5	15,0	8,5	2,278	2,926	2,796	2,815
4	8	4,375	3,0	7,5	4,0	1,575	1,438	1,438	1,500
5	86	6,855	3,0	10,5	6,8	2,035	2,256	2,244	2,355
6	69	6,159	3,0	11,5	6,5	2,266	2,08	1,986	2,094
7	31	7,323	4,5	12,0	7,5	1,998	2,452	2,419	2,452
8	48	8,229	3,0	14,0	8,5	2,533	2,802	2,74	2,688
9	33	8,727	3,5	15,0	9,0	3,018	2,894	2,864	2,970
10	68	5,669	3,0	10,5	6,0	1,876	1,831	1,846	1,993
11	7	8,429	6,0	10,5	9,0	1,427	2,857	2,786	2,786
12	68	7,360	3,0	10,5	7,5	1,920	2,449	2,375	2,537
13	6	5,500	3,0	9,0	4,8	2,683	1,833	1,833	1,833
14	40	6,825	3,5	10,0	6,5	1,627	2,263	2,225	2,338
15	57	7,763	3,0	13,5	7,5	2,184	2,535	2,596	2,632
16	70	5,757	3,0	9,5	5,5	2,028	1,921	1,829	2,007
Total	730	6,912	3,0	15,0	6,5	2,330	2,303	2,259	2,350
Max		18					6	6	6
Min		3					1	1	1

Table No.3: Descriptive statistics for scores on Catfish PT (for each of the participating HEIs)

Kruskal-Wallis test showed that on the significance level of 0.05, there are statistically significant differences among the performance of students of different Slovak HE institutions. However, we lack the data that would help us explain the differences (e. g. the data on the students' level of critical thinking skills at the beginning of their higher education studies).

Interestingly, there is not a big difference among the average scores in the dimensions of analytic reasoning and evaluation, problem solving and writing effective-

ness in the whole sample (2.30; 2.26; 2.35). When taking a closer look at the results on the level of individuals we discovered that the scores given by evaluators in the three assessed dimensions were close to each other in most cases. The score difference in the three assessed dimensions (max-min) was lower or equal to 1 for 97% of students. In 76% of cases it was even lower than or equal to 0.5. The strongest correlation exists between the performance in AR and PS (0.89), followed by the correlation between PS and WE (0.84) and AR and WE (0.76).

		n	Total score		AR		PS		WE	
			Mean	St. Dev	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
OECD	CRT1	5135	9.2	3.1	3.1	1.1	3.1	1.1	2.9	1.2
	CRT2	5043	8.4	3.2	2.8	1.1	2.9	1.2	2.7	1.2
SR	CRT1	751	7.9	2.3	2.6	.8	2.7	.9	2.6	.8
	CRT2	730	6.9	2.3	2.3	.9	2.3	.9	2.4	.9

Table No.4: Descriptive statistics for scores on CRT1 (Lake to River PT) and CRT2 (Catfish PT) - the international comparison

Similarly to other countries that participated in the AHELO GS assessment (Colombia, Egypt, Finland, Korea, Kuwait, Mexico, Norway, USA), Catfish PT (CRT2) was more challenging for students than CRT1 (see the Table No. 4), which shows that CRT1 and CRT2 were not equivalent from the psychometric point of view. CRT2 demanded higher analytical skills and accuracy of expression and was assessed more strictly in this aspect. When we take the CRT1 scores in the interval of <6.1;12.3> as a wide average range of participating countries (the mean ± one standard deviation), then 28% of Slovak students reached lower than average and 3% of them reached higher than average scores. When the average range of CRT2 scores is represented by the values of <5.2;11.6>, 28% of Slovak participants reached lower than average and 2.5% higher than average scores. The answers on the levels of 1 and 2 represent very weak and weak performance. In the case of CRT1, 21% of Slovak students' answers fell into these categories in all three dimensions, while in the case of CRT2 it was 30%.

CAE carried out additional research of the international equivalency of scoring in the area of generic skills, including the Slovak Republic, Finland, USA, Colombia and Egypt. The research showed that the Finnish and Slovak scoring teams were stricter in their assessments than the teams in other participating countries (CAE: Technical Report, 2012).

Discussion

Performance tasks very similar to those used in AHELO GS are included in American institution-based value-added model developed by CAE, known as CLA (Collegiate Learning Assessment). At an institutional level, CLA has already been established as a re-

liable and valid measure designed to assess American college students´ analytic reasoning, problem solving and written communication skills (Benjamin, 2009). However, the use of CLA performance task is disputable in an international comparative assessment design. PTs used in AHELO feasibility study are based on the US setting and are coded by an anglo-american tradition, for which essay-writing is typical. In Slovakia, students are normally expected to produce clear and brief answers in the testing situations. Although many Slovak students wrote correct, relevant and logically-structured ideas, few of these were expanded into convincing arguments. For this reason they could not reach higher than average score (performance level 3) in any of the assessed dimensions.

A contextual questionnaire, completed by all tested students, asked, among other things, about the level of effort made at testing. Based on the subjective answers of Slovak respondents, most of them invested moderate (41.9%) or considerable (44.8%) effort into task solving. Time proportion (out of 90 minutes allocated) that a student was willing to invest into a problem-task solution is an indirect indicator of the testing motivation. The time spent on PT solution ranged at the majority of Slovak students (53%) between 30-60 minutes. However, a considerable share of students (27%) used less than a third of allocated time. There is a medium strong correlation (0.56) between the time spent on solving of and performance at PT.

A significant source of motivation at most test-taking situations is feedback on one's own performance. OECD had made a decision that there would be no feedback provided to the participants at the feasibility study of the AHELO project, which probably also affected the willingness of students to read the extensive Document Library and formulate comprehensive answers to the open questions.

The performance of Slovak HE students in PT was undoubtedly affected also by the fact that critical thinking and argumentation skills of pupils and students are not systematically developed in our educational system. Although the critical thinking is cited as a key competence and its development is a declared objective of education in the strategic documents of the Slovak Ministry of Education (Millenium, 2000), it permeates the instructional design of the courses only gradually (transmissive instructional approach prevails and too much of instruction remains teacher-dominated). For a half of respondents (N=805), monologue lectures account for more than 60% of their class time, for a third of students (N=485) they allegedly represent over 75% of their class time. Many students lack effective learning strategies (a dominant strategy being memorising a large amount of information in a short time for the sake of exam). In the contextual questionnaire, 49% of Slovak students participating in AHELO GS stated a strong emphasis on memorising in their studies.

Conclusion

Educational policies worldwide emphasise the accountability of public expenditure on education, responsibility of a school for the quality of provided education and external performance evaluation based on objectively measured criteria and standards.

At the same time, some of the desirable outcomes of the higher education, such as critical thinking skills, are difficult to measure and compare across different cultural and educational backgrounds. AHELO was designed to enable higher education institutions to know the comparative quality of the learning outcomes of graduating students, when benchmarked nationally and internationally. Assessment instrument used in AHELO GS feasibility study combined multiple choice items (MCQs) and constructed response tasks (CRT). MCQs are easy to score, relatively cheaper to design and, if designed well, perform very reliably. CRTs can be much less reliable due to the effect of scoring. On the other hand, by enabling students to generate their own responses to the tasks, CRTs provide a far wider range of skills, knowledge and understanding to be measured than if the assessment is limited to MCQs (Schleicher, 2013). In AHELO GS, the most important information that could drive beneficial discussion and improvement in teaching and learning was obtained through the performance tasks.

We typically hope and expect that students' CT skills will emerge as a consequence of their engaging in learning and thinking as they proceed through secondary and especially tertiary education studying a range of particular subjects. However, skill acquisition in general depends on extensive quality practice. If we expect Slovak students to be able to demonstrate CT skills, we need to create opportunities for them to develop and practise these skills. Equally if we expect teachers to venture beyond the well-specified goals that exist within traditional subject matter areas and embrace thinking skills as educational goals in a serious and committed way, we must aid them to envision these skills in a way that would make them concrete realities rather than vague abstractions. The intention to improve students´ critical thinking is not only to be listed among the course objectives, but real efforts must be made to fuel faculty professional developement and instructional inovations.

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Сажетак: У последњих неколико година посвећена је повећана пажња општим интелектуалним или когнитивним способностима и вештинама, које, иако нису тако директно повезане са одређеним наставним планом и програмом, сматрају се важним исходима високошколског образовања. Потврђујући ово ствара се потреба развијања и имплементирања парадигме тестирања којом се мере и стимулишу ове способности. Та нова парадигма је подручје процене учинка и представљена је овде помоћу *CLA* задатка који је дизајниран за мерење аналитичког образложења, решавање проблема и писаних комуникационих вештина. Упркос ограничене поузданости налаза студије изводљивости за *AHELO GS*, резултати словачких ученика у процени учинка указују на озбиљне недостатке у све три димензије и потребу креирања више могућности за студенте да развију и примењују ове способности.
Кључне речи: критично мишљење, задаци, *AHELO*

STAJKA RAJIĆ
Primary school "Rudjer Boskovic", Belgrade
MAJA MADŽARAC
Agricultural-chemical school, Obrenovac Serbia

STRUČNI ČLANAK
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VIDEO GAMES AS A FORM OF EDUCATION IN DISTANCE LEARNING SYSTEMS

Summary: E-Learning (Distance learning) is the concept of modern teaching and one of the ways of learning and teaching of a new era. Preparation and creation of educational materials for integration into distance learning systems is a huge challenge for teachers. There are changes in teaching and learning methods, with the use of computers and modern digital media. In order to increase efficiency of learning and instructing, it is necessary to enrich the education process with attractive and interactive contents, which will engage students as active participants. Learning through play (edutainment) is just one of methods that leads to the achievement of the aforementioned ideas and encourages students' activity and interactivity with learning materials. The goal of this paper is to indicate the possibility of integration of video games as a specific form of multimedia in distance learning systems. This paper presents the main advantages of using video games in education, with an emphasis on the opportunities offered by Web tool *Hot Potatoes* - tool for creating and implementing dynamic and interactive quizzes and games, applicable to educational purposes.
Key words: e – learning, video games, edutainment, Hot Potatoes

Introduction

The modern era of modern technologies brings about rapid changes in all the aspects of human life, including to a large extent the sphere of education. The daily influx of new information, knowledge and skills dominates the information technology society, which is marked by the need for fast and timely education, accessible to a wide circle of users.

Distance learning and electronic education are a dominant form of the contemporary education and learning process. Through the integration in informal forms of teaching, as well as very intensive integration in formal forms of acquiring and adoption of knowledge, electronic courses and distance learning procedures are given significant

role in today's education system. Nowadays, learners are no longer passive recipients of information, but rather actively engaged in the exchange of knowledge and experience, participating in the production of knew knowledge. They are assisted in this process by their own knowledge of the modern technologies and their computer skills, which have become an integral part of the modern children's life. The children and adolescents of our time, spanning the years from the nursery to the university, are the first generation that has been raised on the new technology. For their entire lives they have been surrounded by the new technology and have used computers, video games, digital audio and video technology, video cameras, mobile phones and all other gadgets and tools of the digital era. The Internet, e-mail, social networks, media – are all part of their lives (Prenski M., 2005). Whether they are used as a supplement to the traditional learning or as a means of distance learning, modern technologies enable interactive, dynamic and collaborative tuition, suited and available to a wide range of users.

The first chapter of the paper deals with the basic terminology and the distance learning concept, pointing to the difference in meaning between the syntagmas of distance learning' and 'E-learning'. A special part of this chapter is dedicated to the concept and the basic systems of distance learning. In the further elaboration, the paper focuses on the application of video games in distance learning. Game as a component of E-learning and distance learning will be described through a classification of educative games, as well as a presentation of technologies used in creating educative games, pointing to the possibilities and ways of implementation within distance learning. Addressing the issue of generally available and very useful technology for creating educative quizzes, eight-directions crosswords and video games that can be implemented within distance learning systems, this paper will describe the Hot Potatoes program, as a suggestion for teachers who may find it useful in creating digital educative materials.

1. Distance learning and e-learning

A historic review of the development of distance learning has contributed to a more precise definition and conceptual determination of the syntagmas of 'distance learning' and 'E-learning'. Modern literature often goes beyond a correlation of these two terms and there are many authors who use them as synonyms. By analysing the earliest forms of distance learning that were implemented in the early 19th century, it is possible to draw a clear distinction between these two concepts. Since distance learning has from its earliest forms been implemented through correspondence courses (relying on the postal services) and by the means of the radio and television in the later phases, progressing to the use of personal computers and modern information and communication technologies, it can be clearly deduced that E-learinig is only one form of distance learning, confined to situations where modern technology is used for learning and teaching in *online* surrounding.

The implementation of modern technologies, computers and the Internet within traditional classroom-based tuition represents a type of E-learning, as a special type of

education, separated from distance learning. On the other hand, the afore-mentioned conclusions undoubtedly imply that distance learning represents a concept that is wider than the concept of E-learning, since it comprises multiple learning concepts and models. Distance learning can be implemented using other types of technologies, wherein it is seen outside the framework of E-learning (correspondence courses, radio, television, video recorders, film).

1.1. Basic terminology and concept of distance learning

Distance learning is defined as a system that enables a student-teacher interaction between spatially separated partakers (Kanyarsoke K., at al. 2011). Forms of education characterised by an absence of contact between the person delivering the education and the person receiving it are called distance learning. (*Distance Learning, Distance Education*). (Milosavljević G., 2002)

E-learning represents a complex system which implies and integrates the following components (Keegen, D., 1996):

- Distance learning and distance lecturing wherein the participants are separated in space and time.
- Teaching materials that can take a variety of forms (printed materials, audio and visual aids, etc.).
- A learning process that involves either an individual or a group.
- Tutorship with a combination of diverse forms of face-to-face, media-supported communication.
- Interactive work and attainment of synergy effect in a group of students.
- Implementation of multimedia technologies and infrastructure of the Internet technologies.

Ayers and Simonson (Ayers L., at al. 2010: 5) state that 'Distance education is institutionally based education, where the educational group is separated in time and space, depending on an interactive communication system as a base for connecting the students, lecturers, professors and learning material'. The quoted definition highlights the significance of modern technologies as the key medium in implementing distance learning. As opposed to this, the definition of distance learning given by Davis (Davis A., 2004) prioritises human activity. According to Davis, technology is present in order to support the established principles and objectives, not vice versa.

A distance learning environment is a complex system which comprises a series of organisational, administrative, instructional and technological components. "In order to enable learners to use different E-learning tools, it is necessary to secure preconditions in the form of adequate hardware, communication technologies and software." (Horton W., et al. 2003: 4) On a wider plane, the distance learning infrastructure includes human resources that secure the design and delivery of electronic contents. The key component of an electronic education system is the ***Virtual learning environment (VLE)***. The virtual learning environment implies the use of software which enables the

teachers to control educational courses and programmes. The system enables monitoring the students' progress, allowing both the students and the teachers to access relevant information. Virtual distance learning systems are given different names in the literature, including the Learning Management System, CMS – Course Management System, LCMS – Learning Content Management System, LSS – Learning Support System or LP – Learning Platform. Regardless of the terminology that is used, the basic function and the basic purpose of such systems is to provide the tutor with the ease of design, organisation and presentation of an E-learning course (Stefanović M., et al. 2007). Systems used for controlling the courses in the distance learning process are web applications, meaning that they are located on the serves of the institution that organises the course, and are accessed through a web browser. A unified distance learning system provides the professor with various course-design tools, as well as tools controlling the users' access to the course contents.

One of the best known applications and platforms for course design in distance learning is the software package named 'Moodle'. It originated in Australia, as a brainchild of Martin Dougiamas, PhD Computer Sciences, guided by an idea to create a course-management system based on educational, rather than engineering principles. Moodle is an open source software, meaning that it is protected by copyright, though with an open code for users. Owing to its simplicity and functionality, the Moodle platform is nowadays used in numerous universities around the world.

2. Video games and distance learning

Design, development and use of educative games in the teaching process and research started back in 1929, with the development and application of the so-called 'war games', featuring military and political contents. These were used in military schools, designed as simulations of different problems occurring in warfare and political circumstances, helping the learners – prospective officers, to practise making purposeful decisions and orders, as well as to have a comprehensive overview of different problem situations (Danilović M., 2003). Another type of games, implemented since 1939 at schools and faculties of economics, were the so-called 'business games'. These were followed by development of other games types.

A game is an activity involving one or more persons, primarily aimed at providing entertainment and fun. "The essence of a game is to achieve a goal, while obeying certain predetermined rules. By its definition, a game gives pleasure, entails suspension and implies facing the challenge; although confined by rules, it supposes a certain amount of freedom..." (Rečicki G., 2002: 109). Games are primarily played for pleasure and fun, but they can also be educative. The aim of the game is to exclude the players from reality and transfer them into another reality, guided by different rules and behavioural patterns. Educational games are social or computer games that are specially designed to teach a certain topic to the users, guide them to widen certain concepts, strengthen the development, understand a historic event and culture,

or enhance the development of certain abilities. Educational video games represent educative computer software and are used as a supplement to the traditional teaching process, or as a separate type of distance learning (Yanhong, et al. 2010).

Prensky (Prensky M., 2007) emphasises the additional educational value of implementing learning based on digital games, defining it as an approach based on integration of educational content into digital games, yielding the same of better results in comparison with the traditional approaches to teaching. Games contribute to reinforcing motivation, raising the levels of attention, while many psychologists also emphasise that games develop intelligence, since players often have to take individual actions in order to solve a series of tasks and problems posed by the game. Common features of all games are competition activities and challenge to achieve the aim, as well as a set of rules, constraints and the specific context (Clark, R.C., at al. 2008).

In his article *What kids learn that is positive from playing video games* Marc Prensky lists five levels of learning through computer games – HOW?, WHAT?, WHY?, WHERE? and WHEN/IF?. Through the first level named HOW, the individual is taught how to do something (how to use stones to build a city, in order to protect themselves from the enemy, how to build a park, etc.) At the second level, the WHAT level, the players learn what ought to be done (or not to be done) in each concrete game. In other words, the players are taught the rules that guide the game and enable the players to achieve the maximum score when complied with. The third level is the WHY level, where the players learn the strategy of the game, which naturally depends and is based on the rules. The WHERE level introduces the players to the world in which the game develops. The players learn about the world of the game and the values prompted by this world. The emphasis is placed on the ecological and cultural aspect of certain worlds where video games take place. The ultimate level of knowledge in video games, according to Prensky is the WHEN/IF level, where the players learn to make moral and value decisions whether to take an action or not. This is the level where the players achieve the ultimate result of their game. (Prensky, M., 2002)

Learning through play (Edutainment) is a concept related to multimedia, used for software that serves both an educational and entertaining character (Turban, E., at al. 2008). The success of learning through play has been confirmed by the fact that learning becomes entertaining, while teachers and lecturers are given opportunity to convey their knowledge in a manner that is both interactive and interesting. The basic aim of learning through games is to lead students to learn through research, interactive engagement, mistakes and repetition, in a manner that leads them to become engaged in the game, without being aware of the fact that they are also learning at the same time. (Okan, Z., 2003)

2.1. Types and classification of video games

The diversity of computer games has lead to their classification in categories. According to the classification stated by Vladimir Chen, video games can be classified in two groups: informal and educative video games. Informal video games require no special skills in players and have very simple rules. As such, they can be played by individuals of varying ages and interests, and their basic aim is entertainment and

amusement of the players. As opposed to them, educational games serve the aim of educating, not only entertaining. Similarly to informal games, educational games have simple rules – however, the game incorporates certain information that unconsciously contribute to enrichment of knowledge. These games can be used to the purpose of gaining new knowledge through interactive communication, or to the purpose of testing acquired knowledge, through interactive tests. A game whose primary aim is education and secondary entertainment is called a serious game (Clark, C.A., 1970). Serious games utilise characteristics which offer students authentic learning experiences, in which entertainment and learning are unobtrusively integrated in manner that enables their implementation within a wider range of teaching methods.

Video games may require the user to become engrossed in the simulated environment, to adopt a certain role, apply certain problem-solving strategies. More recently, simulation games have been developed in the area of environmental protection and finance, demanding that players make decisions in the related domains. An example of this type of game is the SimCity. Other typical examples of these games include simulated piloting of planes or driving a car, enabling the players to take the pilot's or driver's seat and control the aircraft or the vehicle; there are also simulations of sports where the player must make strategic choices taking into consideration the characteristics of the simulated team. Another important and adequate type of support to learning are games based on a scenario related to a film or a novel, where the outcome depends on the decisions made by the player at different points during the game. "In order to be able to make progress, it is necessary to resolve the enigmas, trace objects and use them in the right place." (Rečicki, G., 2002: 119)

One of the sub-classes of video games according to Rečicki (Rečicki, G., 2002) are games of contemplation, primarily based on intellectual effort that must be invested by the players. This class includes strategic computer games such as chess, dominoes, go-go, backgammon, etc.

It is important to point out that in using video games to the purpose of learning and assimilating certain educative content, it is necessary to be able to choose in the myriad available video games, those that stimulate and provide quality supplement to the teaching contents, owing to their own content and activities they propagate.

2.2. Tools and technologies for designing video games - HOT POTATOES

Software tools for edutainment, the Internet and other multimedia products are primarily reliant on images, animations, sounds and other multimedia contents that have the potential to create an unforgettable learning experience. There is a major difference between the multimedia software for edutainment and the popular software games. Software for edutainment has been developed in order to attract parents and teachers, primarily using the advantages of its design that is focused on the topic of study, whereas the commercial *gaming software* is developed so as to attract players, relying on its design that focuses on the particular type of entertainment.

There is a large number of free software tools for creating educative activities and learning through play that support the SCORM standard and can be integrated into various learning-management systems. Among others, these include the following: eXe (Open Source); Hot Potatoes (Open Source); Articulate Quizmaker 2.2 (Trial); e-Learning Authoring Tool (Trial); Adobe Captivate (Trial); ViewletBuilder (Trial). For the purposes of this paper, the possibilities of the educative software *Hot Potatoes* shall be presented here.

Hot Potatoes (Figure 1) is a free programme package which comprises six applications that enable designing various types of interactive exercises and tests (as well as their combinations). It is not necessary for the user to possess programming skills in order to be able to use the *Hot Potatoes*. All that is required is to know how to input data into exercises, i.e. create questions, answers, reports, etc. Upon request, the program may independently create a web page which can be posted on the web server or store in the computer disk, where it can be used at will, without accessing the Internet. The web page http://hotpot.uvic.ca/ features a tutorial and a clear guide, together with the possibilities of using the interactive contents in every application of the *Hot Potatoes* programme.

There are five separate applications within the *Hot Potatoes* tool which are used for designing educative games and quizzes:

- Quiz-design programme (JQuiz). (Figure 2) There are four types of questions that can be used here:
  - Multiple choice of possibly correct answers, where the student must choose at least one correct answer
  - Multiple choice of possibly correct answers, where the student must select all of the correct answers (multipleselect)
  - Questions with a single correct answer (short answer)
  - Mixed questions (hybrid).

When setting a question, it is possible to set feedback alongside the question, as a form of assistance to the student in solving the task.

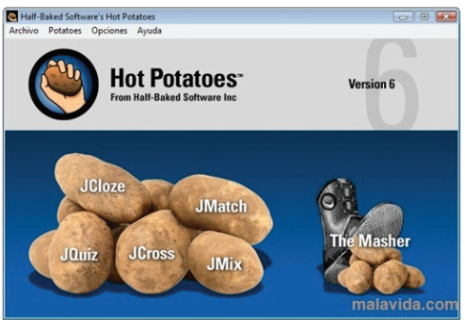

Figure 1. Hot Potatoes

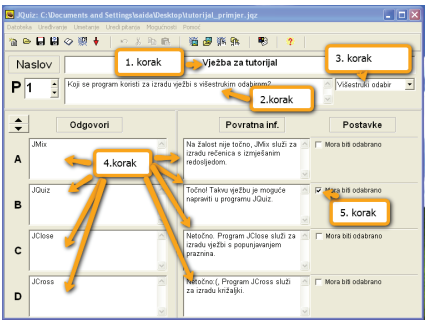

Figure 2. Hot Potatoes, JQuiz

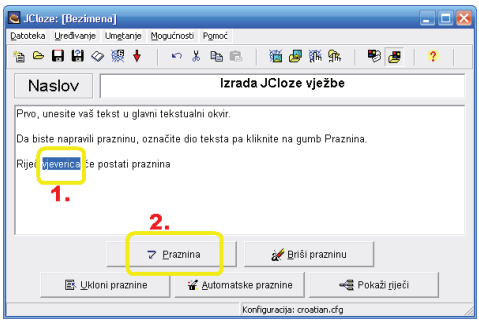

Figure 3. Hot Potatoes, JCloze

- The gap-fill program (JCloze) is used to create a game incorporating a text with gaps to be filled. This application allows creating exercises and test using a sentence or a longer discourse with inserted gaps that ought to be filled with appropriate words, i.e. depending on the selected option within the program, choose one or more suitable words from the lists of words. In addition to textual contents, items that can be inserted into the exercises and texts include tables, images, multimedia files and links to external contents. (Figure 3)
- The JCross application is used for designing crosswords. (Figure 4, Figure 5) The largest part of the program interface is occupied by the table (grid). The grid can be directly filled with words, and for each word it is possible to enter a corresponding description based on which the student can work out the meaning of the crosswords. Apart from this, the application offers another method for creating crosswords, where the words planned for the crosswords are typed in the form of a list, arranged one underneath the other, whereupon the application rearranges the entered words within the set parameters for the grid size, generating the crosswords and informing the author about the actual number of the words from the original input that have been successfully incorporated into the crosswords. The horizontal lines and vertical columns of the crosswords puzzle displayed on the created web page are assigned their respective numbers, while the blank sections where no letters are inserted is darkened. By clicking a corresponding number, the program opens the question or a prompt for the given word, indicating the blank space where it ought to be entered.
- Program with jumbled order (JMix) creates sentences with jumbled words. It is possible to define a large number of different correct answers, including the punctuation signs, as well as providing optional assistance to the learner, activated by pressing a button to display the next correct part of the word that ought to be inserted in the sentence. (Figure 6)

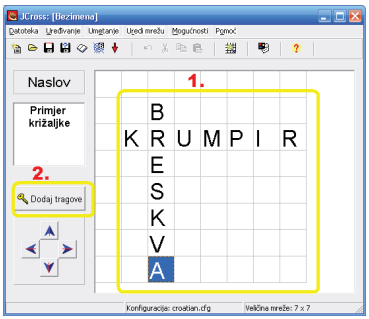

Figure 4. Hot Potatoes, JCross

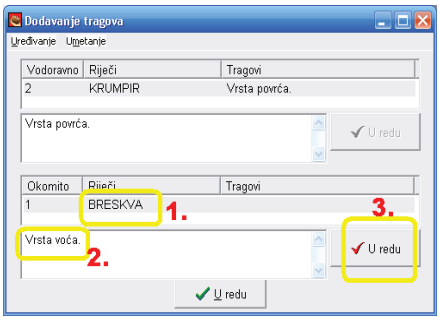

Figure 5. JCross, adding tags

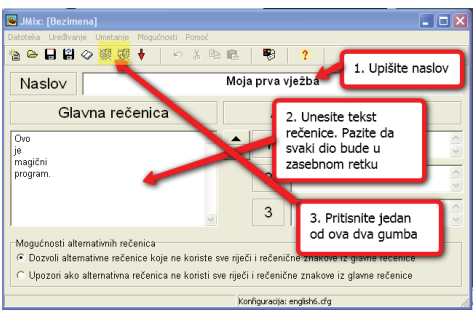

Figure 6. Hot Potatoes, JMix

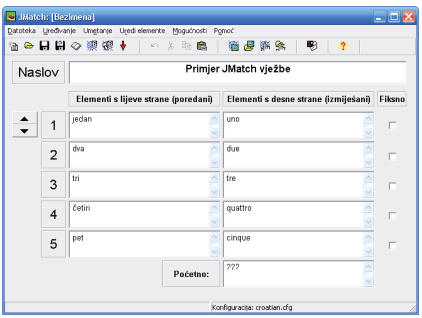

Figure 7. Hot Potatoes, JMatch

- Program for matching pairs (JMatch) creates exercises using pairs of objects that ought to be paired (linked). The questions are in the form two lists of objects that students must link to form pairs. The objects themselves may take the form of images or texts in a drop-down menu. The first column contains parts that will be created at fixed places, whereas the items from the second column are movable, so that in the created exercise they can be dragged in order to be synchronised with the elements from the first column. (Figure 7)
- In the more recent versions of the program, there is the sixth application named JMasher, designed to join individual tasks into a single activity.

Conclusion

The role, significance and the possiblities offered by implementation of modern information and communication technologies in the process of education are extremely important for the development and educaton of every individual. Integration of information and communication technologies in schools and faculties offers realis-

tic opportunities for students' progress and better quality of the knowledge acquisition process. The electronic education and distance learning systems contribute to the process of permanent education and offer opportuinites for self education.

By incorporating certain forms of multimedia in the system of education, the teacher guides the students through the process of gaining knowledge, presenting various educational contents in a dynamic and interactive manner, clarifying more difficult or ambigous issues, encouraging their active participation and enhancing communication and collaboration among the students. Increased motivation, more intense attention and interactivity are all results of implementing multimedia and encouraging learning through play in distance education. This is even more important given the fact that students engaged in distance learning schemes are often isolated. Multimedia enhances the dialogue, interaction and communication – both between the participants and the material and among the participants themselves. Teaching that incorporates the use of interactive contents, animations, simulations, as well as learning through video games prevents the problem of boredom and passive acquistion of knowledge, and it reduces the rate of withdrowal among students involved in distance learning schemes.

Game as a form of education is an active issue of the modern, digital era. This paper, being a theoretical account of the issue of distance learning and implementation of video games and interactive contents as materials that contribute to the dynamics of online courses, can also be seen as a base that raises the questions of the level of information intake and application of modern technologies by teachers who are creators and executors of distant learning. Just to what an extent are teachers familiar with and use technologies in creating interactive quizes and educative video games, both for the purpose of integration with distance learning systems, and the purposes of supplementing and modernising traditional learning and teaching methods?

Edutainment has become a challenge of the modern times. The era characterised by an enormously rapid development of information and communication technologies, as well as the dominance of video games, will in no time transform this challenge into everyday practice, both in elementary and secondary schools, as well as universities. It is therefore deemed appropriate to consider this paper an initial theoretical step towards more elaborated and more systematic empirical research in the area of implementation of electronic education and video games in elementary and secondary schools, as well as universities.

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Сажетак: Учење на даљину све више је концепт савремене наставе и један од видова учења и подучавања новог доба. Припрема и креирање образовних материјала за интеграцију у системе за учење на даљину изазов је који се данас поставља пред наставнике. Све више се јављају промене у начину и поступцима преношења и усвајања знања, уз употребу рачунара и савремених дигиталних медија. Како би се повећала ефикасност учења и подучавања, образовни процес је неопходно обогатити атрактивним и интерактивним садржајима, који ће студенте укључити у наставу као активне учеснике. Учење кроз игру, само је једна од метода која води остваривање претходно наведене идеје и подстицање ученикове активности и интерактивности са наставним материјалом. У овом раду биће изложене основне предности примене видео игара у образовању, са посебним освртом на могућности које пружа веб алат Хот Потатоес при креирању и примени динамичних и интерактивних квизова и игара, применљивих у наставне сврхе.

Кључне речи: е-учење, видео игре, едутејмент, Врући кромпири.

VLADIMÍR JANIŠ
Department of Mathematics,
Faculty of Sciences, Matej Bel University
Banská Bystrica, Slovakia

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EFFECTS OF FRAGMENTATION IN LEARNING

Summary: We suppose that learning mathematics differs from the learning of other (more facts oriented) subjects in its higher sensitivity to continuous and non-interrupted nature. The incapability of a student to concentrate continuously over a longer time period to a single idea, or series of ideas might be one of the reasons of bad results in mathematics and negative attitude to the subject. The effect of interruptions in the learning process has been examined in an experiment, where the students were supposed to study two similar text, one continuously and one with frequent interruptions. The results of this experiment are presented.
A survey on printed and other media is presented, that shows the increasing rate of fragmentation in the information flow over the last century. The school system as a part of the society could not resist this tendency and the activities of school children during the education are also very diverse, what on one hand may contribute to the attractiveness of education, but may also result in losing the ability of the continuous concentration. Mathematics is the subject in which absence of such ability is perhaps most visible.
Key words: study process, mathematics, fragmentation, information flow

1 Introduction

It is often claimed that our life is faster, more hectic and less stable than before. The evidence can be observed in various circumstances – radio and TV broadcasting, quantity of newspaper information, diversification of work tasks, etc. As these statements are probably closely connected to the natural human tendency of overestimating the past, we should be careful to use it as a base for scientific consideration. Nevertheless, if there is a strong evidence, that the (broadly speaking) speed of life has effects – moreover, negative effects on the quality of learning, we should elaborate measures to estimated the mentioned speed and study its connection to educational processes.

2 Information flow

It is a well known fact that the range of information available to us is continuously increasing. This leads to several problems connected to the choice of the information source, evaluation its validity, etc. In some school systems even the subject of medial education has been introduced and the notion of media literacy has already been incorporated into our dictionary (over 200 000 Google references). The main source of information, although not the only one, are media, especially digital media. With a certain degree of inaccuracy we can assume an individual as an object of a process that could be called the information flow.

Our main goal is to study the structure of this flow and its effects in learning processes. Clearly an information flow exists throughout the whole history of mankind, but its structure changes a lot. The feature we would like to stress in this work, is its fragmentation. By fragmentation we understand the ratio of pieces of logically consistent information through a given time or space.

The evidence of fragmentation can be seen almost everywhere – consider e.g. the average duration of songs, frequency of interruptions in television and radio broadcasting, duration of public speeches, etc. Even internet, being a relatively new medium, bears tendency of information shortening and diversification.

Fig. 1 **One of the Slovak leading information portals – homepage in 2000 (left) and 2014 (right)**

In Fig. 1 it is possible to compare the information diversity of the portal www.sme.sk, on of the most popular Slovak online information sources (SME) and its change throughout recent 14 years. The comparison is expressed in the following table:

	links to full texts	**links to other sources**	**advertising**
2000	12	27	1
2014	25	40	3

Tab. 1 **Comparison of the information density**

As we can see, on approximately the same area a visitor of the page can choose now among 68 possibilities, compared to 40 in 2000. Hence the information density has nearly doubled within a relatively short period. The page is also more colourful and includes more graphic elements – all this contributes to fragmentation of the information flow.

Even more dramatic change is visible from analysis of newspaper articles from 2014 and those from the period 1914-1960 (*Web-archive of Slovak newspapers*). We have randomly chosen 31 articles from each time period, in both cases from the most common and widespread newspaper. Each one was chosen from the first page of the newspaper, i.e. one of the principal articles of the corresponding day. The observed variables were the number of sentences in the article and number of words in a sentence. Both have been tested for normality by Shapiro-Wilk test, which confirmed the normality.

The descriptive statistics of the studied variables is summarized in the following table:

	Period	**Mean**	**Standard deviation**
Sentences in an article	1914-1964	36.71	10.63
	2014	19.00	8.37
Words in a sentence	1914-1964	18.70	4.19
	2014	14.85	2.79

Tab 2. **Newspaper text attributes and their changes within the past century**

Graphical interpretation of these data is in the following picture.

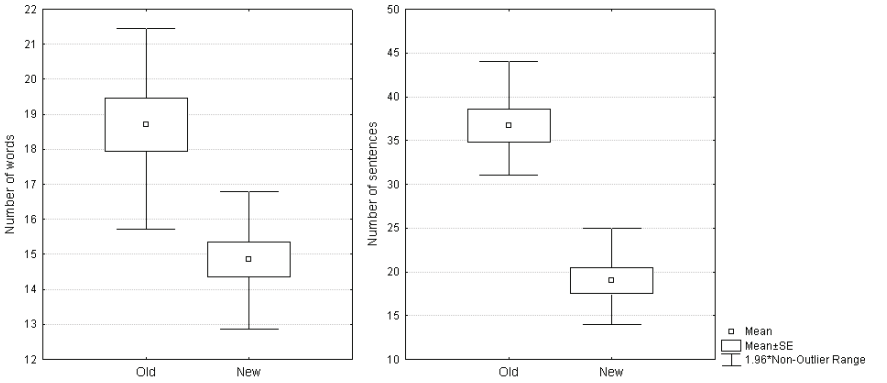

Fig. 2 **Changes in lengths of sentences and articles**

The t-test shows that based on these data we can accept the following hypotheses:

- The average length of the (newspaper) sentence has decreased over the last century.
- The average length of the (newspaper) article has decreased over the last century.

These are conclusions supporting the evidence of the fragmentation trend in media. It is highly probable that similar effects could be observed in almost all aspects of our life, including education.

3 Effects on learning

Diversity of education is usually considered to be one of its positive and highly estimated features. Psychological studies show that at the early childhood the child's concentration to a single object or a topic lasts just for a few minutes (and this time is not too long with the high school and university students as well). The education reflects this knowledge and the teachers are encouraged to change the classroom activities frequently, in order to keep the lesson attractive. However, we should keep in mind, that the ability of a non-interrupted continuous concentration is extremely useful. The role of school education in its creating and supporting is principal, especially in the environment of fragmented information flow, which acts directly against this ability. Overestimating the aspect of diversification may lead to nothing else than another source of fragmentation.

The term of multitasking is used to denote solving a number of problems at the same time in connection with computers, but it appears also in psychological works to describe human behavior of switching attention to different, usually very different topics and activities. Presence of multitasking in everyday life of young generation has bees confirmed by several representative researches (Rideout, Hamel, 2006). Experiments show, that multitasking at learning and studying has negative effect on the learning results (Anderson, Rainie, 2012). We assume, that these effects are different in different subjects. Our hypothesis is, that such effects are different in different subjects. We suppose, that the more is the subject oriented to understanding the principles (contrary to learning facts), the deeper is the effect of multitasking. The verification of such hypothesis would require extensive statistical experiment, however, at least formulation of this hypothesis can be supported by results from the following experiment: A collection of 200 university students was randomly divided into two equal groups. Each group was asked to spend about 30 minutes studying a text from geography and another 30 minutes with a text of financial mathematics. The difference was, that while one group studied in full concentration, the other group was three times interrupted with a completely different activity, each interruption lasting about 2 minutes.

The study of each subject was immediatelly followed by a 5 questions test with grading 2 points for each correct answer, i.e. 10 points at maximum. The mean values are in the following table.

	non-interrupted	**interrupted**
geography	5.69	4.50
financial mathematics	8.57	6.56

Tab. 3 **Comparison of test mean values in different subjects**

The t-tests shows significant results in both cases. However, the fact that interrupted learning is less efficient than non-interrupted one is not surprising and it was not our aim to confirm it. What is in our opinion worth mentioning, is the difference between mean values, which is nearly double in case of financial mathematics.

We are aware of the fact that a single test in each subject cannot provide reliable results, but at least this result (supported by experience) allows us to formulate a hypothesis that while interrupted learning is surely a negative phenomena, its effect is much worse in subjects requiring understanding inner relations, than in those which are mainly focused on larger quantities of facts (although of course deeper understanding is required also here).

4 Conclusion

The observed data show that the information flow becomes not only faster, but much more fragmented. In the same space we are offered more information, which is shorter and often of very diverse nature. This tendency supports multitasking, i.e. rapid changes of a person's concentration from one subject to another one, sometimes also simultaneously. The multitasking may lead to higher levels of stress and lower effectivity of a person's output (Ophir et all, 2009).

It has already been shown that multitasking and interrupted learning lower the effect of learning. We claim that these negative aspects are even more important in subject requiring deep understanding of their inner principles, like mathematics, physics, chemistry, etc. To create and support the ability of longer continuous concentration in students it is probably necessary not to overestimate the role of diversity in the learning process and intentionally include activities requiring longer non-interrupted concentration.

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Сажетак: Претпостављамо да се учење математике разликје од учења других предмета (који су више оријентисани на чињенице) у својој повећаној осетљивости и природној непрекидности. Неспособност ученика да се континуирано концентрише у дужем временском периоду на једну идеју, или низ идеја може бити један од разлога лоших резултата у математици и негативног става према том предмету. Ефекат прекида у процесу учења је испитивана у експерименту, где су студенти требали да уче два слична текста, један стално и један са честим прекидима. Резултати овог експеримента су представљени.

Представљено је истраживање о штампаним и другим медијима, који показује све већу стопу фрагментације у протоку информација током прошлог века. Школски систем као део друштва није могао да одоли овој тенденцији и активности школске деце током образовања су такође веома разноврстан, што с једне стране може да допринесе атрактивности образовања, али такође може довести до губитка способности континуиране концентрације.

Математика је предмет у којем је одсуство такве способности можда највидљивије.

Кључне речи: процес учења, математика, фрагментација, проток информација.

KATARÍNA VANČÍKOVÁ
Department of Elementary and Pre-school Pedagogy Faculty of Education, Matej Bel University
Banská Bystrica, Slovakia

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RETREAT FROM ARGUMENTS OF CULTURAL RELATIVISM AND ITS IMPACT ON THE CONCEPTION OF MULTICULTURAL EDUCATION

Summary*:* The author deals with current changes in the field of multicultural education. She analyses social changes, brought by the new era of postmodernism, from the point of view of sociology and social philosophy. She points out in particular to phenomena directly affecting multiculturalism and, with it, also multicultural education. She proceeds to description of changes connected with a gradual retreat from argumentation of cultural relativism. In the field of education, the shift from the cultural standard approach to meeting objectives of multicultural education to the transcultural concept not working with group identities but focusing attention on the personal dimension of human identity is considered to be of key importance.
Key words: postmodernism, cultural relativism, multicultural education, identity, transculturalism, acculturation

Introduction

The phenomenon of multiculturalism changes its character at all its levels (such as the social reality, ideal, political programme or ideology) depending on development of society, and the view of multicultural education changes with such changes, too. Over the last, approximately thirty years, society has undergone dynamic changes, with diversity, variance, increasing differentiation and plurality becoming its constitutive characteristics. At the same time, we witness a slow, but sensible retreat from arguments of cultural relativism, which, according to its critics, "legitimizes creation of boundaries among groups", because the "doctrine of cultural relativism in practice

1 katarina.vancikova@umb.sk

is incompatible with such phenomena as immigration, integration or acculturation" (Horáková, 2012).

Retreat from Arguments of Cultural Relativism

Cultural relativism is based on the concept of culture with its roots in Romanticism. The then social reality has lead philosophers to perception of the culture as a closed, confined and homogenous universe with its own sets of values and practices, of which Herder's metaphor "isolated island" gives perhaps the truest picture. Cultural relativism flourished at the beginning of the 20-th century, this especially in works of US cultural anthropologists (Boas, Kroeber, Sapir, Lowie, Benedict, Mead, and others), who, through their works, rocked the unwavering idea of good morals.[2] Owing to their sympathetic fight for elimination of rigorous morality, noticeable in their works, and subsequent loud defence of cultural minorities´ rights, foundations were laid for the idea of multiculturalism as a harmonious co-existence. Cultural relativism refused a hierarchic classification of cultures and its main theme was the belief that every culture has in principle a right to life. Why did argumentation of cultural relativism fail?

The relativists´ efforts to protect society from ethnocentrism lead to enthusiasm for cultural diversity. In its borderline positions, the enthusiasm developed even into *extreme multiculturalism*, "which, in the spirit of the radical post-modern paradigm of the pre-eminence of multiplicity over unity, programmatically emphasizes everything strange and different" (Floss, 1994: 75). In intellectual and political debates, *multiculturalism* began to prevail, construed as celebration of difference, which "insists on cultural and social integrity and on esteeming this integrity in others. It urges each group to find and nurture its own center, and at the same time to recognize and support the efforts of those in different units to do likewise" (Fay, 2002: 14). According to this ideology of multiculturalism, life in a multicultural society is thus connected with "the job to realize and celebrate this fact, to applaud the mosaic of colors and shapes which comprise human life on this planet" (ibid.). The celebration of multiculturalism appeared in many political programmes of the second half of the 20-th century, through which several European countries tried to cope with the increasing diversity and outline pillars of the minority policy proclaiming efforts for integration with preservation of identity. Perception of individual cultural groups as closed entities with a specific way of thinking and feeling, which should be esteemed, lead to an emphasis on cultural differences, even to a certain obsession with detection and protection of own particularities. At the same time, owing to its cultural-relativistic basis, multiculturalism got

2 Certainties of the Americans were shattered namely by Margaret Mead´ s bestseller of 1928 *Coming of Age in Samoa*, by which this progressive anthropologist cast doubt upon the then society´s belief that it is the American education and values recognized by the Americans that are the "right" ones ensuring a happy life.

somewhat cornered. It encountered an epistemic problem which can be formulated in the basic question: "if others live within their own framework and we live within ours, how can we understand them?" (Fay, 2002). The theoretically grasped problem reflected itself also in the social practice. September 11 triggered an avalanche of riots, opposition to the enthusiastic celebration of multiculturalism, and in several European countries, there the increasing tension was aimed at rejection of the minority policy based on cultural relativism.

Multiculturalism as the enthusiastic celebration of otherness, with cultural relativism in its background, exposed also other of its weaknesses. Liberal toleration of otherness, to which people were lead in order to respect particularities of individual groups and their identities, lead, according to Z. Baumann, to the incident - a new form of indifference to otherness. According to the author, although such indifference has been theorized as recognition of cultural pluralism, in practice it may lead, for instance, to dangerous interpretation and defence of human inequality (with the argument, that it is their specific, culture-related way of life), which is justified seemingly humanely as the right of every community to its own life, however, in fact deepens injustice in society and prevents fulfilment of the ideal of multiculturalism. Respecting a different cultural identity while emphasizing particularities of individual groups, plus a dose of this new form of indifference may lead (and also leads, as can be seen, for instance, in French suburbs or Slovak Roma slums) also to cultural ghettoisation. Thus, multiculturalism may lead to its very opposite - instead of peaceful co-existence it only strengthens differences among social groups and paves the way for greater contradictions" (Mistrík, 2011: 71).

As the view on multiculturalism was changing over the last thirty years, multicultural education underwent its own development. In the second half of the 20-th century, the enthusiasm for possibilities hidden in this educational issue grew with the celebration of diversity. Its supporters put the hope for improvement of society in it. For instance, Gorski (2009, 2010) believes in his works, that it is multicultural education that may bring change in the form of a more just society and considers it to be an important means of identification and elimination of inequality and injustice which have infested schools, society and the whole world. Also Banks (1997, 2004), its most frequently quoted theoretician, sees the potential to change the world in multicultural education. Gradual weakening of the enthusiasm for multiculturalism, caused by events at the beginning of the new millennium[3], also raised doubts in educational considerations, about the relevance of multicultural education. Opinions on its inclusion in the educational system have divided the professional public into two camps. Some authors insist on their belief that multicultural education is not an option, but a necessity (e. g. Pelcová, 2009), others consider it to be useless (e. g. Danišková,

3 Riots in suburbs of European cities that were results of long-term unsolved problems with the second generation of immigrants can be regarded as the most fundamental events. However, terrorist attacks in New York and later in several capitals worldwide, strengthening the conflict between the Western and Islamic world, attracted more attention.

2010). However, a more consistent analysis of the criticism reveals at least two facts: 1) a tendency to refuse multicultural education on the basis of mistakes identified in political programmes and ideologies of multiculturalism; 2) a tendency to criticize (quite reasonably) the now out-dated cultural standard approach without any effort to penetrate more deeply into the transcultural concept of multicultural education. Thus, any defence of multicultural education in the conditions of crisis of ideological and political projects of multiculturalism must begin with an awareness of the fundamental change, which is to move away from the cultural standard approach to meeting multicultural education objectives and to subscribe to the transcultural concept.

From the Cultural Standard Approach to the Transcultural Concept of Multicultural Education

The *cultural standard approach* pursued for many years to meet objectives of multicultural education was applied in parallel with political programmes that draw on assumptions of cultural relativism. Gradually revealed weaknesses of such programmes and, after all, the essence of cultural relativism, lead also to doubts about the correctness of the cultural standard approach. Multicultural education thus conceived began to encounter criticism that it might later lead even to unintended unwanted consequences almost inconsistent with its very objectives. As stated in Wilson, critics began to warn enthusiasts of multiculturalism not to become obsessed with focusing attention to intercultural differences. According to them, if one wants to alienate and further fragment communication and rapport between ethnic groups in a country, implementation of multicultural education in the educational system is the best way. According to the critics, to dwell on cultural differences at school is to foster pupils' negative prejudices and stereotypes, because it is human nature to view those who are different as inferior.

The fact is that the cultural standard approach has lost its relevance in the new post-modern situation. The world has assumed a new form, and, as argued by Welsch (1996, 1999), it is necessary to abandon the concept of multiculturalism which speaks only of multiplicity of cultures and start talking about transculturalism, a characteristic of which is greater intensity of intercultural contacts, within which various connection networks are created, identities of people blend and boundaries among cultures get blurred. Thinking of cultures as closed entities with their typical features is no longer sustainable. Therefore, also transition from the cultural standard approach to the transcultural approach may be briefly described as a shift from the emphasis on group identification towards the emphasis on a personal and individual approach.

Both approaches focus on a single objective - to participate, through education, in peaceful co-existence of cultures sharing one space - in times of globalization the

space being the world as such. However, they are based on a different view on the concepts of culture and human identity (Table 1.).

Table 1

The Concepts of Culture and Identity, as Grasped in Two Different Conceptions of Multicultural Education

Cultural standard approach	**Transcultural approach**
Culture is...	
an integral, separated monad, organic unity, bound, locked universe, isolated island	an internally differentiated, multilayer entity
a static entity, social unit with clear characteristics	a dynamic, changeable entity
Identity is...	
monolayer	multilayer
unchangeable, static, man perceived as a passive object	changeable, dynamic, man perceived as an active being transforming reality

The culture standard approach sees the *culture* as a closed homogeneous system separated from its surroundings by distinct boundaries. From such an angle of view, the world consists of a number of monads separated from one another. This conception has lead to the belief that improvement of mutual intercultural relations requires knowledge of characteristics of different cultural groups. Thus, the cultural standard approach has focused on dissemination of information about different cultures, their particularities, history, traditions, cultural rituals... Such information should help to explain and understand causes of others' conduct. However, as stated by the authors of the publication *Stratégie rozvoja multikultúrnej výchovy ve všeobecném vzdělávání* (*Strategies of Development of Multicultural Education in General Education*), such an effort leads to capturing only some of the characteristics of culture. It cannot capture either nuances which do not fit into the description of whole group's character or its dynamics. The cause is that the culture is not an organic unity. Even apparently the most homogeneous societies are significant of inner differences; even the most isolated groups experience foreign influences. This especially today, in the conditions of global economy and cultural oecumene (Fay, 2002). Focusing attention on particularities of cultural groups entails also a more serious risk. This a misconception of the world composed of "us" and "them", where "them" are mostly other, strange. Educational intervention thus creates a labelling environment. According to Morvayová (2005) multicultural education providing information to some of its participants, about their co-participants as different, makes the pupils and students objects of ethnic classification and perceives the ethnicity and race as ontological givenness, not as a processual category bound to discursive conditions. This is one of serious mistakes of the cultural

standard approach. Eriksen, too, warns about the danger of creating firm boundaries among different cultures. He stresses the necessity to understand culture as naturally changeable, having many meanings and being in the process of continuous development. In his opinion, culture is a process that is without boundaries in its nature (Eriksen, 2007). Differences between "us" and "them" are interchangeable, relative and dynamic (Fay, 2002).

It follows from the above that the cultural standard approach seeing cultures as closed entities unwittingly builds a system of categories. The result is that "multicultural education instead of ridding school teaching of dogmas leads to fragmentation of curricula by ethnic criteria, thus replication of nationalist dogmatics, just in a minority version" (Morvayová, 2005: 66). Focusing attention on differences of cultural groups eventually further deepens stereotypes, which multicultural education has to fight.

Perception of the concept of culture as a closed system with clear characteristics results also in mistaken perception of the essence of human *identity*, supported by a holistic concept according to which a person's identity is determined by group membership because it is created by social and cultural forces (Fay, 2002: 67). Then, in the cultural standard view, culture is a "*c*omplex set of shared beliefs, values and concepts which enables the group to make sense of its life and which provides it with directions for how to live... In perhaps the most influential variant of this standard view culture is pictured as a text the vocabulary and grammar of which its members learn. Indeed in this view, becoming a member of a particular culture in a process of enculturation conceived as learning to read the culture's basic text and making it one's own" (ibid., p. 72). Thus, identity is perceived as a function of enculturation and rather a static category. According to this concept, static, unchangeable cultures are composed of beings passively accepting their heritage in the process of enculturation. This is, however, a serious mistake. Expressions of cultural and social life are namely an outcome of actions by acting people, not passive objects or wheels of a mechanical system... Culture does not mould those who embody it as a form does dough, a society does not determine its members as a boiler does the heat output. People make the culture their own, do not reproduce it. They apply old rules in new situations changing them at the same time, give new meaning to the old, creating new (Fay, 2002). A person becomes an original being through his or her own activity; therefore the emphasis on group identity at the cost of personal identity is not correct. Members of social groups definitively cannot be perceived only as interchangeable units, whose behaviour fulfils only certain social functions or roles in the system (ibid.). Denying a person´ s activity and his or her originality leads to seeing the person as an object of culture having all characteristics attributed to the given culture. The person is imprisoned in these characteristics. It is a much distorted view of human identity. As Eriksen writes, membership in a group is situational, relational and identification of an individual depends on the situation and on whom the individual identifies himself or herself with. Also, it is necessary to keep in mind that in today's exciting times a nation or ethnic group is only one of the groups

of which we are members. Our identity is multilayer and a membership in working, hobby and other groups may be of greater importance for an individual than his or her nationality or ethnicity (Eriksen, 2007). If we act upon such conception of human identity when meeting objectives of multicultural education, we teach pupils to attribute motives of people' s behaviour not to their character traits but to their membership in a group. Thus we deny the key value which is the basis of multicultural education, namely irreplaceability and unrepeatability of an individual person, individual life. "The value of an individual person is a concentrate of what multicultural education practically heads to" (Mistrík, 2005: 109).

Multicultural education aimed at acquiring knowledge about characteristics of individual cultural groups unwittingly accentuates also differences among groups, agrees with its critics because it goes, so to say, against itself. By focusing attention on group identity and describing inter-group differences it namely evokes a feeling of mistrust rather than mutual understanding. At the same time, it contributes to stereotypes and dichotomies of the type "us" and "them" or "our" culture and "other", "different", "strange" culture. In the effort to give pupils the truest possible description of individual cultures, multicultural education implementers may even perpetrate caricaturization.

Social changes, but also problems the multicultural world encounters, have prompted theoreticians and multicultural education implementers to rethink the cultural standard approach. Gradually coming to the scene is the so called *transcultural approach*, which, instead of description of individual socio-cultural groups, begins with thinking about causes and boundaries of the difference in each of us. The transcultural approach withdraws from thinking in categories and talks about experience of an individual (the individual's culture), which manifests itself in mutual encounters with others as a cultural difference" (Moree, 2008). In the transcultural concept, multicultural education is not oriented on providing information about the "others", but it attempts to build openness, encourage pluralistic thinking and individual civic approach (Moree, 2008). It is based on differently grasped concepts of culture and identity than in the cultural standard approach.

Culture in the transcultural concept is perceived as an auxiliary taxonomic category, not as ontological givenness. Societies are not integral. Cultures do not resemble cells separated from one another by distinct boundaries. Culture is a social entity that is changeable in time and motion; it is subject to transformation, development and change. That is why it is very difficult to attribute specific characteristics to any cultural group and, for the same reason; it is a mistake to insist on them. Culture cannot be viewed as a static matter, because it is a process. Culture can change as well as disappear or emerge... Changeability of culture is given by the fact that it is realized only through our everyday encounters with people (Moree, 2008).

Such a view of culture changes also the view of human identity. The transcultural concept is rather inspired by the atomism approach according to which each of

us is an autonomous individual formed by his unique states of consciousness to which he has the exclusive access, abilities and needs he has independently of others (Fay, 2002). Human identity is also perceived as dynamic, meaning that the human being is considered an active co-creator of culture, not a passive holder of group characteristics. Identity changes in time, this depending on the changing context. In this sense, identity is not something inborn (none of its parts), but it is a dynamic complex changing in time and in social situations to which an individual gets (ibid.). Contacts with other cultures and processes of acculturation play an important role in processes of self-identification. Identity is in fact of dialogical nature. What we are we are thanks to relations with others... If we do not understand others, we cannot understand ourselves. The extent of self-consciousness is given by the extent of our knowledge of others (Fay, 2002). At the same time, identity is multilayer. It is created both socially based on the membership in social groups and personally. In the transcultural concept, a person is perceived in all complexity as a biological, socio-cultural, but also individual being. Thus, the personal dimension of human identity and the value of human uniqueness and authenticity gain importance. People are not perceived only as members of a group (one) culture, but as original beings. The perception of identity as a multilayer phenomenon eliminates its reduction to ethnicity or nationality perpetrated by implementers of multicultural education based on the cultural standard approach. A person identifies himself/herself with many groups which can be of various importance for him/her and, as already mentioned in the previous section, is given situationally. "A conception of identity is based in people's existence of specific communities and contexts "(Howard, 2000: 386).

Different views of the concepts of culture and identity indicate a different approach to achievement of goals in multicultural education. In this case, to implement multicultural education means to create space for respect for different cultural groups, this through self-reflection and reflection on personal experience based on people's social contexts and various social situations. Success depends on a teacher's ability to enable pupils enter into intercultural dialogue, emphatically imagine oneself in the situation of other people, but also to think about the social context affecting people's thinking and behaviour. The transcultural approach invites to reflection on how membership in diverse groups (not only ethnic or national, but also hobby, professional, and similar groups) affect human self-perception and perception of the world around. Within the transcultural concept, multicultural education attempts to focus attention on the uniqueness of every person, which eliminates accentuation of group identities. The aim of educating is an individual who does not attribute characteristics to people only on the basis of their membership in a group and thus does no labelling. Multicultural education so conceived presents a personal approach, which instead of clear pigeonholing and emphasizing the importance of cultural predetermination of individuals rather seeks to describe the way how various cultural influences affect a person and co-create the person's identity (Moree, 2008).

Conclusions

The world has changed due to globalization processes. The intensity of intercultural contacts has increased, intensifying acculturization processes. Owing to these processes boundaries among cultures get slowly blurred and identities of people get mixed, changed dynamically and become increasingly complicated. The basic feature of society is no longer multiculturation, but transculturation. This change is palpable also in the Slovak society. Individual groups are no longer closed entities with clearly defined values, cultural traditions and customs. They are communities dramatically changing under the influence of acculturation processes. Communities are differentiated inside. Due to generation exchange, they define, identify themselves anew. Not seldom are the changes a result of generation conflicts. Despite these facts, the view of cultures as isolated islands still prevails in thinking and conduct of many Slovaks . This is manifested in their tendency to attribute to certain cultural groups properties not relating directly to their ethnicity. An example may be attribution of life strategies of poverty to the Roma culture. Many characteristics stemming from objective circumstances are perceived as characteristic features of cultural groups, which leads us to indifference to their problems. The result of such an approach is gradual deepening of the social distance and growing inter-group tension that can be seen in the Slovak society. With this social sentiment it is very important that multicultural education takes firm place in our schools. Its implementers, however, should remain open to criticism and do everything not to unwittingly deepen the gap among cultures through strategies of multicultural education. They should make effort for this educational issue to meet its basic objective - support peaceful co-existence of cultures. This requires to abandon group identities, rethink the former cultural standard concept of multicultural education and to focus attention on the transcultural concept based on personal approach.

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Сажетак: Аутор описује савремене промене на пољу мултикултуралног образовања. Анализира социјалне промене које је са собом донела нова ера постмодернизма, са аспекта социологије и социјалне филозофије. Посебну пажњу посвећује феноменима који директно утичу на мултикултурализам и мултикултурално образовање. Она наставља да описује промене повезане

са постепеним повлачењем из аргументације културног релативизма. У области образовања, прелазак са стандардног културног приступа испуњавању циљева мултикултуралног образовања на транскултурални концепт није могућ са групним идентитетима, већ се пажња усмерава на личну димензију људског идентитета која има кључни значај.
Кључне речи: постмодернизам, културални релативизам, мултикултурално образовање, идентитет, транскултурализам, акултурација

CLASS TEACHING METHODOLOGIES

IVANA RANČIĆ
Department of Physics, Faculty of Sciences
DUŠANKA OBADOVIĆ, STANKO CVJETIĆANIN
Faculty of Education in Sombor
MIRJANA SEGEDINAC
Department of Chemistry, Faculty of Sciences, University of Novi Sad, Serbia

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STUDENTS' METACOGNITION IN REGARD TO SCIENTIFIC METHOD IN PHYSICS TEACHING

Summary: Different teaching methods in teaching physics help in developing students' metacognitive abilities. This research was conducted with the aim to analyze a relation between implementation of scientific method in physics teaching and developing students' metacognition. Research sample consists of 520 students of both genders that have finished some of primary schools in Novi Sad. Questionnaire (that included Metacognitive Awareness Inventory - MAI) and physics knowledge test were constructed for the need of this research. The obtained results were treated statistically. It is shown that statistically significant difference between the students' metacognition exists regarding to implementation of scientific method as teaching method. Higher matacognitive level have shown students who are opinion that experiments (scientific method) in teaching physics were helpful for their understanding of the physics contents, also students who are writing down in a notebook the performed experiments (the procedure, explanation...) and students who understand experiments and their explanations.
Key words: physics, scientific method, simple experiments, metacognition

Introduction

Students leaving elementary school, therefore finishing compulsory education, in the Republic of Serbia have no satisfactory operational physics knowledge, that is they don't develop the ability to use learned material in new and concrete situations. This is indicated by the results of various knowledge tests of natural sciences, such as the PISA test examination in operational knowledge.

Very important problem in teaching science is how to make students think on their own and acquire applicable long-lasting knowledge. Also it is very important to prepare students for lifelong learning. In order to achieve those goals the quality of science teaching must be improved. Good way to improve science teaching is using the contemporary teaching methods. Contemporary teaching methods enable active participation of the learners in the teaching process, as well as improving the quality of science teaching (Obadovic et al., 2013; Obadovic et al., 2012).

The introducing the basic concepts of natural sciences from the first grade of elementary school to the end of compulsory education, by implementation some of the contemporary teaching methods (scientific method, inquiry based learning and similar) requires the application of simple experiments. The application of simple experiments is not only useful by the end of compulsory education but in high school teaching as well.

Different teaching methods in teaching physics help in developing students' metacognitive abilities. High level of students' metacognitive abilities allows them to learn efficient and to learn in everyday life, not only in school, also, to gain applicable knowledge.

In this paper the relation between the use of scientific method in teaching physics and the level of students' metacognitive awareness is discussed

Simple Experiments and Scientific Method

An experiment is very important educational and motivational tool in physics education.

To gain understanding about physics contents, physicists systematically question nature through experiments. Experiments are designed to challenge existing hypotheses and provide clues to more powerful theories. Experiments are essential in expanding our scientific knowledge but also they play a key role in the teaching of science. Experiments allow students to observe phenomena, test hypotheses, and apply their understanding of the physical world and experiments motivate students (Moseley et all., 2005).

More specifically, experiments are used in schools to:

- - motivate students,
- - provide concrete examples of complex concepts,
- - increase understanding of technical apparatus,
- - verify predictions, theories or models.

Experiments are important in the teaching of physics for they afford the students direct contact with natural phenomena (Hırça, 2013). One possibility to define

simple experiments is by listing some typical criteria. For simple low cost hands-on experiments:

- • The equipment is in general available (e.g. objects and materials at home, supermarkets etc.), it is easy to get, and has a low cost,
- • The set up is simple,
- • The presentation should not last very long,
- • Sometimes it can cause special affective effects (surprise, doubt, enthusiasm,...)

Since the first idea of "learning by doing", given by John Dewey who thought that active learning is both cognitive and social, numerous psychologists and educators have been encouraging this way of teaching and learning (Breault, D. A. & Breault, R.). Students construct their knowledge actively by thinking and doing, through interactive experiences with the environment, rather than like passive receiver (Acıkgoz, 2004; Ozel, 2005). That is self-regulation process (Zimmerman, 1989).

The scientific method significantly makes it easier to understand the essence of issues that are studied in physics and provides the longevity of the acquired school knowledge. It also contributes to achieving the didactic principles in physics: the principle of scientific value and systematization, evidence, links theory and practice, activity, durability of acquired knowledge, skills and habits, the individualization of teaching, adaptation of teaching. The scientific method consists of a series of logical procedures. Elements of scientific methods that should be implemented in the classroom are: asking questions – problem definition, formulation of hypotheses, experiment, analysis, conclusion and presentation of results (poster). Pupils should be given specific instructions to be followed in the realization of themes using the scientific method before processing themes on the procedure of scientific method (Obadovic et al., 2007; Nagl et al., 2012).

Through simple hands-on experiments realized with the use of scientific methods, pupils become accustomed to conduct independent research from the first grade of compulsory education, which facilitates the adoption of elementary knowledge of physics higher grades.

The scientific method is a way to ask and answer scientific questions by making observations and doing experiments – it is an organized way of figuring something out.

It can be used as contemporary teaching method in teaching Physics. Usually six steps of scientific method are defined:

1. Identify a problem/question – where students should recognize problem that they are trying to solve and post adequate question that they will try to find answer.
2. Make a hypothesis – where students are predicting the outcome of experiment (based on their background experiential knowledge they predict what will be answer on their question).

3. Conduct an experiment – students should design experiment that will help them to verify their hypothesis by using available material, with teacher's help if it is necessary, and to conduct designed experiment.
4. Analyze your data – after conducting experiments, gained data should ne analyzed.
5. Draw conclusions – based on analysis of data students should draw their conclusions and verify or disprove their hypothesis.
6. Report results – students should report their results and conclusions in front of their class or to other students in their school or wider, as a presentation, poster, talk…

When scientific method is used in teaching science students should write every conducted research in one notebook (experimental notebook) and by doing that they learn to write down correctly proposed hypothesis (true or false), record procedure of experiment and sketch it, record and organize gained data, as well as conclusions. Students are getting used to be a systematic and to thing like scientists.

Metacognition

Understanding the concept of metacognition is very useful. It can answer questions related to the development of cognitive and affective area; also it can improve understanding and analysis in all areas where the process of self-regulation is included. Research of metacognition has been carried out since the seventies of the twentieth century with the beginnings of developmental and cognitive psychology. Knowledge about the metacognition was developed in research on memory (Flavell & Wellman, 1977).

Henry Brooks Adams stated, "They know enough who know how to learn". Metacognition enables students to solve new problem by retrieving and deploying strategy that they have learned regarding to similar context.

John Flavell (1979) originally came up with the term metamemory, and later the term metacognition and used it in the late 1970s with meaning "knowledge and cognition about cognitive phenomena," or simpler "thinking about thinking", "knowledge about knowledge".

Since then concept of metacognition is attributed with different meanings, but most researchers believe that metacognition refers to one's thinking process, monitoring and control of thinking.

Cross and Paris (1988) define metacognition as the knowledge and control children have over their own thinking and learning activities. Kuhn and Dean (2004) give definition that it is awareness and management of one's own thought and Martinez (2006) that it is the monitoring and control of thought. Ormrod (2004) defines metacognition as what one knows about his own cognitive processes and how he uses these

processes in order to learn and remember. According to Hennessey (1999) metacognition is understood as "awareness of one's own thinking, awareness of the content of one's conceptions, an active monitoring of one's cognitive processes, an attempt to regulate one's cognitive processes in relationship to further learning, and an application of a set of heuristics as an effective device for helping people organize their methods of attack on problems in general" (p. 3). Generally it is defined as the activity of monitoring and controlling one's cognition (Weinert & Kluwe, 1987).

According to first framework given by Flavell, metacognitive awareness can be categorized into awareness of:

1. metacognitive knowledge,
2. metacognitive regulation and
3. metacognitive experiences.

Metacognitive knowledge (knowledge of cognition) includes three different kinds of metacognitive awareness:

1. declarative knowledge,
2. procedural knowledge and
3. conditional (strategic) knowledge.

These kinds of metacognitive awareness cover how to do something; skills, strategies and resources required to perform the task (knowledge of how to perform something); and knowledge of when to apply certain strategy, respectively.

Regulation of cognition refers to awareness of the need to use certain strategies, such as (Schraw & Dennison, 1994, Schraw & Moshman, 1995):

1. planning – planning, goal setting, and allocating resources prior to learning,
2. information management – skills and strategy sequences used to process information more efficiently (e.g., organizing, elaborating, summarizing, selective focusing),
3. monitoring – assessment of one's learning or strategy use,
4. debugging in process of thinking and learning – strategies used to correct comprehension and performance errors and
5. evaluation – analysis of performance and strategy effectiveness after a learning episode.

Metacognitive experiences are manifestations of the online monitoring of cognition as the person comes across a task and processes the information related to it. They are the interface between the person and the task. They comprise metacognitive feelings, metacognitive judgments/estimates, and task-specific knowledge (Efklides 2001, 2006)

Metacognitive experiences are for example:

1. feeling-of-knowing,

2. judgments-of-learning and
3. ease-of-learning judgments.

Metacognitive experiences can have influence on students' motivation. If student believe that he/she is able to learn something easily it will make them more willing to learn it. Also feeling-of-knowing can make student self confident…

Research methodology

Research aim was to analyze a relation between implementation of scientific method in physics teaching and developing students' metacognition.

Research hypotheses were that:

- Implementation of experiments (demonstrative experiments, simple "Hands-on" experiments) helps in developing different metacognitive level.
- Implementation of scientific method in teaching physics helps in developing different metacognitive level.

Research sample consisted of 520 students of both genders that have finished some of primary schools in Novi Sad

Appropriate questionnaire was constructed, part of it included Metacognitive Awareness Inventory – MAI. In questionnaire students answered on general questions and on questions about teaching physics. They were asked about carried out experiments in teaching physics. Examples of questions:

- Did your teacher carried out demonstrative experiments?
- Did you carried out simple "Hands-on" experiments?
- Were experiments and their explanations clear?
- Were experiments helpful for your understanding of the physics contents?
- Did you write down in a notebook the performed experiments (the procedure, explanation...)?
- Were experiments carried out in steps of scientific method?

On each question they could answer: no experiments were done, almost never, often, sometimes, rarely, almost always.

MAI questionnaire is intended to assess metacognitive skills of adolescents and adults and contains items that examine each of the eight components: knowledge of cognitive processes (declarative, procedural and conditional) and regulation of cognitive processes (planning, information management, monitoring, evaluation and debugging in thinking process). MAI is constructed in the early nineties (Schraw & Dennison, 1994). The scale of the instrument has satisfactory validity (accuracy) and reliability, the Cronbach alpha coefficient is 0.90. Of the 52 items with five-point response Likert scale of MAI 32 items appropriate for the selected sample were retained

and adjusted. The choice of items was made based on the capabilities of students to understand the items that constitute the scale, which was tested by pilot survey, and based on example of the survey about the children's awareness of metacognition that is proposed for children aged less than 14 years (Junior Metacognitive Awareness Inventory - Jr. MAI; Sperling, Howard, Miller, & Murphy, 2002).

Examples of items in MAI:

- I ask myself periodically if I am meeting my goals.
- I try to use strategies that have worked in the past.
- I pace myself while learning in order to have enough time.
- I know how well I did once I finish a test.
- I slow down when I encounter important information.

Research results analysis and discussion

The obtained results were treated statistically and it is shown that statistically significant difference between the students' metacognition exists regarding to some, but not all, aspects of implementation of scientific method as teaching method, at the 95% confidence level.

Hypothesis that implementation of experiments (demonstrative experiments, simple "Hands-on" experiments) helps in developing different metacognitive level is proved to be wrong

There was no any statistical difference in matacognitive level that has shown students that answer differently (no experiments were done, almost never, often, sometimes, rarely, almost always) to questions:

Did your teacher carried out demonstrative experiments?

Did you carried out simple "Hands-on" experiments?

So it is not enough just to demonstrate phenomena by the use of experiments or to give students chance to carry out "Hands-on" experiments on their own. Experiments must be carried out in adequate way and must be well understood by students.

Hypothesis that implementation of scientific method in teaching physics helps in developing different metacognitive level is confirmed.

Different matacognitive levels have shown students that answer differently (no experiments were done, almost never, often, sometimes, rarely, almost always) to questions:

Were experiments and their explanations clear?

Were experiments helpful for your understanding of the physics contents?

Did you write down in a notebook the performed experiments (the procedure, explanation...)?

Were experiments carried out in steps of scientific method?

Higher matacognitive level has shown students who understand experiments and their explanations and they who are opinion that experiments in teaching physics (implemented through scientific method) were helpful for their understanding of the physics contents.

Also, higher matacognitive level has shown students who are writing down in a notebook the performed experiments (the procedure, explanation...) and who carried out experiments in steps of scientific method.

Conclusion

Metacognition is relevant to work on cognitive styles and learning strategies so far as the individual has some awareness of their thinking or learning processes and is also relevant since it is related with the development of cognition in children.

Students' metacognitive awareness is very important in effective physics teaching/learning process. Experiments help in improvement scientific knowledge and students' motivation but for seeing their effect on students' metacognition it is not enough that teachers choose adequate experiments. Since there is difference between the students' metacognition regarding to some aspects of implementation of scientific method as teaching method it can be proposed that teachers pay more attention on their instructions and way of carrying out experiments.

Results of this research imply that similar researches are necessary in order to better understand relations between the use of scientific method and students' metacognition and it's of great importance in order to improve teaching science.

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Резиме: Примена различитих наставних метода у настави физике доприноси развоју метакогнитивних способности ученика. Истраживање је спроведено са циљем да се анализира веза између имплементације научног метода у настави физике и развоја метакогнитивних способности ученика. Узорак истраживања је чинило 52о ученика оба пола, који су завршили неку од основних школа на територији Новог Сада. Упитник (у оквиру којег је био Упитник за испитивање метакогнитивне свести - MAI) и тест знања из физике су формирани за потребе овог истраживања. Добијени резултати су обрађени статистички. Показано је да постоји статистички значајна разлика између нивоа метакогнитивних способности ученика у односу на то да ли је примењиван научни метод у настави физике. Виши ниво метакогнитивних способности су показали ученици који су мишљења да су експерименти (научни метод) корисни за њихово разумевање садржаја физике, такође, ученици који воде свеску изведених експеримената (извођење, објашњење...) и ученици који разумеју експеримент и објашњење.
Кључне речи: физика, научни метод, једноставни експерименти, метакогниција

IRENA GOLUBOVIĆ – ILIĆ,
ALEKSANDRA MIHAJLOVIĆ
Faculty of Education in Jagodina
Serbia

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THE POSSIBILITIES OF INTEGRATING CONTENT OF MATHEMATICS AND WORLD AROUND US AS SCHOOL SUBJECTS IN THE PROCESS OF CLASS TEACHING

Summary: Considering the fact that one person-school teacher realize the teaching process in the majority of school subjects and has a comprehensive insight into the knowledge, capabilities, and student achievement in all areas, classroom teaching provides special possibilities for application of an integrated approach. Complex and interdisciplinary content of school subject World around Us/Science and Nature make it feasible for teachers in very different ways to integrate the planned activities into the teaching of mathematics. In this paper we will highlight and critically evaluate both the benefits and weaknesses of applying integrative approach from the aspect of inter-linked curriculum, these two among students generally (not) favorite subjects, and also, we will illustrate the idea by concrete examples of a certain content. Experience shows that integrative teaching not only contributes to pupils to acquire knowledge in certain subjects but also it develops thinking skills, creativity, physical, cognitive and social competence of both pupils and teachers.
Key words*:* integrated teaching, integrative approach, inter-linked curriculum, Science teaching, Mathematics teaching

Introduction

Knowledge that students acquire in the process of class teaching[1] should be connected in a functional and meaningful way. The content of one school subject should not be completely separated, isolated and incoherent with the content of the rest of the school subjects. The strict disciplinary approach in which certain phenomena and events are classified as subject areas of some specific sciences in teaching young learners is not suitable because young learners tend to look at the phenomena as a whole and

1 Students are from 7 to 11 years old

as a unity of the specific result "starting with its mutual and observable connections" (Spremic-Solakovic, 2009: 401).

Class teachers are in the favourable situation because they teach most of the school subjects and they are able to easily organize and coordinate integrative teaching with other colleagues (foreign language teachers and elective subject teachers), that is the class teachers are in the position to find the ways to connect and integrate the contents of obligatory, elective and facultative school subjects without major technical and staff problems[2]. On the other hand, it is impossible to connect and integrate the content of all thematic units every day, it could be possible only when teachers are able to make functional connections which will have certain effects on understanding, realizing, longer and better memory of the content and the possibility of its practical application. The integrative teaching represents an innovative model which serves for the mutual connection between the teaching content of several school subjects. The specificity of this approach is that it enables "greater dynamics and interdisciplinary approach towards specific problems" (Lukic-Radojicic, 2011: 368). Since the integrative teaching enables connection of the teaching contents, it is very close to the way of thinking of children from 7 to 11 years old. In this age learners are not able to approach the certain natural and social phenomena analytically because these learners look at their surrounding as the wholeness in a synthetic (Golubovic, 2012: 246), direct way, as a unity, and the integrative approach they see as "the spontaneous way of learning something new because learners in this period of life experience the world around them in the same way" (Lukic-Radojicic, 2011: 369). Besides that, "integrative approach to learning best fits to learning in the real life situations which integrates and connects different development areas and gives the new quality to learning" (Buljubasic-Kuzmanovic, 2007: 148). If we look at the school system, the integration means forming the whole learners' perceptions about the world around them. It is realised in the way that from the educational content we take certain components which resembles specific concepts about the phenomena which could be observed in our surrounding (according to Spremic-Solakovic, 2009: 403). It is important in this process to have in mind that young learners learn better and they are more motivated to learn if the content "is connected to the real life situations and if it can meet their needs, goals and interests" (Buljubasic-Kuzmanovic, 2007: 150). The integrative approach to learning highlights the intellectual, social, emotional and aesthetic development, it supports the whole learner's development and it is not focused on one aspect, mostly cognitive. In the middle of the integrative learning is the "individual programme directed towards a learner and not towards the school subject managed by the teacher" (ibid.: 148).

If we look at the more developed countries in the world we may notice that the integrative approach has long time ago ceased to be considered as the innovative approach, while in our country it is "the rarity for which few ambitious individuals could take the credit for and this is mostly done in the class teaching while the subject teach-

2 In the process of class teaching the integrative approach usually demands lots of exceptions in the class schedule and rearranging the time of teaching for the most of subject teachers…

ing is still closed for this challenges" (Lukic-Radojicic, 2011: 371). The integrative learning starts from the fact that the role of the modern school and teaching is changed and that learners are burdened with the comprehensive programmes and with many everyday obligations so, as the result, these learners leave the primary school with lots of data and information that could not be applied in the real life situations. The changes are not avoidable since in the last few years, according to the technological progress, the school lost the privilege to be the main source of knowledge and information. As a consequence learners learn more outside the school using the internet, films and other means, for example, media. Teachers are also not satisfied with the current situation of the school system because during the teaching process they have problems with the students' attention span, discipline management in the class and students' motivation to learn new contents.

The concept of the integration, its significance and the ways of accomplishing it in the teaching process

The integration is the process or the phenomenon which results as the wholeness. The wholeness is the way of the mutual (inner or outer) connectivity of the certain elements which are not self-sufficient and they function only as the elements or the subsystem of the unique superior system (…), and the gist of the integration process lies in the qualitative transformations inside each of the mentioned elements (Spremic-Solakovic, 2009: 404). The integration is consisted of the necessity of the mutual connection between all elements in the teaching process in all the systems and subsystems.

The integrative teaching is the innovative model in which there are no strict boundaries between the certain school subjects (Djordjevic, 2007). The specific units of the different science areas are thought in the integrative way and these are subject connected (ibid.). Learners are active – they solve problems, ask questions and search for answers in their surroundings. The integrative learning means "looking at the different dimensions of one specific problem, from the different aspects and different points of view (…), it includes learners' thoughts, feelings, intuition, interests and experience (Djordjevic, 2007: 77). If we think about the traditional teaching as the one based on the learning the content and facts across different school subjects, integrative teaching is, on the other hand, based on learning the knowledge by nurturing and developing thinking abilities, physical, emotional and social competence. There is no reason to burden the learners by the similar contents of the several related school subjects and in several classes when we can achieve the same[3] effect in one class by the qualitative and effective integrative teaching organisation.

Besides that the integrative teaching enables and brings to the unique world observation and forming the scientific attitude towards the world, it brings also to the

3 Maybe even greater (better effect) – authors' note

greater educational effects, learners' motivation, extent and the quality of the gained knowledge, and to the dynamic of the teaching process in general. Knowledge that learners learn by making certain connections between the school subjects, contents or areas, are mostly integrated into the system that "lasts" longer in the process of forgetting things. Such knowledge is, on one side, long-lasting, and on the other side, it brings to the transfer accomplishment, that is, it transfer "the competences gained through one learning to the other" (Vucic, 1991: 113). The integrative approach gives to the teaching greater possibilities for learning by doing, researching, cooperative learning, experiential learning and learning through game. This way it is possible to connect the contents in the higher and deeper level and to gain some functional knowledge and develop thinking skills as the result. One of the possibilities to integrate different contents is the project teaching. Doing the projects young learners have the possibility to deal with different problems that happen in the real world from the aspects of mathematics, natural and social sciences (for example, measuring the longitude through history, mathematics in certain occupations etc.).

By integrating the contents we may avoid unnecessary repetition, save time and energy (Spremic-Solakovic, 2009: 408) and the knowledge gained in this way become systematic, more qualitative and applicable. This teaching process is, compared to the traditional teaching, more dynamic, intellectually more valuable and emotionally richer, because learners see the practicality and the connectivity in learning like this so they are more motivated to do it. Even third year students at the Faculty of Philosophy in Osjek have the opinion that the integrative learning mobilises the existing knowledge and experience, it develops the discussion, self-evaluation, initiative, openness, flexibility, critical opinion, self-criticality and the adjustment to new situations (according to Buljubasic-Kuzmanovic, 2007: 159). One of the most important qualities of the integrative teaching approach is that the contents and methods of different disciplines overlap with the aim of achieving deeper understanding of each discipline as well as connecting the knowledge from different areas (Hardy, 2005 according to Milinkovic, 2011).

The beginning of the integrative teaching appeared in the end of 19th and at the beginning of the 20th century as the reaction on some didactic principles of the old school in which dominated very strict differentiation in the subject teaching and which brought to the fractured, and split teaching with all the negative consequences on the youth educational quality (Pedagogical encyclopaedia, 1989: 276). From that period onwards that kind of teaching was called – concentration, correlation, unity, thematic unity, synthetic teaching etc. (Skupnjak, 2009: 262). Having in mind that this concept of integrative teaching is usually equated with the concepts such as *interactive teaching, interdisciplinary teaching, thematic teaching* and *correlation*, we will try to define these concepts and to point out to their significant difference.

The concept **interactive** teaching (lat. inter = between; action = acting, have the influence on) means didactic model in which the interaction is the dominant relationship between the participants in the educational process. The cooperation between

teachers and learners is accomplished by the interactive learning which means that learners learn something new by doing different activities which can be complement and supplement at the same time. This process is the two-way process in which a learner can be in the interaction with the teacher, then with his peers, with different sources of knowledge or with all three mentioned aspects at the same time. Working in pairs or group work is the usual classroom management while students' activities are encouraged by other participants – peers with whom they learn while being in the interaction with them, they solve tasks, problems, research and evaluate their own work.

The integrative teaching can be interactive when during the teaching process we use different forms of interactive learning.

Interdisciplinary approach to teaching means connecting the content of different disciplines (school subjects) into logical units focused on one problem or topic which could be explained from different points of view of several disciplines and the gained knowledge serves to enlighten and clarify the specific problem. The interdisciplinary teaching is always **thematic** because the different or similar contents from different disciplines are organised into thematic units. Thereby, the thematic unit is consisted of different disciplines' contents (parts of the curriculum) which are logically connected; they are compatible, mutually connected and in the best way they bring to the understanding of a unit. "One of the best gifts that you can offer to your students is the awareness of the connection between the learning in the classroom and the real life. The interdisciplinary approach requests that you use one string and bind the learner's knowledge instead of using the only one approach and only one textbook for each school subject (Jansen, 2003: 99).

The **correlation** in teaching represents "functional connection and harmonisation of the teaching contents from the different school subjects which are similar or they are complementary" (Pedagogical encyclopaedia, 1989: 412). The concept definition and the gist of correlation represent the connectivity and mutual dependency of two phenomena whereby each change initiates and is followed by the appropriate changes in some other area (Golubovic-Ilic, Vukicevic, 2014). In the class teaching the correlation is usually accomplished by the *thematic* connection of two phenomena which are then united into one harmonic unity and by the *structural* connection in which the connection between two school subjects represents one inner feature of one certain phenomenon which could be, again, found in the previous phenomenon.

Some possibilities of integrating contents of Mathematics and Science in primary education

At first sight it is not easy to perceive common and related parts of Mathematics and Science teaching curriculum. Therefore, integrating and combining elements of the two apparently different subjects presents both a challenge and an opportunity for teachers to express their creativity, teaching skills, ideas and abilities. The fact that children in the concrete operational stage still need concrete materials to make mental representations

opens opportunities for integrating contents of these two subjects (Dejić, Egerić, 2006: 32). History of mathematics points to the fact that mathematics as a science has always been related to economical and social aspects, and to the development of society. Mathematics developed as a response to different social and economical needs of early civilizations. Modern society is more than ever dependent on technology development and we cannot imagine any stage of its development without the use of mathematics. Furthermore, mathematics played an important role in the development of all other sciences. Therefore, it is surprising that integration of mathematics with other scientific disciplines is often neglected in the teaching practice. This opens some new questions of finding solutions and possibilities for integration of the contents of these two subjects. In almost every Mathematics lesson teacher can use simple questions to provoke pupils to make connections between the subjects: *Can you tell me where you can see mathematics on your way home from school? How and when do you use mathematics outside the school? What units of measure do your mom and dad use and how?* In this way, students are given the active role of researchers. We provoke their interest about the subject and deepen their understanding and appreciation of the necessity of learning and knowing mathematics.

Teachers often tell students that one of the reasons for learning mathematics is that mathematics is used everywhere. Still, in most cases, a small number of teachers really creates learning environment that supports this. Students should be constantly encouraged to perceive and explore how, where and in what ways mathematics is used in everyday life. It is important for students to recognize the applicability of mathematical knowledge. It is often the case that students can recognize the mathematical content that appears in other areas, but still they are not able to integrate this knowledge (Milinkovic, 2011: 53). Integrating content of different subjects into teaching practice helps students to understand that mathematics is not fixed, final and isolated system of knowledge. However, it is a living and developing process, which is always closely associated with other branches of science scientific disciplines. Integrated approach requires not only an increased level of students' activity, but higher activity of teachers as well. Realistic context creates the opportunity for in-depth learning, establishing connections and knowledge transfer. Dealing with "incomplete" defined problem situations leads to the need for children to see a problem and developing / designing / creating a plan for its solution. This leads to the establishment of connections and transfer from different areas and even different items. Resolving problem situations results in discovering new concepts or links, and in deeper understanding of concepts and procedures and their relationships. In this way the knowledge, skills and competencies that children acquire are integrated, so children can understand the relationship between key ideas, events and processes that have to transfer knowledge and to learn with understanding, perceiving the world as a whole. The broader aim of integrative teaching is not to present mathematics education as a completely closed and abstract system, but to develop students' ability of mathematization (Milinkovic, Djokic, Dejić, 2009). Integrated approach helps children to overcome a belief that mathematics is too abstract and irrelevant for their cognition of the world (Hardy, 2005 according to Milinkovic, 2011).

On the other hand, the knowledge and experiences that students acquire in Science classes help them to gradually form basic mathematical concepts, to develop the ability of solving logical tasks, and to master the use of arithmetical operations. At this age, primary children are able to understand that quantitative properties of objects (number, weight, volume, etc.) do not change with changing their outward appearance (shape, position, etc.) (Egerić, 2006: 30). A significant feature of this developmental period is children's capacity to classify objects according to one or more different criteria, to determine their sequence based on size or some other characteristic (sequencing), to orientate in space and time, and to use units for measuring space and time (Golubovic, 2012: 248). There is a considerable overlapping between some of the mathematics and science contents and learning objectives. To save time, it is recommended to cover such teaching units simultaneously by integrating contents and organizing joint class activities. Besides these similar topics that are explicitly given in the curriculum of both subjects, it is possible to achieve integration in many other ways and levels. The paper presents some of the possibilities of such integration.

In Grade One, one of the most suitable contents for integrated teaching approach is the concept of a set. This concept is usually formed through the play and practical activity. Students observe the groups of elements (this is where we make relations with Science classes, e. g. a bouquet of flowers, a flock of birds, school equipment etc). When they figure out the common property of all objects of one group, and neglect all the others, they manage to acquire and understand the concepts of a set and an element (Dejić, Egerić, 2006: 65). One more opportunity to integrate Science and Mathematics contents are teaching units of 'counting elements' and 'comparing sets' by the number of elements. Students match the elements of the two sets (1-1 correspondence) in order to check if sets are equipotent. While doing this, they can connect e.g. animals and the plants they eat, animals with their young, objects made of the same material (wood, plastic, metal etc.) etc. Another example of integration is determining the directions of moving (left-right) in the traffic (Science teaching unit 'traffic and traffic-safety rules') and practicing the understanding ordinal numbers through connection with the days of the week.

Besides the above mentioned, the common core of both subjects also includes spatial relations (forward, backward, up, down, under, over, left, right, in, on, off), as well as comparison of objects by size, length, width, shape and colour. Joint activities of both curriculum subjects give an opportunity for very interesting lessons, save time and make learning process more creative and dynamic.

One of the important Grade One teaching topics in Mathematics is 'measures'. Students are introduced to measuring length and to monetary units. These contents can easily be integrated with the content of Science teaching unit *The environment in which I live* (as part of the topic 'me and others'). Teacher can organize an activity in which the classroom is turned into a store, a shopping mall or green market. In such environment each student gets the appropriate role or adequate "trade" activity. They have the opportunity to put themselves in the role of seller or buyer. Teacher explains

the procedure of buying and selling, barter, exchanging money for smaller or bigger monetary units. This activity gives students the opportunity to master the proper use of units of currency and to practise converting different monetary units. The educational value of these activities is also the fact that kids make estimations and decision how much they can spend, what to buy, what is more cost effective etc.

Another opportunity for integration of Mathematics and Science teaching is the topic 'measuring length'. This topic is part of both curricula (Mathematics: *Measuring length*; Science: *Observing, measuring and recording time and length*). Instead of having non-related and isolated classes of both subjects, teacher can organize an integrated class and activities. Concept of measuring the length and the concept of meter as a unit is introduced to students through a practical activity. First, students measure the length with different units of measure such as strips, sticks, body parts, certain object from the environment. Since they are getting different numbers of measure, they come to the conclusion that a conventional measuring unit for length should be introduced. Teacher can also point out how people used to measure the length in the past.

One of the Science teaching units in Grade Two is 'Different groups of people in my environment and my role in those groups'. A very important aspect of mathematics teaching is developing logical reasoning. Through logical tasks students can practise family (and other) relationships: *Toma is Nikola's father. Nikola is Matija's father. What is Toma to Matija?*

A common part of both subjects' curricula is the content related to measurement of time (Mathematics: 'Measuring time' (year, month, week, day, hour, minute, second); Science teaching: 'Measuring time' (clock and how to use it), 'Time units' (day, week, year), 'Seasons' and 'Time line'). In Mathematics classes children practice time orientation and learn the following units of time: hour, minute, day, week, month and the relation between different units. It would be non-practical, non-rational and non-logical to organize isolated classes and activities of the subjects. Integration of those contents allows saving time, creating many different and rich activities for students and the use of different teaching methods and resources.

Grade Three curriculum offers even more possibilities of integrating contents of Mathematics and Science teaching. Grade Three Mathematics curriculum covers the topic 'Geometrical object and the relation between them' (circle and circumference; Drawing with a compass; Angle and types of angles; Parallel and perpendicular lines and their construction; Rectangle and square; Triangle; Construction of these figures using ruler and compass). Some of these contents can be successfully connected with the topic cartographic literacy, which students learn in Science classes (Orientation on the map). The results of some studies (Mihajlovic, Vulović 2013) show that teachers put geometry in the first place, as one of the topics that cannot sufficiently be linked to real life situations. We assume that the reason for this is the fact that there are not enough materials and guidelines that would help teachers. Moreover, there is insufficient attention to these topics in the textbooks. We will give a couple of ideas

how some of these units may be associated with the Science content, and how their integration can help to solve some problems in real life contexts.

After students have learned about the concepts of circle and circumference, and how to use a compass, in their Maths classes, and after learning how to read a map and orientate themselves on a map, in their Science classes, teacher can introduce the following problem:

Example: *Mihajlo met Sanja while he was on a summer holiday. Unfortunately, he forgot where Sanja lived, but he still remembered some data: he knew that Sanja lived in a town which is 100 km away from Belgrade. He also remembered that she had told him that her town was in the mountains. Can you help Mihajlo to find out where Sanja lives? Are these data sufficient to find the solution?*

Mathematical aspect of this task is reflected in the fact that Sanja's town is located 100 km from Belgrade. Students know that the set of points that are equidistant from one fixed point is a circumference. Using a map of Serbia and by drawing the circumference, students can find all the towns that are on that line. They must know to read the map in order to complete the task. Since they are familiar with geography of Serbia (mountains, rivers etc.) they will be able to identify what might be the town where Sanja lives (we can also sometimes change conditions of the task so that there are two or more possible solutions).

Furthermore, some other mathematical contents might be integrated as well (arithmetical operations) in teaching Science. For example, text problems in mathematics can use the concepts taught in Science classes. Students can practise algorithm of arithmetical operations and geography of Serbia through the following task:

Example. *The musical band Van Gogh had three concerts last year: in Belgrade, Subotica and Kraljevo. At the concert that was held in the capital of Serbia there were 972 visitors. In the town in highlands there were 6 times fewer visitors than in the capital. In the town in the lowlands there were 200 people more than in Kraljevo. Fill the missing parts of the sentences: The most visited concert was held in _____. There were 362 visitors in _____. There were _____ visitors in Kraljevo.*

In Science classes students are introduced to the settlement plan and its elements. This is an excellent opportunity to practise some geometrical concepts as well.

Example. *Vladimir wants to go to the cinema. However, since the cinema is new, it is not yet marked on the city plan. He asked his older sister Vera for help. Since Vera knew that Vladimir had not finished his math and science homework, she decided to give him the following instructions: Well, first, you should go from our house to the school by using a straight path. When you come to the school, you should turn to the*

north perpendicularly to the path you used and move forward until you cover the same distance you have already covered. Label that place, and then go back home. Now, go to the museum by using the straight path again. When you reach the museum, turn to the south perpendicularly and continue moving until you cover the distance twice as long as the one you have covered from home to the museum. Now label that place too. Now draw a line that connects the two labelled points. The new cinema is in the middle of that line.

Besides reading the settlement plan, and practising orientation on the map, an important aim of this activity is to practise drawing lines, perpendicular lines and segments.

One of the units of the Science curriculum is 'Properties of liquids'. Among other properties, children should explore volume. On the other side, students learn about volume of the liquids and units of volume (liter, deciliter, centiliter, milliliter, hectoliter) in Mathematics classes. Integration allows teacher to prepare more complex and interesting activities and to make more connections to real life situations. It saves time and makes the knowledge that students acquire more functional and holistic.

One of the concepts that students learn about in Science classes is the concept of temperature (*Weather and its importance for the life and the environment)*. Students learn to use thermometer in order to determine temperature, and this is a great occasion to relate to the concept of the number line. Furthermore, it is also a great opportunity to prepare children for some contents that they learn in upper grades (e.g. observing negative value of temperature makes good introduction and prepares students for the concept of integers, learned in Grade Six of elementary school). Another interesting activity for the students might be collecting temperature data for a given period (week or month). Teacher can explain to students how to read the data from graphs (e.g. one axis represents the days in a given month, and the other axis represents daily temperature for each day - morning and noon). Students can do the following activities individually or in groups: measuring the temperature for the whole week (in the morning and noon); gathering and recording the data; presenting the data on the graph; calculating the difference between the highest and lowest temperature. Teacher can also explain the concept of "average" temperature (since they may hear this term in everyday life) and how to calculate it.

In Science classes children also learn about famous people of their region (educators, poets, writers, artists, scientists ...). This can be an excellent opportunity to introduce biographies of some Serbian mathematicians (depending on the region in which students live) such as: Mihajlo Pupin, a mathematician and physicist, born in Idvor, Banat; Mihailo Petrovic Alas, Milutin Milankovic, Dimitrije Danić, born in Belgrade; Mileva Maric Einstein, born in Titel; Atanasije Nikolic, born in Backi Brestovac etc.

Learning about the way of life in the Middle Ages in Grade Four of primary school (Science curriculum: 'Way of life in the Middle Ages - Chronology of the various scientific discoveries') is an excellent opportunity for teachers to include some contents of the history of mathematics. Using history of mathematics in education can increase motivation

of students, deepen their understanding of mathematical contents and show students that mathematics is not an isolated discipline. Teacher can introduce students to some important advances and discoveries in the field of mathematics. For example, teacher can show the students how people used to do calculations (e.g. finger multiplication, i.e. European peasant multiplication) and let them try it by themselves too.

After learning the division of multiple digit numbers, area and units of area, in Mathematics classes, the acquired knowledge can be practiced through some contents in Science classes (Science content: 'The main characteristics of the Republic of Serbia'; 'Serbian Population: natural population - number, density, migration'). Teacher can ask students to explore which town has bigger population density (by given data about the number of citizens and area). The main idea of this activity is to practise converting units of area, algorithm of division and to increase comprehension of the concept of density (which is for 10-11 year old students quite abstract).

Conclusion

We are witnessing the necessity of modernization and innovation of classroom teaching since the existing one cannot respond to the needs of modern society. Education system faces problems such as: use of old educational technology, domination of didactical materialism, excessive number of students in classes, lack of funds, teachers' insufficient training for using modern teaching methods and technologies. The consequence of traditional instruction is low effectiveness of teaching – non-applicable knowledge of students, a large number of subjects, students overwhelmed with too much, often unrelated information that must be memorized. Students should acquire knowledge and skills that will be functional and applicable. Teaching process should prepare them for real life situations and problems. Only integrated knowledge, skills and abilities can prepare individuals for the challenges of the modern society. Integrative teaching is one of the innovative organizational solutions which has a number of advantages compared to traditional teaching. In order to use it more frequently, teachers must be motivated through in-service training in seminars and round-tables, by being provided with published guidelines and manuals with examples etc. There are no detailed instructions, templates and "recipes" for successfully organized integrated classes, but it is important that this approach is used when there are justified reasons and opportunities.

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Сажетак: С обзиром на чињеницу да једна особа-*учитељ* реализује наставни процес из већине наставних предмета и има целовит увид у предзнања, могућности и постигнућа ученика из свих области, разредна настава пружа посебне погодности за примену интегративног

приступа. Комплексни и интердисциплинарни садржаји предмета Свет око нас омогућавају да се планирани садржаји на врло различите начине интегришу са наставом Математике. У раду ће бити истакнуте и критички сагледане предности и недостаци примене интегративног приступа са аспекта међупредметног повезивања ова два међу ученицима углавном (не) омиљена предмета, и такође, биће наведени и илустровани конкретни примери одређених садржаја. Искуства показују да интегративна настава не доприноси само усвајају знања из одређених предмета, него и развијању мисаоних способности, креативности, физичких, конативних и социјалних компетенција ученика и наставника.

Кључне речи*:* интегрисана настава, интегративни приступ, међупредметно повезивање, настава предмета Свет око нас/Природе и друштва, настава математике

ALZBETA BRISOVA
Department of Mathematics,
Matej Bel University, Banská Bystrica
Slovakia

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USING PROBLEM SOLVING TO ACQUIRE MATHEMATICAL AND TARGET LANGUAGE COMPETENCIES

Summary: In recent years, Content and Language Integrated Learning with its acronym CLIL, has become fast spreading across the Europe. Educational authorities have recognized underlying values of this approach and have recommended its integration to become a part of the mainstream education. The paper outlines the links with Europe, main principles and its benefits. It provides a closer look at a learner and outlines where this integrative fusion meets his mental world from the philosophical, psychological and pedagogical points of view. As a tool is used problem solving as the significant way of construction learners' mathematical and language knowledge and skills. Observations and recommendations are present as well. Using the results of own quasi experimental research and research works done throughout the world; the paper indicates why CLIL qualifies itself for being ranged among those innovative methods which have impact on the holistic personality development of learners.
Key words: CLIL, Mathematics, English Language, problem solving.

"The teacher who is indeed wise does not bid you to enter the house of his wisdom but rather leads you to the threshold of your mind."
Khalil Gibran

Introduction

Many challenges have been brought by globalization and changes in society in these times known as Knowledge Age. An attempt for adaptation has been reflected in education where the significance of ideas, creativity and intelligence have taken an important place. The key elements of organization which influence the current stream in education are: integration, convergence and participative learning (Maasen, P. & Stensaker, B., 2010).

One of the priority skills of European citizens is the knowledge of at least two foreign languages. Educational authorities have recognized underlying values of the CLIL phenomenon and have recommended its integration to become a part of the mainstream education in the European countries. By implementing CLIL, schools can provide opportunities for promotion of foreign languages by the daily use and make language learning available for all students. The most outstanding among its benefits, if done properly, is the preparation of learners for the life in multicultural society by significantly improving language competences and by deepening tolerance and cultural awareness of the mother country, target countries and also other countries (Coyle et al., 2010).

This paper has been written in accordance with the research results which show the constructivist approach as a path leading towards the desired changes in the teaching and learning mathematics. In accordance with Hejny's viewpoint, we found constructivism in the heart of development and improvement of the mental world of a student (Hejny, 2009). Therefore, we incline to the opinion that learning mathematics requires a construction, not passive reception, and to know mathematics requires constructive work with mathematical objects in a mathematical community (Davis et al., 1990). Problem solving can be used as a tool which satisfies these conditions.

And yet, we are convinced that the key role in the educational process is still put on the teacher and his/her mindset, pedagogical convictions and beliefs, self-confidence and also his/her confidence in students. We highlight the fact that success of CLIL is closely related to the school, teacher and classroom characteristic features.

The main aim of this paper is to provide an insight into the fusion of problem solving and CLIL approaches, which can be regarded as a way directed at successful acquiring of competencies related not only to mathematics and language. The advance in this article is from general to particular - introducing the core features and characteristics of the problem solving and CLIL, then its links with Europe and Slovakia, followed by CLIL relations to the mental world of a learner. The will of a learner to learn, plays an important role in the process because (s)he can actively form the context around him/her (Popper K. R., 1994). The results of own qualitative quasi-experiment, which can serve as the stepping-stone for further qualitative or quantitative research are present as well.

1 Issue relevance

1.1 Problem solving and the collaborative problem solving skills

Problem solving skills and strategies have always had a prominent role in everyday life full of ill-defined problems that require high-level reasoning and organizational skills. As Forman suggests, some school activities have the potential to teach learners to deal with complex task (Forman et al., 1993).

In an appropriate context, collaborative problem solving allows for an effective division of labour; the incorporation of information from multiple sources of knowledge, perspectives, and experiences; enhanced creativity and quality of solutions stimulated by ideas of other group members (OECD, 2013). In order for learners to benefit from the problem solving and cooperation, it has to be of importance to them. One of the important consequences of Piaget's epistemological constructivism is that knowledge is always an answer to one's own problem (Piaget, 1971).

1.2 CLIL as a teaching approach

The acronym of the educational approach 'CLIL' is largely self-explanatory, it stands for Content and Language Integrated Learning. The term itself was introduced by David Marsh, University of Jyvaskyla, Finland (1994): *'CLIL refers to situations where subjects, or parts of subjects, are taught through a second language with dual-focused aims, namely the learning of content and the simultaneous learning of a foreign language*.' By second language we understand foreign, regional or minority language.

Paying attention to twofold aim - to develop proficiency in both subject areas, the broader scope needs to be dealt with, as it is expanded in *Content and Language Integrated Learning at Schools in Europe:* achieving two-fold aim requires development and use of the best practice methods because it is not teaching and learning *in* a foreign language but *with* and *through* a foreign language. *This implies a more integrated approach to both teaching and learning, requiring that teachers should devote special thought not just to how languages should be taught, but to the educational process in general* (Baidak et al., 2006). What distinguishes CLIL from some established approaches (such as content-based language learning) is the planned pedagogic integration of contextualized content, cognition, communication and culture into teaching and learning practice (Marsh et al., 2008). The provision of CLIL teaching may take many different forms. It may be regarded as 'early' or 'late' depending on the age of the children for whom it is intended. It may be considered 'total' if the entire curriculum is taught in what is termed the target language, or 'partial' if that language is the language of instruction for just some subjects (Baidak et al., 2006).

1.3 The present links with Europe

In Europe there seems to be present top-down pressure to enhance the outcomes in language education - this is reflected in many transnational documents, e.g. Rethinking Education: Investing in skills for better socio-economic outcomes (2012) or Developing Key Competences at School in Europe (2012) and many others. The OECD provided a framework to promote acquisition of collaborative problem solving skills (2013).

The promotion of the competencies related to collaborative problem solving is strongly driven by the need to prepare students for careers that require abilities to work effectively in groups and to apply their problem solving skills in these social situations (OECD, 2013).

One of the priority skills of European citizens is the knowledge of at least two foreign languages (Eurydice, 2012). In general, most countries associate CLIL with the attempts to reach the following aims:

- linguistic aims - enhancement of language skills which emphasise effective communication for real practical purposes;
- educational aims - stimulating the assimilation of subject matter by means of a different and innovative approach;
- socio-economic aims - preparing pupils for life in a more internationalised society and offering them better job prospects on the labour market;
- socio-cultural aims - conveying to pupils values of tolerance and respect vis-a-vis other cultures, through use of the CLIL target language (Baidak et al., 2006).

1.4 CLIL in the Slovak Republic

Slovakia has had long-term experience with CLIL approach, including various languages, and schools spread across the country. Bilingual education has been provided since the early 1950s in minority languages and since 1990s in foreign languages. In 2003 legislation related to specific aspects of bilingual education has been developed and laws have reflected the experience of the bilingual schools (Laukova, 2005). Slovakia, as a part of the European Union has implemented recommendations of the European Council (2005 onwards) that CLIL should be adapted as a major educational initiative.

CLIL is available at primary and secondary levels of education. Since 2008 to 2012 there was a pilot project Content Reform and Modernisation of Teaching Foreign Languages at Basic and Secondary Schools: Creating Conditions for Effective Application of the CLIL Methodology on CLIL which included 14 primary schools (Statny pedagogicku ustav, 2010).

An attempt for further implementation of CLIL was done in the years 2008-2010. In these years, the project team, in cooperation with the State Pedagogical Institute (Statny pedagogicku ustav) in Bratislava and MPC Bratislava, organized twelve teaching workshops for teachers of basic and secondary schools related to CLIL methodology and its applications in English teaching (Pokrivcakova et al., 2010).

Status of languages taught in CLIL (Baidak et al., 2006) in the Slovak Republic:

- foreign languages: English, French, German, Spanish and Russian;
- regional and/or minority languages: Hungarian, Ukrainian and Ruthenian.

In response to the current EU education policy, there is a growing demand to introduce CLIL to vocational and business schools. Synthesis of the professional and language skills is crucial for graduates to become successful in their occupations. It also contributes to the mobility which should be within the reach of everyone (Laukova, 2007). Ministry of Education in the

Slovak Republic recommends implementation of innovative methods and forms of education, such as creation of mind maps, project way of education, Content and Language Integrated Learning (Ministerstvo skolstva SR, 2013).

However, the shortage of training and recruitment of appropriate teachers is one of the major barriers to implement this method. Slovak teachers are not formally trained in CLIL approach and they are insufficiently qualified or competent. They can participate in short-term courses usually provided by foreign training institutions. To set-up in-service education is one of the issues concerning its future development (Kubes, 2011).

2 Philosophical, psychological and pedagogical background

2.1 The idea of Three Worlds

Any enrichment in the world of culture is the product of the mental activities of the individuals (Hejny, 2009). Unquestionably, the development and improvement of the mental world of a student is in the centre of attention of present day education. This section retreats from a curriculum and its demands on learners. It deals with an individual learner and outlines where this integrative fusion (problem solving and CLIL integration) meets his/her mental world and needs.

Hejny's modification of the Bolzano-Popper idea of Three worlds, originated in the philosophy, will serve us as the pedagogic and theoretical background (2009). These three worlds are

- World 1 - Physical world - the world of objects, nature, cars, molecules, animals,...;
- World 2 - Mental world - includes conscious and unconscious experiences and ideas of a man; the world of his mental states and process, hopes, fears, questions,...;
- World 3 - World of culture - products of human activity, thinking and human language. An idea belongs to this world when it becomes the part of the mental world of a few individuals *(local culture* - e.g. the idea is shared among students of the cSchool world - the ideal spirit of school, 'workshop of humanity' (Hejny, 2009).

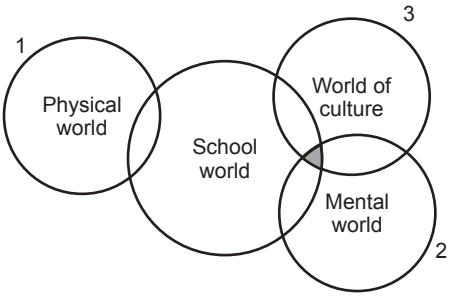

Figure 1: The *Three worlds* and their relations to the School world *Source*: Hejny's modification of *Three worlds* (Hejny, 2009)

In the figure, the intersection of the school world, world of culture and the mental world is emphasized - it is a scope where students and a teacher, and students together interact and communicate. In this sense, communication *is the expression of confrontation of ideas and concepts just coming to life*. In the course of communication, there occurs language learning and acquisition. Moreover, already formed language is transformed under its course. Communication is required by the collaborative problem solving task. And this is the scope in which we implement the target language (foreign, minority or regional). Phil Ball in his article *What is CLIL?* views language as a 'vehicle', not simply as an entity in itself. Language use is necessary to approach the content and so it becomes student's need and serves as driving force. More importantly, the acquisition of language takes place. We underline that language use takes place in the antagonism between the convention and the revolutionary step (Gadamer, 1999).

The problem should be as close as possible to the kind of learning which is alwaystthat appropriate support, scaffolding and guidance are provided, for which Vygotskij introduced the term 'zone of proximal development' (Vygotskij, 1978). Teachers' task is to maintain a balance between cognitive challenge for learners and appropriate and decreasing support as learners progress.

It is generally known that landmark works by Piaget, Bruner and Vygotskij led to the development of socio-cultural, constructivist perspectives on learning. Related areas such as multiple intelligence (Gardner), integration (Ackerman), learner autonomy (Holec, Gredler, Kukla), language awareness (Hawkins) and language learning strategies - played the key role in examining ways to raise levels of curricular relevance, motivation and involvement learners in education. (Coyle et al., 2010).

2.2 Process perspective

When solving a problem, students almost inevitably use words mentioned in the task. If the solution is done by writing, they have to memorize the word and then create it again - even this process requires brainwork. Also such simple activity as rewriting is has a positive impact on the students' learning (Spitzer, 2012). Moreover, putting just

learnt language to immediate use while learning and manipulating content makes CLIL a just-in-time approach as opposed to a just-in-case approach. Students are not learning a language for the sake of the language learning and future use (Coyle et al., 2010).

Problem solving, if relevant to the mental world of the learner, makes him search for a solution or a pattern without the certainty of its existence. It points out towards the higher general intellectual level of thinking not only related to mathematics. Additionally, in order to understand the problem it is necessary for students to construct representations (enactive, iconic or symbolic) of the problem. Many students do not understand mathematics because they do not construct representations (Hejny, 2009).

The fusion of these two approaches can be cognitively or linguistically demanding. Students have an opportunity to be engaged with words. It was shown that the more intense is engagement with words, the better is coding in the memory (Spitzer, 2012). Thus, even less proficient learners in the target language can benefit from the CLIL approach but their activity is required. With the help of the teacher or classmates they have to overcome the distress. Especially the novelty of the target language in a new context can cause anxiety of students and it can obstruct learning and self-actualization (based on Maslow's hierarchy).

Assuming that within a class not all the learners are at the same level of proficiency in English or Mathematics, working in pairs or groups can lead to interactive learning among students. In addition, since most of the communication in this type of tuition should be among students in small groups, it is expected to lower anxiety and fear.

Teacher's task is to secure safe and enriching environment and make tasks linguistically and cognitively accessible for students (Coyle et al., 2010). Language scaffolding - 'breaking down tasks into small steps, creating interest, providing constructive feedback, use of language frames, substitution tables, word banks, glossaries, use of native language, use of models for production of language' is one of the core features of CLIL (University of Cambridge, 2010).

CLIL and problem solving tuition can question the way how 'learners learns'. It has the potential to make them aware of their knowledge, the way of learning, understanding, controlling and manipulating their own cognitive processes. In other words, the tuition can enhance metacognitive skills.

2.3 Competencies' acquisition

Many studies showed that CLIL, done properly, has a profound impact on the acquiring of language competences (Coyle et al., 2010, Heine, 2010, Breidbach & Viebrock, 2012). Results of research works related to bilingual children indicate that these children have greater communicative sensitivity. To put it differently, they are more able to take into account situational factors and to react appropriately by correcting errors of sequencing and behavior (Ben-Zeev, 1977). One suggestion is that it is caused by the need to rapidly determine the choice of the appropriate language for a particular context (Baker, 1996). Bilingual children have better cognitive control over linguistic

operations (Bialystok, 1988) and greater sensitivity to semantic relationships between words (Cummins 1978) which fall within metalinguistic skills (Beardsmore, 2008). According to Vygotskij (1985) bilingual children distance themselves more readily from a given language. It makes a child more conscious of the relative nature of the conceptual filter through which a particular language gives meaning or verbal expression to the outside world.

There are some hypotheses which indicate that thinking in other language than mother tongue activates analyzing, evaluating and creating. These are higher-order processes of cognition (in accordance with Bloom 's taxonomy (1956) revised by Anderson and Krathwohl (2001)). Some studies related to cognition were conducted in Belgium. They propose that CLIL type programs help students to develop cognitive skills. They have the potential to produce more widespread creative answers, ranging from modest innovative changes to major creative endeavours (Braun, 2007). They have greater faculty for creative thinking at their disposal (Beardsmore, 2008).

Yet, the important question is: does it have an impact on better quality and more profound concept formation? How to secure correct grasp of the concepts? This field needs more researches to be carried out (Bonnet, 2012). Anyway, noticeable is the resemblance between target language acquiring through CLIL and mother tongue acquiring. The acquisition of mother tongue is closely related to child's interests and his various activities. A child creates his/her language when (s)he is dealing with complicated reality (Hejny et al., 2009, Vygotskij, 1985). CLIL in its nature brings us to the world that imitates the way how other language is created. Students are in close touch with the target language. They need to use language in order to be able to function in the environment. Together with a teacher they found themselves in the misty world of the form creation. Michal Ajvaz, writes about the polarity of the emergent and completed: only what is completed, what has been formed, has been given the right to be real. He continues that it is necessary to get rid of the fear and resistance to the impurity of the creation, and go back from the world of the completed forms (Ajvaz, 1997)Is not CLIL too demanding for the brain? In addition, an article by Ting (2010) deals with the CLIL impact on the brain information processes from the neuroscience's view. She suggests that it is compatible.

3 The quasi-experimental research

3.1 Methodology of the quasi-experimental research

Under our guidance altogether three different grammar schools classes had the opportunity to participate in teaching and learning Mathematics through via CLIL. The immersion program was entire and the tuition covered considerable parts of the thematic areas but not the entire ones. After the tuition, students filled out a questionnaire with open and closed questions. It aimed at capturing students' close observations of

the tuition. Moreover, we tried to estimate the intersection of their mental world with the tuition. Thereinafter we will refer to our research as quasi-experimental research, since the sample consisted of only 76 students.

Hence the observations and findings could serve as a basis for the further complex qualitative research and for formulating hypotheses for a later planned long-term quantitative research.

To determine students' connectedness to this kind of teaching and learning, we have adopted the Inclusion of Community in Self scale (Mashek et al., 2007) and modify it to our objectives. The scale is a single-item pictorial measure consisting of six pairs of overlapping circles, with each pair of same-sized circles overlapping slightly more than the preceding pair (see Figure 2). Participants were told that each circle on the left of the pair represented themselves, while the circle on the right represented the target, in our case it was either CLIL, Mathematics or English. Connectedness to the target at large was assessed by asking participants to 'circle the picture that best describes your relationship with the target at large'.

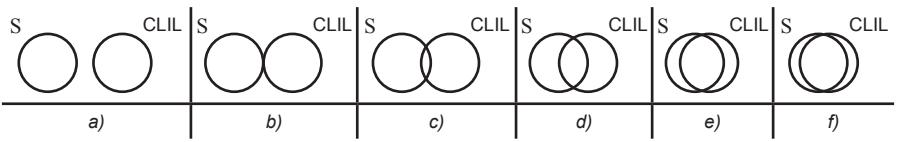

Figure 2: Self and CLIL The modification of the *Community in Self scale* (Mashek et al., 2007)

The scale measures relations directly and visually. Out of 74 students, 34 students were directly addressed the scale in all three targets (CLIL, Mathematics and English). The others filled out a questionnaire and on its bases we assigned the relation of the targets to their mental worlds.

3.2 Participants' prospective

During and after the tuition we were interested in students' perspective of the tuition, which advantages and disadvantages they acknowledged. Students' observations are as follows: • the tuition 'saves time'- simultaneous improvement in language and content;

- in order to communicate it is necessary to produce the language - students were exposed to situations which required genuine and spontaneous communication;
- in order to solve the task, students had to cooperate;
- the promotion of linguistic competency, which they became aware of, had an impact on building the self-esteem;
- the anxiety over studying in different than mother tongue is considerably lowered;

- students acknowledged ‘the language in practice’ which they considered absent in their English lesson;
- noticeable is the demand on profound reading and listening comprehension;
- a tuition was a step towards the autonomy in learning and facing the challenges;
- language barrier can reduce the time initially intended to spend on the mathematical problem solving and slow down the pace of the lesson;
- not proficient students in English felt obstacles to the content comprehension and it either led to their passivity or considerable struggling throughout the tuition.

3.3 Discussions

Students took delight in the deduction of the meaning of the words in tasks. Some students adopted negative attitude towards the tuition at the beginning of the course, but throughout the course, they found it compatible with their skills and so manageable and their attitude changed. They became aware of the immediate practice of the target language occurring in the tasks since they were asked to argument, interpret or reason their solutions. All students, regardless their proficiency in English, felt demand on their conceptual skills and some realized that the tuition made them think in English language. It was one of the most persuasive evidence of the value of the CLIL, as students claimed.

Since the language is the key to understand content, 67% of students saw language barrier as the potential problem for students who did not feel efficient in English. We found interesting that 14 % of the students thought that producing the language (their activity) was a disadvantage of the tuition. They rationalized this attitude as the result of their long-time low self-esteem in the language.

Many students (90% of the students) found the main contribution of this tuition, its positive impact on motivation towards the English language and Mathematics. 71% of students would welcome at least one more experience with the CLIL approach during the Mathematics lessons, 20% would not, and 9% was indecisive with regard to Mathematics, but they would welcome other content subjects to be integrated.

3.4 The relation of the target to mental world of the students

The next section describes the connectedness of learners to this kind of teaching and learning. The results, also depicted in the Figure 3, showed that the mode and the median of connectedness to CLIL, correspond to the relation depicted in d). The visualization of average is closer to c) in the Figure 2. These relations are comparable with connectedness with English language.

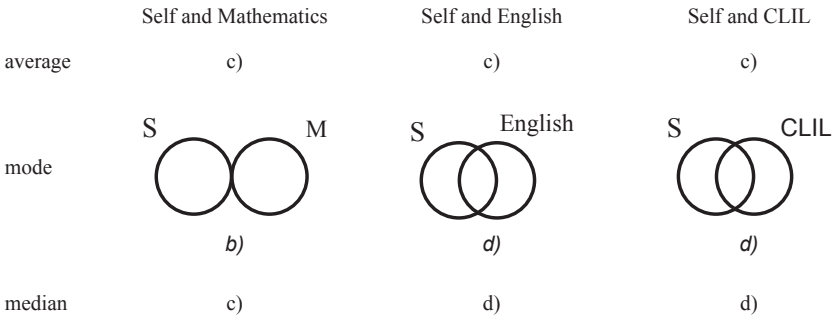

Figure 3: The relations to the mental worlds of students

The mode of overlapping of students' self with Mathematics corresponds to b), but the average is slightly more than this pair, visually closer to c) relation. The alarming is the fact that around 13% of all students circled the option a) when they express their relation to Mathematics. For the majority of these students, the source of stimulation for their activity was English language, as they expressed in the questionnaire.

4 Conclusion

In recent years, the Content and Language Integrated Learning with its acronym CLIL has become fast spreading across the Europe. Educational authorities have recognized underlying values of this phenomenon and have recommended its integration to become a part of the mainstream education in the European countries. The most outstanding among its benefits is the preparation of learners for the life in multicultural society by significantly improving language competences and by deepening tolerance and cultural awareness of the mother country, target countries and also other countries.

The main aim of this paper is to outline the skills and competencies related to problem solving and CLIL approaches. The paper refers to links with Europe and, in particular, with Slovakia. Then the paper retreats from society and its demands and deals with an individual learner and outlines where this integrative fusion (problem solving and CLIL integration) meets his mental world and needs from philosophical, psychological and pedagogical points of view. In qualitative quasi-experiment we tried to illustrate the relations of learners to the particular parts of the tuition. Of our interest was attitude of learners towards this type of educational provision. Via questionnaire, we map the attitude of learners and other information about the CLIL method from their point of view.

Obtained data have proved very encouraging. Students saw the necessity of being proficient in English language and improving their collaborative problem solving skills. They believed that CLIL could ensure being more receptive to multilingualism.

Some of them took the opportunity to enhance their education and personality development through building self-confidence when using the target language.

Our observations and suggestions are as follows:

- in order to take the most of it, students should be more aware of the benefits of the tuition before attending it;
- students who are not proficient in English should be prepare to work harder than in the previous courses;
- a teacher should not abandon the language demands but (s)he can lower them;
- many students have adopted a negative attitude towards mathematics but we believe that problem solving, if relevant to their needs and mental world, can improve it;
- students should be familiar with collaborative problem solving process in order to succeed and profit from it;
- although students are expected to be at the certain level of proficiency in the target language, the reality is different and it is teacher's serious task to keep students motivated and involved in the tuition;
- for students, who are fond of English language, the language serve as the incentive to the meaningful understanding of content and vice versa.

The observations and results of own qualitative quasi-experiment can serve as the stepping-stone for further qualitative or quantitative research.

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Сажетак: У последњих неколико година, учење које интегрише садржај и језик са скраћеницом **CLIL**, брзо се шири у Европу. Образовне власти су препознали вредности на којима почива овај приступ и препоручују његову интеграцију у опште образовање. У раду се наводе везе са Европом, главним принципима и њеним вредностима. Пружа се ближи поглед на ученика и објашњава се где се интегративна фузија среће са његовим менталним светом са филозофске, психолошке и педагошке тачке гледишта. Као средство користи се решавање проблема као значајан начин изградње математичкихи језичких знања и вештина. У раду

се наводе запажања и препоруке. Користећи резултате сопствених квази експерименталних истраживања и истраживачких радова широм света, рад показује зашто se CLIL квалификује за метод који га сврстава у иновативне методе које имају утицај на холистички развој личности ученика.
Кључне речи: CLIL, Математика, енглески језик, решевање проблема.

OLIVER ZAJKOV

Institute of Physics, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University

FADIL AJREDINI

Department of Physics, Faculty of Natural Sciences and Mathematics, State University of Tetovo

Republic of Macedonia

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REAL OR VIRTUAL EXPERIMENTS FOR BETTER UNDERSTANDING ELECTRIC CIRCUITS

Summary: Misconceptions that are created and built during studying electrostatics are good basis for new misconceptions related toelectric current and electric circuits. Computer with its features became inevitable tool for learning, obtaining better knowledge and fighting misconceptions. Free simulations, which can be use in the process of teaching and learning physics and science in general, are available on many internet sites. This article investigates the difference in knowledge gained with real experiments and virtual experiments i.e. simulations. The investigated students are from the second year gymnasium (tenth grade). The investigation reveals that the activities performed in the experimental groups contributed more in higher level thinking skills than the direct traditional teaching. Very often, real experiments initiate higher level thinking more than the virtual ones. Difficulties with symbolic problems are, also revealed.
Key words: real experiments, simulations, PhET, Ohm's law, misconceptions

1. Introduction

Misconceptions that created and built during studying electrostatics are good basis for new misconceptions related to electric current and electric circuits. As for the Ohm's law, there are many misconceptions among high school students as well as among university students. Very often students say that batteries filled with current (Stepans, 1996). There are students who think that while running through the wires, current is spent (Küçüközer et al., 2007), so its intensity lowers along the wire (Stepans, 1996; Beer, 2010).This effect is even more significant if the current flows through any kind of consumer (light bulb, motor, resistor etc.). Concepts of conventional flow and technical current also initiate misconceptions among student (Beer, 2010).

Computer with its features became inevitable tool for learning, obtaining better knowledge and fighting misconceptions.

Computer simulations are flexible and adaptive to the students' style of learning (Podolefsky at al., 2010). The key characteristics of the computer simulations – visualization, interactivity, context and effective use for calculations – are very effective help to the students in understanding abstract concepts of a certain area of physics (McKagan, et al., 2008;Ajredini et al., 2014). This achieved only by following set of principles for design (Adams et al., 2008a; Adams et al., 2008b).

Free simulations, which used in the process of teaching and learning physics and science in general, are available on many internet sites. Some of them are:

1. My Physics Lab (http://www.myphysicslab.com/)
2. Active online physics (http://wps.aw.com/aw_young_physics_11/13/3510/898586.cw/index.html)
3. Physics Simulations (http://apphysicsb.homestead.com/vls.html)
4. Physics Central – Physics Buzz blog http://physicsbuzz.physicscentral.com/2013/08/free-physics-games-and-simulations.html

The aim of this research is to investigate the difference in knowledge gained with real experiments and virtual experiments (simulations) among higher secondary school students i.e. gymnasium students, with age of about 16.

2. Methods and sample

2.1 The sample

The sample consists of second year students from three gymnasia, in three different places in Republic of Macedonia: Skopje, Tetovo and Valandovo. Two experimental groups and one control group are formed. The first experimental group consisted of 87 students. The classes in this group realized with real experiments and the group called *Real group*. The second experimental group consisted of 89 students. The classes were realized with computer simulations and the group is called *Sim group*. Traditional direct teaching used in the control group, which consisted of 58 students. The students' knowledge in all three groups measured with pre-test and post-test.

2.2 Students' activities

Lesson unit *Relation between the current and the voltage* was realized.

The students in the Real group divided into four groups, each consisting of 6-7 students. Previously directions with experiments and activities were prepared. After completing the activities, they presented the results and discussed them.

The students in the Sim group used PhET simulations*Circuit-construction-kit-dc*(PhET, Capacitor Lab, 2010) and Resistance in the wire (PhET, Resistance in a Wire, 2010). For the students in the Real group experiments were prepared with instructions. After the class, they discussed the results they obtained.

2.3 The test

To test students' pre knowledge and the knowledge acquired after the class, test created with seven questions, out of which five open ended questions and two multiple-choice questionswith one correct answer. The students had to give additional explanation for the answers to the multiple-choice questions. The students were pre-tested in order to measure the pre knowledge and the acquired knowledge measured by post-test. The same test was used for pre- and post-testing.

3. Results

In this section, we will look at the students' answers to each question in the test.

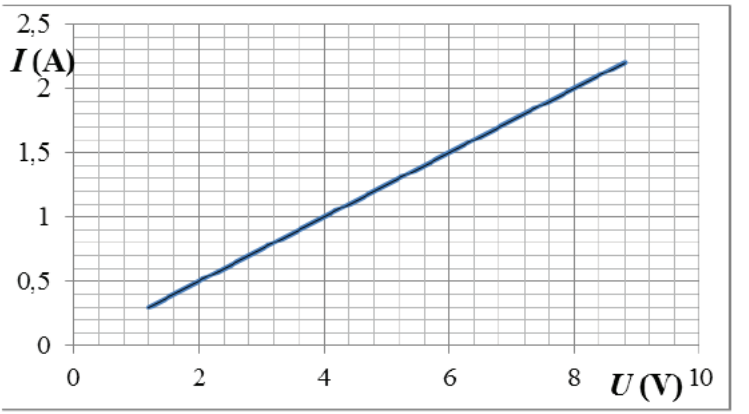

Figure Q1 Figure within question number 1

Q1: The relation between the current in a certain consumer and the voltage at its ends is presented in the diagram (fig. Q1). What is the resistance of the consumer?

Table 1. Distribution of answers to the question number 1 at the pretest and posttest for all three groups

	Pre-test (%)			Post-test (%)		
Group	Correct	Incorrect	Did not answer	Correct	Incorrect	Did not answer
Real	21	10	69	83	5	12
Sim	17	11	72	80	8	12
Control	16	0	84	50	29	21

The results show that all three groups have similar pre-knowledge, which is in the first, second and third level of Bloom's taxonomy.

Q2: Order the resistors by current, starting from greater I_1 to lesser I_4 (fig. Q2).

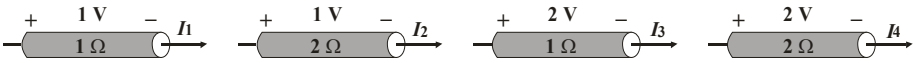

Figure Q2 Figure within question number 2

Table 2. Distribution of answers to the question number 2 at the pretest and posttest for all three groups

	Pre-test (%)			Post-test (%)		
Group	Correct	Incorrect	Did not answer	Correct	Incorrect	Did not answer
Real	19	31	49	71	9	21
Sim	19	35	46	68	7	25
Control	12	33	54	32	29	39

Maybe this looks like a third level question, but it requires comparing, which is in the level of analyzing and enters the higher-level skills.

Q3: If you have constructed real electric circuit like the one in the fig. Q3, how can you determine the resistance?

a) After the batery is connected, anohmmeter can be used,
b) Before the battery is connected, an ohmmeter can be used,
c) Current and voltage can be measured and then Ohm's law can be used to calculate the resistance,
d) Two of the mentioned methods can be used.

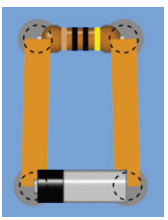

Figure Q3 F igure within question number 3

Explain your answer.

Table 3. Distribution of answers to the question number 3 at the pretest and posttest for all three groups

	Pre-test (%)					Post-test (%)				
Group	A	B	C	D	Did not answer	A	B	C	D	Did not answer
Real	16	33	21	3	27	7	16	40	36	2
Sim	20	24	34	8	14	7	10	59	20	3
Control	19	35	35	5	5	18	11	61	7	3

61% of the students in the control group, 59% of the students in the Sim group and 40% of the students in the Real group related the answer only to the usage of the Ohm's law. During the classes in any of three groups, for measuring resistance the ohmmeter not used at all.

Q4: A circuit connected as in fig. A. If a resistance connected as in fig. B, the light bulb will:

a) shine more
b) shine less
c) nothing will be changed

Explain your answer.

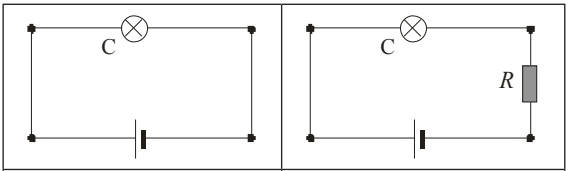

Figure Q4 Figures within question number 4

Table 4. Distribution of answers to the question number 4 at the pretest and posttest for all three groups

	Pre-test (%)				Post-test (%)			
Grop	A	B	C	Did not answer	A	B	C	Did not answer
Reual	24	47	15	15	17	78	0	5
Sim	46	25	17	13	22	73	2	3
Control	39	44	12	5	21	50	18	11

Some of the students related the answer to the Ohm's law.They have written the formula for both of the circuits and draw a correct conclusion.

Q5: All conducting wires presented in the fig. Q5 are made of same material. Order them by resistance, starting from greater $R_1$to lesser R_5.

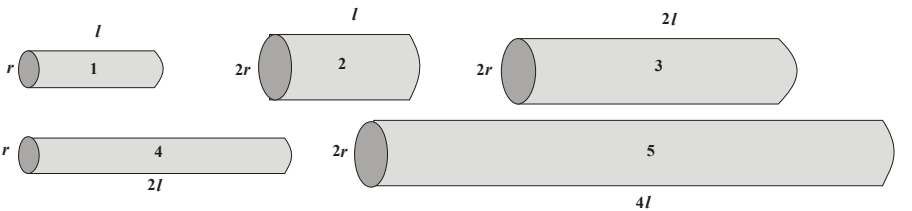

Figure Q5 Figure within question number 5

Table 5. Distribution of answers to the question number 5 at the pretest and posttest for all three groups

	Pre-test (%)			Post-test (%)		
Group	Correct	Incorrect	Did not answer	Correct	Incorrect	Did not answer
Real	1	39	60	59	14	28
Sim	0	42	58	47	29	24
Control	0	33	67	18	36	46

The pre test shows equal pre knowledge of the students in all three groups. The post-test shows that the students in the Real group have best response. It expected the students in the Sim group to have best result, concerning the beautiful visualization in the simulation *Resistance in the Wire*. Reason for this can be too simple activity that this simulation enables. It did not require by the students too much engagement in the measurements, nor in the analysis of the results. It is obvious that the visualization by itself is not enough to give better quality knowledge.

Q6: Why light bulbs burn up more often when we close the circuit (switch on) than when we open the circuit (switch off)?

Table 6. Distribution of answers to the question number 6 at the pretest and posttest for all three groups

	Pre-test (%)			Post-test (%)		
Group	Correct	Incorrect	Did not answer	Correct	Incorrect	Did not answer
Real	0	4	96	5	41	53
Sim	0	6	94	2	29	69
Control	0	7	93	7	64	29

The distributions of the answers at the pre test are almost uniform. Most of the students did not give answer at all. Although the percents of the students who gave answer at the posttest are much bigger than at pretest, the percents of the correct answers at the posttest are still very small.

Q7: In your laboratory, you need resistor with a given resistance. Explain how you could make such resistor. What information you need for this?

Table 7 Distribution of answers to the question number 7 at the pretest and posttest for all three groups

	Pre-test (%)			Post-test (%)		
Group	Correct	Incorrect	Did not answer	Correct	Incorrect	Did not answer
Real	0	2	98	53	12	35
Sim	0	3	97	27	3	70
Control	0	4	96	11	14	75

Most of the students did not explain the procedure in details, but they gave the information they need to fulfill the task. Those answers take as correct. There was not any example given during the classes, which involves this kind of problems. Thus, we can say that the influence of the real experiments on the application of the knowledge in new situations, which means higher order thinking, is very much obvious.

3. Discussion

Working with graphs is very important skill. Analyzing graph data is a higher level of thinking. When talking about misconceptions related to working with graphs, GAP (Graph-As-Picture) effect be mentioned (Murphy, 2000). In this case, students see the graph as apicture instead of graph, which shows relation between two quantities. In mechanics, students see the graph as a trajectory of the object (Zajkov et al., 2003). Luckily, the relations between the displacement, position, velocity and time are not subjects of interest in electromagnetism and GAP effect is not visible here. Still, students have problems with using graphs. The research activities in the experimental groups required organizing presenting data in graphs and tables. This gave the students additional knowledge and skills, which they have used to give the answer to the first question. Thus, it is not difficult to calculate the resistance from the graph for students who understand graphs. For many of the students it is difficult to explain how resistance influences the behavior of the electric circuit (Duit et al., 1997/98). This can be direction for new future activities. In their explanations, students usually say that, "*the electric current is inversely proportional with the resistance*", which is not discussed further. Conditions in which this claim works and how these changes affect the circuit not analyzed. An example of graphic representation of current versus voltage dependence given in the textbook, but there is not any activity proposed which will encourage students to read and apply this diagram.

At first sight, the process leading to the answer of the second question may seem that involves third level activities, according to the Bloom's taxonomy. However, the students have to compare and make assessment, which without any doubt are higher-level activities.

Although in any of three groups ohmmeter not mentioned at all, the Real group has best response of all three groups. During their activities, they meet measuring devices called multimeters, measuring device with several measurement functions i.e. it can measure current, voltage and resistance. In the process of getting acquainted with the devices and preparing for the experiment, students have probably noticed that this instrument can measure resistance, but they have not given significance to this. This is good example of unconscious learning. During this process, the data are stored in the background, unconsciously. The information about the ohmmeter has been probably on the margins of their minds, but they have used it properly the moment they needed. This kind of research activities in the process of learning gives additional knowledge, which, at the moment of learning has not been in the focus, but comes out of the memory when it is needed. It also gives contribution to developing of intuition. It is clear that students have intuitively concluded that "if there is a device with which resistance can be measured and if *ohm* is unit for measuring resistance, then this device is probably ohmmeter". The importance of research activities in learning found very important by other authors as well (Kallunki, 2009).

This experimental experience is again evident in the fourth question with the intensity of the light bulbs. Although the students from experimental groups did not investigate the intensity of the light bulbs, they were able to use investigation of the dependence of current on the voltage and relate it with the intensity of the light bulb. Both, real and virtual experiments gave almost equal contribution in understanding this relation, unlike other researchers, who find that virtual experiment give more contribution in mastering concepts then the real ones (Koopmans, 2010; Finkelstein, et al., 2005).

This investigation again reveals that the knowledge acquired in the primary school is short term. The concepts that students studied only two years ago almost completely forgotten. Moreover, the responses on the posttest show that only part of the students have mastered the concepts. The interviews and discussions performed after the posttest show that students have difficulties in solving symbolic problems, which is in accordance with other researches (Torigoe, 2012). Probably, symbolic problems are more mathematics to the students than physics and it makes problems while students try to clarify the concepts (Redish, 2005). On the other hand, teachers give symbolic problems to the students, thinking that it will help them to come to the essence of a certain phenomenon (Burk, 2014).

Students did not give deep explanation about the reason of light bulbs burning. They did not analyze the situation of the filament before switching on, the change that the filament goes through during switching on and finally, condition at the end.

In a situation when students have to create, they enter deeply the higher order thinking area. Creating product, like resistor, means the students have to go through all level of knowledge and skills. None of the higher level can be reached without mastering the lower levels.

4. Conclusion

This research shows that the activities performed in the experimental groups contributed more in higher level thinking skills than the direct traditional teaching. Very often, real experiments initiate higher level thinking more than the virtual ones.

Textbook authors should pay particular attention on the activities with graphs. In a situation when there is a lack of such activities, teachers should create ones and encourage students in using and applying them.

The research showed that change in the order of the units should be done. According to the curriculum and the textbook, students study about resistance first and after that about relation between current and voltage, the Ohm's law. The order should be reversed, because when talking about resistance, possibility for indirect measurement using Ohm's law is mentioned in the textbook. Moreover, introducing resistance as a coefficient of proportionality in the process of discovering the formula:

$$R = \rho \frac{l}{S}$$

where, **ρ** is specific resistance, ***l*** is the length of the conductor and ***S*** is the cross section area of the conductor, is more natural way, then the one used in the textbook.

Teachers should pay attention to choose simulations, which enables investigation. This means to choose virtual experiments instead of virtual demonstrations.

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Сажетак: Мисконцепције које су створене и изграђене током учења електростатике су добра основа за нове мисконцепције у вези електрике и електричних кола. Рачунар је са својим карактеристикама постао неизбежан алат за учење, стицање бољег знања и борбе против мисконцепција. Слободне симулације, које могу да се користе у процесу наставе и учења физике и природних наука уопште, доступне су на много интерент сајтова. Овај рад истражује разлике у знању које је стечено путем реалног експеримента и виртуелних експеримената као што су симулације. У истраживању су учествовали ученици другог разреда гимназије. Истраживање открива да активности које је вршила експериментална група развијају више

нивое мишљења у поређењу са традиционалном наставом. Врло често, стварни експерименти производе виши ниво мишљења у поређењу са вуртуалним. Примећене су такође, потешкоће са симболичним проблемима.
Кључне речи: стварни експерименти, симулације, PhET, Омов закон, мисконцепције.

NATAŠA BRANKOVIĆ
Faculty of Education in Sombor,
University of Novi Sad
Serbia

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ASSESSMENT STRATEGIES IN EARLY SCIENCE TEACHING

Summary: Contemporary strategies for student achievement assessment in early science teaching have mutual characteristics that differentiate them from traditional strategies. Firstly, they are more focused on descriptive data which direct teachers and students towards improving their work. This paper studies ways in which teachers can use assesment in a more productive manner. That means shifting from evaluating what as learned to assessment **for** learning and assessment **as** learning. The efficient forms of assessment used in early science teaching that are used for specific domains of learning target, such as objective test's tasks, class discussions, concept maps, guidelines for task performances, projects, problem tasks, observation, assessment scales and students' reports will be especially studied and reinforces by examples. The necessity to train the students in the early phase of science teaching to self-grading and self-assessment is emphasised, which, among other, implies the importance of explaining the criteria for assessment of successfulness of self and someone else's work, as well as the role of self-assessment as the means of monitoring of one's own learning.
Key words: Assessment strategies, early science teaching, assessment as learning.

Introduction

The important element of student's satisfaction and degree of learning motivation is the way in which the process of assessment is performed, that is the methods and procedures the teachers apply in assessment, as well as their attitude towards assessment and grading. The assessment provides information on student's learning. The teacher learns about student's progress not only from formal tests and projects but by continual monitoring of student's actions in class. In order to evaluate student's knowledge, abilities and attitudes in science teaching, the teacher must use various techniques, approaches and instruments. Furthermore, the adequate assessment manner influences the creation of a positive work environment in class. Positive work

climate is visible when students explain their homeworks or raise hands in class. The teacher, among other, may be satisfied only when a parent gives feedback on his work by saying, for example: " My kid talked about what you did in class. Never before he didn`t talk so much about school", or when students decide that the classroom is a better place for them than school corridors or yard are. Scarce research on assessment in Serbia show that teachers have various assessment criteria, that the majority of them have milder criteria when evaluating lesser students, that they apply grades as disciplinary measures and that grades from other subjects guide their assessment (Malinić, Komlenović, 2010).

Therefore, the change of focus in assessment is necessary in early science teaching (Table 1).

Table 1. Change of the focus in assessment

What should we have less in the assesssment process?	What should we have more in the assesement process?
Assessment of what is easy to measure.	Assessment of what has the highest value in science teaching.
Evaluation of scientific knowledge.	Evaluation of scientific understanding.
Assessment to discover what student doesn't know.	Assessment to discover what student knows.
Assessment as an exclusive activity of teachers.	Student's engagement in this part of the teacher's work.

Establish a clear connection between learning targets and assessment

The initial conditions for modernisation of assessment process is explanation of learning targets, that is, their concretisation. Many of the students wonder, for themselves or out loud: "Why are we doing this?" or "Why do I have to learn this now?" and teacher's answer should foreshadow learning targets. For example: "We are going to a park so that you could show how much you are able to observe the plants around you and record what you see on your own."

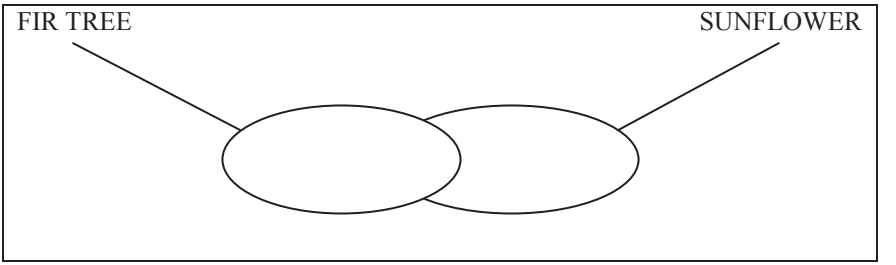
Afterwards, if, for example, the students, are given the task to find out something about the occurrences in nature, flora or fauna from encyclopaedia, each student can do it in his own way.

In the end, it happens that students pay attention to various things, some to detail, some to the main idea. Therefore, it is important that the teacher clearly states what he or she expects from the students, in other words, what should students focus their attention on. (Anderson, 2013). The most important effect of specific and precise formulation of goals to students is development of ability to monitor own learning and assess personal success in learning.

Besides establishing a clear connection between the learning targets and assessment, it is important that the assessment form corresponds to the level or the type of learning. If we wish to check how much students know certain facts about occurrences in nature or a certain object, multiple choice and alternative answers should be used instead of essay questions should not be used. On the other hand, if we wish to see how developed are the students creative abilities, and simultaneously let them apply what they learned about the characteristics of the studied material, we will ask of them to construct the solution (for example, make the boat out of plasticine, matches and paper). One important ability of students in science teaching is the ability to compare two objects or occurrences. When formulating comparison task, the students should be asked to compare, but, in the very form of the task, the form of Venn diagram should also be introduced to students in junior classes (example below):

- Compare the following plants (picture of sunflower and picture of fig tree). Use the picture below when answering. First, in the middle of the diagram write what these two plants have in common (for example, they grow, feed...). Secondly, write only the characteristics of sunflower in the area market as "sunflower" and only the characteristics of fig tree in the area marked as "fig tree".

Figure 1. Venn diagram



Three categories of contemporary assessment process

Contemporary assessment has three extremely important categories: summative, diagnostic and formative. *Summative* assessment sums what student learned. It is expressed by points or grade and includes tests and final project grade. Summative assessment has no option for learning increase. Its downside is that you have to wait until the end of one part of learning to check what the student had learned about something, which is simply too late. *Diagnostic* assessment is applied by the teacher to check student's prior knowledge and ability level, to identify student's misconceptions, to indicate student's interests and discover learning styles desired by the students. Diag-

nostic assessment provides information that help teachers in planning and preparing different instructions. Since this assessment has a diagnostic purpose a teacher does not evaluate the result. It is about assessment before teaching. For example, before he or she starts a lesson about behaviour of materials in water, a teacher could hand out drawings of a water container and by its side objects made of different material. The students have the task to arrange the object in the container, depending whether they sink or not, on the surface or at the bottom. By evaluating this task, teacher can establish student's prior knowledge before presenting chosen program content and use such kind of assessment for diagnostic purposes.

In the situation of diagnostic assessment can use: a pre –test, concept maps, K-W-L diagrams **(***Table 1*). *K-W-L-H (KNOW-WANT-LEARNT-HOW) organiser* introduces the students to learning framework by which they can check their basic knowledge. This organiser may be used as an individual or group strategy, but also when the students want to check their knowledge individually, before sharing it with others.

- K - „know" indicates to a student a reminder of what he already knows about a certain subject.
- W - „want" exists in order to help a student determine what he wants to learn.
- L - „learned" exists for a purpose to help a student identify and think about what he will learn at the end of a subject or an activity.
- H - „how" stands to help a student remind himself of how he learned something, that is to establish a connection between what he had learned and how he had done it on a metacognitive level.

Figure 2. A Graphic organizer (K-W-L-H)

K-W-L-H			
What I **know?**	What I **want** to find out? (discover)	What I **learned** about it?	**How** I learned it?

Formative assessment always goes with the instruction for students since a teacher gives a specific feedback to a student which he can use to improve his learning. Formative assessment includes formal and informal methods, such as a quiz, oral examination, teacher's observance, students' construction of concept maps and reports in the form of portfolio . Contemporary assessment is summative the least. (McTighe, O´Connor, 2005). Formative assessment promotes learning that helps a student answer three questions: Where am I going? Where am I now? and How can I reduce the gap between the two?

When the process of formative assessment is concerned, the students are equally important as the teachers in the process of providing information.

What are the necessary components of formative assessment?

- Formative assessment starts with a clear explanation of learning target to students;
- The students receive feedback about their work, which helps them understand where they are in terms of desired learning targets;
- The students participate in self-assessment;
- Formative assessment enables understanding of specific steps that enable the students improve their work.

The strategies of formative assessment

Strategy 1:*To provide a clear and understandable vision of learning target.* It is necessary to discuss learning targets with the students before any learning directions are given, using a language comprehensible to students. This is provided in such a way to show the students what is implied under the term quality when it comes to their work. If the learning target is to train the students to systematically observe a natural occurrence, then the goal is to write an observance report in as comprehensive manner as possible. During the process, it is good to ask the students what they think it is that makes a comprehensive observance report, that is help them identify the concept of a good report. For example, at the beginning of the unit about a human as a living being, the teacher should describe to students two tasks that he or she will use to grade their achievements. In the first task, the teacher will use a multiple choice test and in the second will ask the students to design a two day proper diet menu. The first task, a *test* is a typical summative assessment while the second task demands from a student to apply his knowledge on the authentic situation and this is the task that enables a student to explain the reasons behind his menu, discuss its possible improvement and provide intensive students' activity. In that way a student focuses on what he should be able to do with his knowledge, contrary to the test where a student focuses on what his teacher expects him to learn.

Strategy 2: *Use examples for good and bad results*. The students must know what excellent examples look like in order to know which direction the should progress to. In application of this strategy, the students should be asked to evaluate the work of some unknown student and to discuss his work using comprehensible language. Such practice will help a student develop self-assessment abilities.

How to introduce students to assessment work?

1. Hand out assessment instructions to students which will enable them to evaluate the quality of their product on their own.
2. Choose a certain aspect that will be evaluated.
3. Show typical examples to students.
4. When students sum the points on their own, divide them in groups and enable them to use proper language to explain the reasons for receiving certain grades and practice self-assessment is such a way.

The situation that is rather frequent is when a students gets a certain grade and the parents ask him what that grade meant (a smiley or a numeric grade). A student usually is not trained to describe his strengths and weaknesses related to knowledge or some other achievement factor. That requires application of certain strategy to enable students' self-assessment.

Authentic tasks used to cherish such assessment practice and which *imitates learning* are open cloze tasks and they do not require unique correct answer. To evaluate this type of tasks it is necessary to use columns which describe characteristics of each grade level (number of points). Such columns are of great use to students too, since in that way they know the criteria upfront and have a clear learning goal. Therefore, students do not have to assume or guess what is most important to teacher when he or she evaluates or which method will he or she use to evaluate their work.

Strategy 3: *Always enable students a descriptive grade*. The teachers usually reduce the feedback by saying ,"4+, Great work!" or ," You did not put enough effort into it!". A correct feedback points out success and at the same time gives instructions how to correct procedures (Bloom, 1984). Grades given in signs (+.., 1-5) do not tell a student which part he should improve. One of simpler actions in applying feedback can be the so called traffic lights, that is grading using green, yellow or red colour to determine the level of assistance needed.

Traffic Light Self Assessment (5-11 age)

Students should be encouraged to self-evaluate and carefully think about their learning even in the early years of science teaching. At the end of each unit, so called traffic lights self-assessment system can be used. At the end of each unit students draw a circle and write:

- Red light – I`m stuck; I need some extra help;
- Yelow light – I`m not quite sure; I need a little help and I have asked the person next to me
- Green light – I understand fully; I'm okay without help.

In such way we find out how the students understood programme content, and encourage them to think about their learning as well.

Feedback which is desired and supports assessment for learning is a descriptive feedback or formative feedback. It gives students information about their learning which have power to change the way students work and lead them to success. (Brookhart, 2010). This kind of feedback is motivational in general.

Strategy 4: Teach the students self-assessment and setting goals. If we use descriptive assessment, the students model such opinion that is necessary to them as self-evaluators. The next step is that the students are given a task and are instructed in the practice of self-assessment and setting goals. During that, it is useful to describe

to the students both strengths and weaknesses of their work before letting them shape self-assessments. A certain form shown next can be of great use (Figure 3**).**

Figure 3. Student Self-Assessment Form

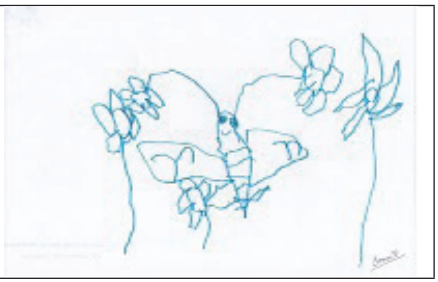
Name Date
Sudent Self- Assessment
Assignment _____
Write about you did.
What where you trying to learn?
_____
How did you start your work?
_____
What materials did you need? _____
What did you learn? _____
Check the sentences that describe your work.
__ I made a plan befor e I began my work.
__ I was able to do the work.
__ I did not understand the directions.
__ I followed the directions but got the wrong answer.
__ I found a different way to do this assignment.
__ I could explain how to do this to someone else.
__ The work was easier than I thought it would be.
__ The work was harder than I thought it would be.

Assessment scales and check lists are useful instruments for students' self-grading and self-assessment.

Guidelines for Scoring Student Work

If a student cannot explain what he drew (in a science teaching that is a certain model that shows the solution to the problem, a figure, a score table, etc.), teacher can encourage a student with the following questions:

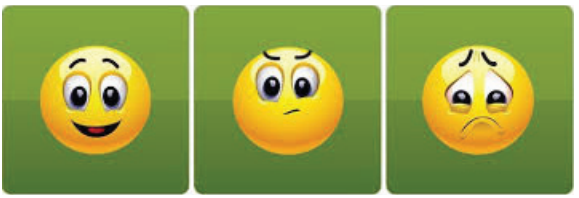
- Can you tell me about your picture?
- Can you tell me what is happening in the picture?
- Can you show me where you...?
- What made you think about drawing your picture like this?
- Can you explain how you thought about this problem?



Smiley Self Assessment (5-11)

Self-assessment by smileys is an efficient and interesting way for students in early science teaching to develop their self-assessment abilities. It would be wise to use it on a daily basis, at the end of each unit. To get younger children involved in evaluating their work and understanding, we can use a *smiley face system* that each child does on their work at the end of session...:

Figure 4. Smile face system



Strategy 5: Design lessons to focus on one aspect of quality at a time. This strategy can be shown in the following example: Let us say that the students have to be trained to plan a scientific research and that it is important that they assess the quality of their hypothesis. If this formulation is problematic, the students can practice hypothesis formulation, give each other feedback and assess good and bad sides of their research outlines.

Effective Assessment

At the very start of presenting a new module or a unit, the teacher should plan assessment strategies, that is, to determine what it is that he or she will be assessing, why and how the assessment information will be used, who will have access to them, what assessment techniques or tasks will enable a student to show what he had learned. The effective assessment is multidimensional and based on the criteria a student know and understands. In order for assessment to be effective, it should be a collaborative process between a teacher and a student.

What I want my students to learn?

What can they do to show what they learned?

It is important to mention here what a teacher is assessing: procedural knowledge. declarative knowledge, attitudes, or something else. When declarative knowledge is discussed, in science teaching this kind of knowledge is not that important, meaning that memorising facts is less important than understanding and applying knowledge, that is, understanding the context. For example, it is not that important that the students know the definition of the term "ecology", but it is very important that they understand the importance of taking care of animals and plant in certain habitats. On the other hand, the procedural knowledge is related to the ability , skill, process

and procedures in knowledge acquirement. Besides the final product, which is usually assessed by the teachers, it is very important that the teachers assess and evaluate students' procedural knowledge, which may be identified only when a student is in action, by discussing with him, as well as by student's reports. Students' attitudes may be assessed when they have the chance to present them.

An important characteristic of effective assessment in science teaching are the tasks which the teacher creates in such a way that they provide the necessary context where the students can present their procedural knowledge. Actual life situations are the most suitable context that a teacher should use, bearing in mind that a student has an opportunity to get in contact with various resources.

Effective assessment is *assessment for learning*. It demands mastering the techniques of recording and analysing of learning results. For each work change it is necessary to gather students achievement and success results and interpret them afterwards (Anderson, 2013).

Table 2. Effective assessment

Assessment goal	**Assessment means**	**Who is assessing**
Assessment of learned	Tests, essays, reports, oral examination	A Teacher
Assessment for learning (formative assessment)	Observation, question in class, exercises, work diaries, self-assessment, mutual student grading, practical exercises	A Teacher with students' participance
Assessment as learning	Individual monitoring of learning, individual errors correction, self-regulation	A Student

Assessment management in a classroom

Assessment certainly is a great challenge for every teacher. What kind of system could help a teacher successfully manage assessment in a class?

- A teacher must gain ability to give effective and precise comments to students about their achievements. Thereat, it is important to give a comment to a student in such a manner that the student immediately uses this feedback
- Provide conditions for a discussion with a student(students)
- Time dedicated to assessment should be treated as time used for teacher's and students' learning.
- Creation and use of check lists for assessment.
- Cooperation with a student in terms of students inclusion in self-assessment.
- Cooperation with other teachers in creating and exchange of assessment instruments.

- Electronic devices as an assessment aid. Besides computer programmes, those may be videos that a teacher will use to find information about a student during observance of his class activity.

The knowledge in the field of science most often cannot be checked using traditional assessment instruments. Even in early science teaching, learning through mini projects and use of cooperative teaching methods should be used the most. This manner of learning programme contents is a precondition to stimulate assessment as learning. Sato and Atkin (2007) indicated to practice where teachers use strategies to assess concepts and abilities, such as effort, creativity, as well as affective outcomes. They point out that traditional assessment cannot assess motivation, students participation, dedication or attitudes, which alternative strategies can.

Managing the assessment of student project in science teaching demands monitoring a number of steps in order to create certain categories to assess student achievement in project teaching method:

1. Choosing an adequate subject (based on educational goals and standards).
2. Defining tasks.
3. Determining dimensions that will be assessed. For example, if we want to create columns to assess research reports, then we might assess reports, content, style, etc.
4. It is necessary to identify three different degrees of achievement for every dimension. For example, one dimension can be research and the degrees of achievement may be:
   - advanced = at least three sources;
   - medium= at least two sources;
   - basic= only one source.
5. Points/numbers and words (such as advanced, medium, basic, etc.) as an assessment scale for learning achievements.
6. Adding a column that sums the points of each dimension, as well as a total score.
7. Handing out copies with these columns to students at the beginning of their tasks, so that they clearly have in mind how their achievement will be assessed.

Cooperative learning provides opportunities for learning in a different manner. It enables a teacher to perceive those outcomes that do not belong to conceptual development. In cooperative learning a teacher communicates with small groups and that gives him or her an opportunity to listen to their students. Cooperative learning types also demand a certain manner of assessment of students achievements. A lot of techniques of cooperative learning that may be applied to different levels of education and in various subjects were developed by S. Kagan. Only those that can increase students self-assessment ability will be sampled here:

- *Three step interview*: Each member of the group picks different member for his or her partner. During first step, a student interviews his partner asking him questions about the subject. In the second step, they switch roles while in the third step members of the group share their answers in the team; *A three minute report*: during his lecture, a teacher stops at any point during the lesson related discussion and gives the teams three minutes to make a report on the subject of discussion;
- *Pair check*: in the first step, students think in silence about the question or task they were given from the teacher. The second step implies exchange of opinions in pairs and in the third step pairs share their conclusions with other pairs or groups, or just within their own group; this technique is suitable for review classes;
- *Circle reporting*: this technique is suitable for subject systematisation; it is first necessary to display posters on the blackboard or the walls, with the title of the subject related to the matter; each group has its colour which they use to write for a minute everything they know about the subject; afterwards they move onto another poster and continue in circle; however, before a group starts writing on posters with a certain subject, they must read what previous group wrote on the subject and if they have anything to add do it in their colour. In the end, a student from each group reports on specific subject (Kagan, 1994).

Conclusion

It is certain that assessment in science teaching in Serbia will remain traditional, that is will be defined as *assessment of learned* for some time in the future. Findings and examples, as well as the principles exposed in this work, have the idea to actuate thinking about introducing different assessment – *assessment for learning*, that is *assessment as learning*.

Contemporary strategies for assessing students achievements in the early science teaching are directed more to descriptive data which guide teachers and students to improve their work. These strategies should provide a general picture of what a student understands, how able is he to perform it and how he applies the knowledge he gained. The strategies used for assessment in science teaching are based on project estimation, quality of essays which describe course of students observance or research, content of concept folder, portfolio, etc. Fensham (2004) points to learning outcomes which science teachers should consider as very important. The alternative strategies can enable the students to show results in various ways, such as drawing or writing, observation and communication. Such outcomes should be assessed as a special aspect that is an important part of assessment (McMillan J, Myran S & Workman D, 2002).

Interactive approach to learning provides that students build their confidence in the atmosphere where their everyday knowledge is valued and their interests respected. This influences climate in the class and gives new learning opportunities. Alternative assessment strategies provide assessing of more than just students knowledge on scientific concepts and a holistic approach to understanding of science teaching.

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Сажетак: Савремене стратегије за процену постигнућа ученика у почетној настави природе имају заједничке карактеристике које се разликују од оних традиционалних стратегија. Прво, оне су више усмерене на описне податке којима се наставник и ученик усмеравају

да побољшају свој рад. У овом раду разматрају се начини како учитељи могу продуктивније користити оцењивање. То значи померање од оцењивања наученог према оцењивању за учење и оцењивање као учење. Посебно ће бити размотрене и примерима поткрепљене ефикасне форме оцењивања у почетној настави природе које се користе за поједине домен наставних циљева: задаци са објективних тестова, дискусија на часу, појмовне мапе, упутства за извођење задатака, пројекти, проблемски задаци, посматрање, скале процене, ученички извештаји. Истакнута је неопходност оспособљавања ученика у раној фази образовања за природне науке за самооцењивање и самоевалуацију, што између осталог подразумева важност објашњавања критеријума за процену успешности сопственог и туђег рада, као и улогу самооцењивања као начина праћења сопственог учења.

Кључне речи: стратегије вредновања, рано учење природних наука, вредновање као учење.

GORDANA HAJDUKOVIĆ-JANDRIĆ
Primary School "Miroslav Antić", Futog
DUŠANKA Ž. OBADOVIĆ
Faculty of Education in Sombor,
University of Novi Sad
MIRJANA SEGEDINAC
MAJA STOJANOVIĆ
Faculty of Sciences, Department of Physics, Novi Sad
Serbia

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EFFECTS OF APPLIED TEACHING INSTRUCTIONS IN ACTIVE TEACHING OF PHYSICS ON EFFICIENCY OF ADOPTION OF TEACHING CONTENTS

Summary: The purpose of this study was to investigate the effects of two types of teaching instructions: traditional and experimental ones - *the problem-solving* and *scientific methods of teaching*, as teaching instructions in active teaching of physics. The results of the research performed in order to examine the effects of teaching instructions applied during physics classes on overall educational performance and understanding the aspect of the nature of science and scientific research in relation to traditional teaching are presented. The research was conducted as a pedagogical experiment of parallel groups, on a sample of sixth - and eighth graders. Final test result analysis shows a positive trend in understanding almost all aspects of the nature of science in the experimental groups.
Keywords: problem solving teaching, scientific method, teaching instruction

Introduction

Researches conducted in schools have showed that of all school subjects, physics is the hardest and least favoured subject among students (F. Ornek, at al., 2008). The concepts studied are abstract, not easily understood and often completely unknown, and high level of math skills are required to solve them. Students are confused by terms they are familiar with from experience, or having other meanings (mass and weight, density and viscosity, force and power). To understand physics one needs to understand and be familiar with the scientific method, and in the absence of such an approach, students find it difficult to understand the cause and effect relationships in physics that are necessary for understanding the teaching material (Morgan J. T, at al. 2012).

One of the major outcomes of education for all students at the age of 15, was the creation of the basis of scientific literacy.

The subject matter of this research is the effect of two types of two types of teaching instructions: traditional, and active teaching of physics. This paper shall present *the problem-solving* and *scientific methods of teaching*, as teaching instructions in active teaching of physics in selected areas.

The comparison is illustrated by the example of teaching and learning in the areas of *Pressure* in the grade six and *Electric currant* in the grade eight.

In other words, the research should monitor the effects of problem-solving teaching and the scientific method, as an independent variable, to monitor educational performance, as a dependent variable.

This research is aimed to determine:

- Consider a theoretical aspect of problem solving teaching and scientific method, their characteristics, levels, principles, establish their position in the educational systems
- to determine the differences in achievements of students in relation to application of traditional teaching or instructions based on active teaching methods in physics teaching (problem-solving teaching and scientific method based on simple experiments)
- whether students at the age of primary school are able to create an adequate view of the natural science and the specificity of scientific research.

Research method and process:

The research was conducted as a pedagogical experiment of parallel groups, with two experimental and one control group. The research was conducted on a sample of sixth - and eighth graders of "Miroslav Antic" and "Desanka Maksimović" Primary Schools in Futog.

Descriptive method was applied when examining theoretical assumptions, practical solutions and obtained results.

The scientific method, as an experimental factor, was examined in the physics classroom in "Desanka Maksimović" School. There is also a classroom used for teaching physics at this school but it is not so well equipped compared to the one at "Miroslav Antić" School. The scientific method with and emphasis on simple experiments that can be performed even at poorly equipped schools was used.

The topic "Electrical current" of crucial importance in programme contents was selected for the eighth grade. Programme tasks give greater importance to this specific topic then to the remaining material. This teaching unit contributes to the development of logical and dialectical thinking in students, and provides sci-entific and dialectical approach to the teaching. In the sixth grade The topic "Pressure" was selected for the sixth grade which the students learn at the end of sixth grade, when they have already acquired a basic knowledge of physics. The number classes dedicated to processing and reinforcement i.e. repetition was determined on the basis of the curriculum.

Regarding the control group, the classes were implemented using the traditional teaching and for their implementation only sketches of the class "in the usual way" were prepared.

The determined initial conditions were used as the basis for determining the group's equivalence.

The above analysis showed that the two groups (experimental and control) in the sixth and eighth grades as well were fairly uniform and the observed differences cannot significantly affect the results of the experiment.

In the preparatory phase of the research methodically designed algorithms for the implementation of problem solving and scientific method were made for the introductory and explanatory classes and for repetition or reinforcement of selected educational contents as well. Any written elaboration of the teaching unit includes: knowledge that students should acquire, educational tasks, experiments, teaching materials/resources, teaching methods and the very class. Using these algorithms the classes were implemented at all levels, different ways of creating a problem situation were used, with a focus on the experimental one. Using the results obtained by a theoretical analysis of learning through problem solving of their own experience, it was concluded that the most effective way to develop a problem solving process is as follows: posing a problem-hypothesis-decomposition of a problem-solving a problem (verification of the hypothesis)-conclusions-testing acquired knowledge in new problem situations. Deviations from this general structure of the lesson occurred only in teaching units that did not offered the possibility of complete problem processing.

Methodical morphology of these classes is based on the reasoned opinions about solving a problem as a form of effective learning. Throughout the class the teacher's activity is oriented towards encouraging students to come up with solutions, discussing with students, uninterrupted stream of thoughts, but intervenes giving his/her suggestions when he/she notices that students are moving away from significant or when their discussion does not seem to result in a solution of the problem.

The assumption for the classes which were implemented using the scientific method is that the learning problem is formulated in accordance with the process of creation of scientific knowledge (Давыдов, 1992) and that solving it a student in a concise and abbreviated form repeats the process that led to the creation of scientific knowledge. In this way, the student does not acquire knowledge in its final form, but discovers and realizes the real process that leads to their creation in science. Applying the same methodology that led to the formation of knowledge and concepts in science, the student puts himself/herself in a similar situation a scientist was in, thereby overcoming some (not all) of the contradictions that arise in this process.

The teacher proposes situations that allow students to meaningfully explore. He/she directs the students, but does not do anything instead of them, allows them to express and discuss their opinions, takes part in process of reaching a conclusion, and then puts the findings in the context of scientific knowledge. Special attention is given to linguistic expression.

Results of performed research

Student achievement in relation to the applied teaching instruction

Problem solving teaching

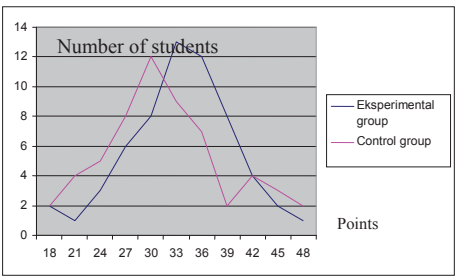
After the performed experiment the results obtained were statistically processed.

The achievements of students in relation to whether traditional teaching or instruction based on active learning method in the physics classes – problem solving teaching was used are shown below.

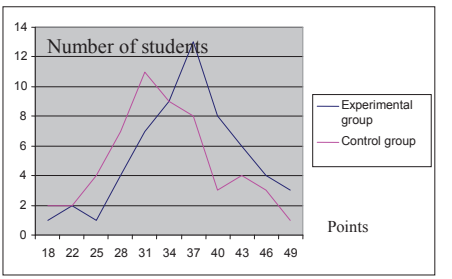
Experimental group, grade 6				Control group, grade 6			
N	$\overline{X}$	σ	V%	N	$\overline{X}$	σ	V%
60	33.50	6.25	18.65	58	27.76	7.29	26.25

Experimental group, grade 8				Control group, grade 8			
N	$\overline{X}$	σ	V%	N	$\overline{X}$	σ	V%
58	36.41	6.74	18.51	54	28.33	6.87	24.25

Table 1



Grade 6



Grade 8

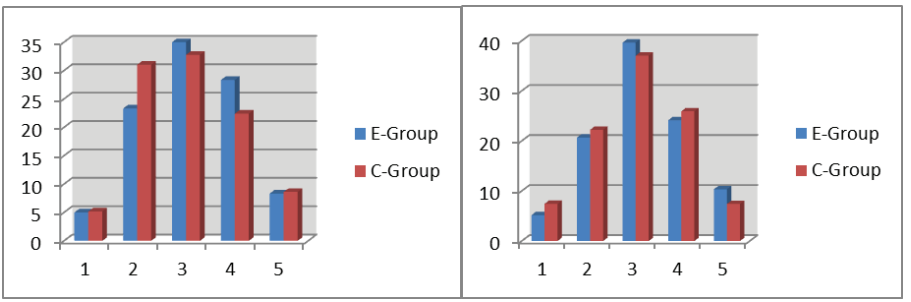
Polygons 1.

It can be seen that the mean value of points per student belonging to the experimental group of the sixth grade is 33.5 while the corresponding number of points for students in the control group 27.76. It can be concluded that the performance of problem solving teaching is 5.74 points i.e. 17.13%.

The test results in both groups are in line with the law of the Gaussian curve, and based on the obtained data the conclusions about the significance of difference between arithmetic means can be drawn. The above graphs show that more students have obtained better result in the experimental group. If we observe the steep side of the group E curve which corresponds to poorer results, it can be seen that it is significantly shifted to the right compared to the same part of the group C curve. It can be concluded that there is a larger number of students achieved poor results belongs to the group C (19 students scored below 25 points in the control group, while in the group E only 6 of them).

If we compare the mean number of test points scored in the eighth grade experimental group, 36.41, with the corresponding value of the control group, 28.33, it can be seen that it is higher for 8.08 points per student i.e. 22.19%. If we look at the results of the eighth grade students in experimental and control groups presented by the polygon and it can be seen that both curves tend towards symmetry in the normal distribution but the results of the experimental group are significantly shifted towards higher performance.

The test results in both groups are in line with the law of the Gaussian curve, and based on the obtained data the conclusions about the significance of differences between arithmetic means can be drawn. The above graphs show that more students belonging to the experimental group have obtained better results. If we observe the steep side of the group E which corresponds to poorer results, it can be seen that it is significantly shifted to the right compared to the same part of the group C curve. It can be concluded that there is a larger number of students achieved poor results belongs to the group C.



Grade 6 *Grade 8*

Histograms 1.

The experimental group evaluation criteria were more stringent than control group ones. That was the result of different mean values and standard deviations in both groups. The effects of experimental factor can easily be observed from the histograms enabling qualitative analysis of pedagogical experiment conducted. Higher percentage of sufficient grades can be noticed in the control group than the experimental one, while higher percentage of very good grades can be noticed in the experimental group. The difference in relation to excellent and insufficient grades between experimental and control groups is

insignificant. If we look at the second histogram and we can see the difference between the results of experimental and control groups. We do notice higher percentage of sufficient and very good grades in the control group than in the experimental group, while the experimental group observes a higher percentage of good and excellent grades. The number of insufficient grades was also higher in the control group. It is obvious that the experimental factor with the eighth grade students did not equally affect all populations of students, but here as well it can be said that the effects on all students were positive.

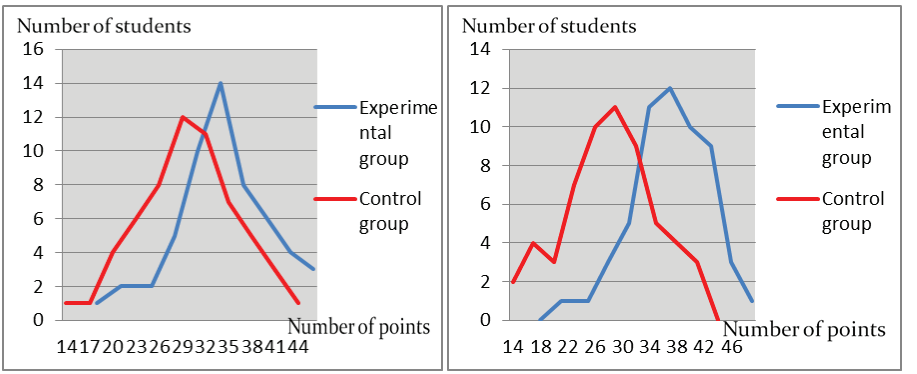
Scientific method

The achievements of students in relation to whether traditional teaching or instruction based on active learning method in the physics classes – scientific method was used are shown below.

Experimental group, grade 6				Control group, grade 6			
N	$\overline{X}$	σ	V%	N	$\overline{X}$	σ	V%
57	34.74	6.67	19.19	59	28.81	6.37	21.37

Experimental group, grade 8				Control group, grade 8			
N	$\overline{X}$	σ	V%	N	$\overline{X}$	σ	V%
56	37.09	5.60	15.09	58	28.17	6.74	23.92

Table 2.



Grade 6 *Grade 8*

Polygons 2.

It can be seen that the mean value of points per student belonging to the experimental group of the sixth grade is 34.74 while the corresponding number of points for students in the control group 28.81. It can be concluded that the scientific method performance is 5.93 points i.e. 20.58%. Both curves tend to be symmetrical in the normal distribution with the difference that the results of the experimental group shifted to higher results. As for the curve peaks in the experimental group it corresponds to higher values, higher number of points and a higher frequency.

The above graphs show that more students belonging to the experimental group have obtained better results. Maximum number of scored points in the experimental group is 49 while in the control group it does not exceed 44. If we observe the steep side of the group E curve which corresponds to poorer results, it can be seen that it is significantly shifted to the right compared to the same part of the group C curve. It can be concluded that there is a larger number of students achieved poor results belongs to the group C (11 students scored below 25 points in the control group, while in the group E only 5 of them).

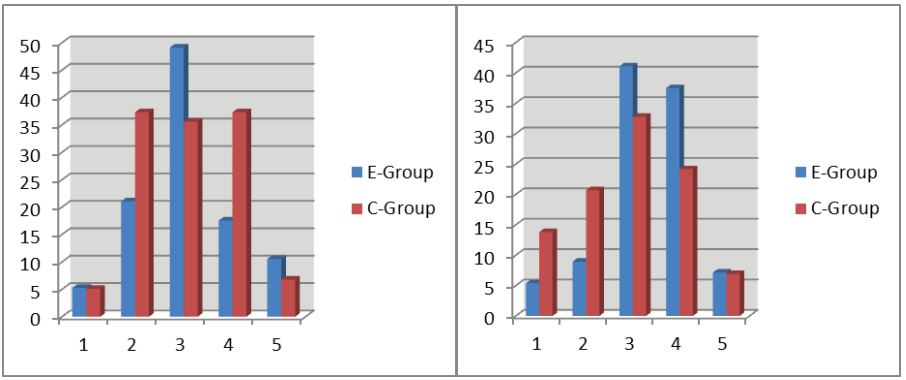
The above graphics show that more students have obtained better results the experimental group. In the experimental group, the maximum number of points won by 49 in the control group, this number does not exceed 44, Looking at the slope of the E group which corresponds to weaker results can be observed that it is significantly shifted to the right compared to the same part of the group C curve. It is noted that in the group C a larger number of students with poor results (below 25 points in the control group has 11 students, while in group E has only 5).

As for the students of the eighth grade, it can be seen that the mean value of points per student belonging to the experimental group is 37.09 while the corresponding number of points for students in the control group 23.92. It can be concluded that the scientific method performance is 13.17 points i.e. 26.34%

Here as well both curves tend to be symmetrical in the normal distribution with the difference that the results of the experimental group shifted to higher results. As for the curve peaks in the experimental group it corresponds to higher values, higher number of points and a higher frequency. The above graphs show that more students belonging to the experimental group have obtained better results. Maximum number of scored points in the experimental group is 49 while in the control group it does not exceed 43. If we observe the steep side of the group E curve which corresponds to poorer results, it can be seen that it is significantly shifted to the right compared to the same part of the group C curve. It can be concluded that there is a larger number of students achieved poor results belongs to the group C (16 students scored below 25 points in the control group, while in the group E only 2 of them).

As for the students of the sixth grade, higher percentage of sufficient and very good grades can be noticed in the control group than the experimental one, while higher percentage of good and excellent grades can be noticed in the experimental group

(histrogram 2). The difference in relation to insufficient grades between experimental and control groups is practically nonexistent. It can be concluded that the experimental group students scored between 30 and 40 points, while the majority of control group students scored between 25 and 35 points. It is obvious that the experimental factor did not have the same affect on every student population but it can be said that the effects on all students were positive.



Grade 6 *Grade 8*

Histograms 2.

Applying the same qualitative analysis of the results of the pedagogical experiment with the eighth graders, comparing the histograms, the difference between the results of experimental and control groups can be notices. Higher percentage of sufficient and insufficient grades can be noticed in the control group than the experimental one, while higher percentage of good and very good grades can be noticed in the experimental group. The number of excellent grades is somewhat higher in the control group. Which means that a higher percentage of experimental group students scored between 32 and 44 points, while higher percentage of control group students scored between 22 33 points.

It is obvious that the experimental factor with the eighth graders did not have the same affect on every student population. The greatest affect was made on good and very good student population.

Understanding the aspects of the nature of science and scientific research

Understanding of the aspects of the nature of science and scientific research has been measured by the adapted version of the POSE (Perspectives on Scientific Episte-

mology) questionnaire (Abd-El-Khalick, 2002). Since it did not contain the scientific subjectivity and social impact on science as aspects of science, the experimental version of the questionnaire was amended by the VNOS-c (Views of Nature of Science) questionnaire (Lederman 2002) and adapted to the age of respondents.

Questions within the questionnaire are open-ended, while the classification of responses has been performed for each scientific aspect of nature. The responses have been classified as "naive" (no answer or the answer is not in accordance with the scientific nature), "transitional" (the answer is partly in line with the scientific nature) and "informed" (the answer is in accordance with the nature of science).

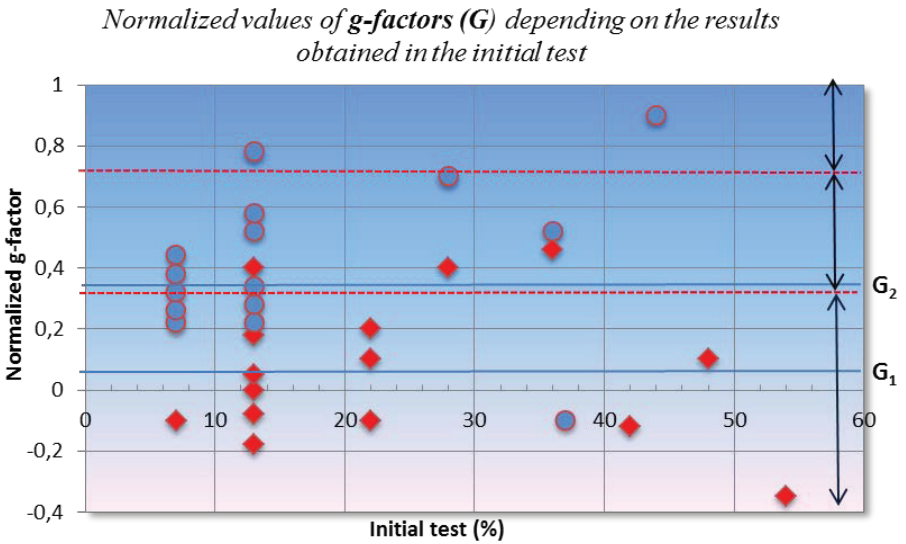
The results obtained in the initial test for the experimental and control groups do not differ either in meaning or quantitatively for certain aspects of the nature of science. According to the assumed methodology, nearly 68% of students have a "naive" view of the nature of science, while 27% of students are have a partially correct view. Only a small number of students, only 5% of the total sample had the correct vision of science.

Results of the final test indicate a positive trend in understanding of almost all aspects of nature of science in the experimental groups. The analysis was conducted based on the g-factor (Hake, 1998), which is defined as the ratio of absolute success of test results and overall success possible in relation to the results of the initial test. Analysis of the results indicates that the level of knowledge of the way of the formation of scientific knowledge in all aspects of the nature of science is more prominent in the experimental group.

The graph 1 shows higher concentration of g-factor in the area between as well as above the value of mean g-factor for each student in the experimental group, while the success of students in the control group is concentrated mostly in the area of low and medium g-factor, with a tendency of negative values of the success factors. Negative values indicate that some students after the experiment are less successful in understanding the nature of science than before the research. This trend is more pronounced in the control group. The results suggest that the teaching which includes elements of nature of science (problem solving teaching and scientific method) result in significant progress in the knowledge of the aspects of nature of science in relation to traditional teaching.

Most aspects of the nature of science are applicable to the elementary level, except for the aspect of "subjectivity and objectivity," as well as the aspect of "scientific theories and laws." These results are less prominent in the final test as well, so they need to be introduced in the later stages of scientific education.

The current elementary curriculum of physics does not contain contents related to the nature of science, so one could say that this means they are acquired exclusively through involvement in research work.



Graph 1.

G_1 – mean level of *g*- factor in control group - experimental group
G_2 – mean level of *g*- factor in experimental group - control group

Conclusion

Results obtained by the research suggest that educational instruction incorporating elements of nature of science (problem solving teaching and scientific method) in comparison to the traditional teaching produces better results in terms of student achievement as well as in terms of understanding the nature of science and the specificity of scientific research.

Through teaching based on problem solving as an experimental factor, better achievement of students in the experimental group has been achieved, both for students in the sixth and eighth grades. Increase in the educational performance by 17.13% and 22.19% is relatively high, although if you take into account the long-term performance of teachers on the use of these methods as well as the preparedness of students, it might be expected that the increase will be much greater than the previous studies shown.

The scientific method as an experimental factor also resulted in better success of the experimental groups from both the sixth and eighth grades. The level of knowledge in the sixth grade was higher by 20.58%, while in the eighth grade by 26.34% than the level of knowledge of the students who were taught by traditional methods.

The results obtained indicate that the scientific method as an experimental factors produced a slightly more significant impact than the teaching based on problem solving.

Considering that the aim of the study was only to determine whether the students of primary school age could create an adequate view of the nature of science and of the specific nature of the scientific research, the differences between groups, and the statistical significance of the difference between them was not calculated. However, it is noticeable, that in all aspects of the nature of science higher level of success was achieved in the experimental groups.

Such teaching fosters opinion instead of mechanical memorization of scientific knowledge but also provides progress in writing, verbal expression and in reasoning.

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Сажетак: Предмет овог истраживања су ефекти два типа наставне инструкције: традиционалне, и експерименталне - проблемска настава и научни метод као наставне инструкције у активној настави физике. Приказани су резултати истраживања спроведеног са циљем испитивања утицаја примењених наставних инструкција у настави физике, на резултат укупног образовног учинка као и разумевање аспеката природе науке и научног истраживања у односу на традиционалну наставу. Испитивање је извршено као педагошки експеримент типа паралелних група, на узорку шестих и осмих разреда Утврђено је постојање значајне разлике у нивоу усвојености наставних садржаја као и позитиван тренд разумевања скоро свих аспеката природе науке у експерименталним групама
Кључне речи: проблемска настава, научни метод, наставна иснтрукција.

УПУТСТВО ЗА ТЕХНИЧКУ ПРИПРЕМУ РУКОПИСА

Часопис *Норма* објављује оригиналне научне, прегледне и стручне чланке, као и студије, прилоге, грађу, хронику и библиографију, из области науке о књижевности, педагогије, дидактике и методика разредне и предметне наставе, под условом да нису претходно објављени или понуђени за објављивање некој другој публикацији. Уколико је рад претходно био изложен на научном скупу у виду усменог саопштења (под истим или сличним насловом), податак о томе треба да буде дат у посебној напомени, по правилу, при дну прве странице чланка. Радови у часопису објављују се на српском или енглеском језику. Радови на српском језику биће штампани на екавском или ијекавском књижевном наречју, ћириличним, односно латиничним писмом, уколико аутор инсистира на томе. Приспели рукописи пролазе поступак анонимног рецензирања од стране два рецензента.

Рукопис би требало да буде исправан у погледу правописа, граматике и стила. Радови на српском језику, понуђени часопису *Норма,* стандардизују се у складу с измењеним и допуњеним издањем *Правописа српскога језика* Митра Пешикана, Јована Јерковића и Мата Пижурице (Нови Сад: Матица српска, 2010). Осим правописних норми, утврђених овим правописом, аутори у припреми рукописа за штампу треба да се придржавају и следећих начела за припрему текста:

Изглед и обим рада

Рукопис чланка треба да има следеће елементе: а) наслов рада, б) име и презиме аутора, назив установе у којој је аутор запослен, в) резиме, г) кључне речи, д) текст рада, ђ) литературу и изворе, е) резиме на енглеском језику, ж) прилоге. Овај редослед датих елемената уједно је и обавезујући. Радови који представљају краће прилоге, грађу, приказе и сл. поред основног текста садрже име аутора и наслов.

Наслов рада треба што верније и што прецизније да реферише о садржају рада. У интересу је аутора да користе речи прикладне за индексирање и претраживање. Уколико таквих речи у наслову нема, пожељно је да наслов прати поднаслов, који би био информативнији у погледу садржаја. Наслов треба да се налази на средини странице, обележен верзалним словима.

Име и презиме аутора штампа се изнад наслова, уз леву маргину, верзалом. Имена и презимена домаћих аутора увек се наводе у изворном облику, независно од језика рада. *Назив и седиште установе* у којој је аутор запослен наводи се испод имена и презимена аутора. Ако је аутора више, мора се назначити из које установе потиче сваки од наведених аутора. Функција и звање аутора не наводе се. Службена адреса и/или електронска адреса аутора даје се у ендноти, која је звездицом везана за презиме аутора. Ако је аутора више, даје се само адреса првог аутора. Подаци о пројекту, односно назив програма у оквиру којег је чла-

нак настао, као и назив институције која је финансирала пројекат или програм, наводе се у посебној ендноти, која је двема звездицама везана за назив установе у којој је аутор запослен.

Поред тога, почетна страна рада треба још да садржи и *резиме* и *кључне речи*. У резимеу на српском језику, који не би требало да премаши 1500 словних знакова, неопходно је укратко представити предмет истраживања, циљ, примењену методологију, као и резултате научног истраживања. Резиме дати испод наслова, с левом маргином увученом 1 cm у односу на основни текст (односно подједнако увученом као први одељак основног текста). *Кључне речи* (до десет речи) наводити испод резимеа, с истим поравнањем као и резиме. Препоручује се да се оне одреде с обзиром на терминолошке речнике датих струка, као и то да учесталост кључних речи (с обзиром на могућност лакшег претраживања) буде што већа. Осим тога, неопходно је резиме и кључне речи превести на енглески језик, на крају текста. Уколико аутор није у могућности да обезбеди коректан превод, треба да напише резиме на језику на коме је написан и рад, а уредништво *Норме* обезбедиће превод. Уколико је рад написан на страном језику, резиме и кључне речи треба превести на српски језик.

Текстови треба да буду писани фонтом Times New Roman, 12 pt, проред 1,5, с маргинама од 2 cm са сваке стране. Табеле, цртежи и дијаграми дају се као засебни документи, а у самом тексту се, римским бројевима, јасно означава место на коме ови прилози треба да се налазе. Табеле се прилажу у MS Excel формату (.xls), а цртежи и дијаграми у графичком .tif формату, резолуције 300 dpi. Читави радови (тј. основни текст рада, списак референци, резиме, кључне речи, као и *Summary* и *Key words*) не би требало да буду дужи од 30 000 словних знакова, рачунајући притом и празна места. Редакција задржава право да објави и прилоге који премашују предвиђени обим уколико то захтева поступак научне елаборације садржаја.

Навођење у основном тексту рада

а) Наслови посебних публикација (монографија, зборника, часописа, речника и сл.) који се помињу у раду штампају се курзивом на језику и писму на којем је публикација која се цитира објављена, било да је реч о оригиналу или о преводу.

б) Пожељно је цитирање према изворном тексту (оригиналу) и писму. Уколико се цитира преведени рад, треба у одговарајућој напомени навести библиографске податке о оригиналу.

в) Презимена страних аутора у тексту наводе се транскрибовано (прилагођено српском језику), сходно правилима измењеног и допуњеног издања *Правопис српског језика*, а када се страно име први пут наведе, у загради се даје оригинални начин писања у угластој загради, нпр. Нил Гејмен [Neil Gaiman], осим уколико је име широко познато (нпр. Јан Амос Коменски), или се изворно пише исто као у српском (нпр. Цветан Тодоров).

г) Упућивање на библиографску јединицу у основном тексту рада обележава се тако што се у загради наведе презиме аутора и година издања текста који се наводи – уметнутим библиографским скраћеницама у изворном облику и писму (Lévi-Strauss 1958), (Савић 2003). Уколико се дословно наводи извор, потребно је уз референцу навести и број странице (Савић 2003: 157). Када навод захвата неколико суседних страна цитираног текста, између бројева страна ставља се примакнута црта (Rosandić 2005: 332–334). Ако се навод односи на несуседне стране, бројеви страна одвајају се зарезом (Петровић 2008: 355, 453, 461).

д) Уколико се један аутор наводи више пута, наводи се према години издања, од најстаријег ка најновијем раду. Уколико се пак наводи више издања истог аутора из исте године, уз годину се додају словне ознаке „a, b, c…“, на пример (2001a, 2001b), како у основном тексту, тако и у попису литературе.

ђ) Уколико библиографски извор има два аутора, у уметнутој библиографској напомени наводе се презимена оба аутора (Дотлић, Каменов 1996), за библиографску јединицу чији је пуни опис: Дотлић, Љубица и Емил Каменов *Књижевност у дечјем вртићу*. 1. изд. Нови Сад: Змајеве дечје игре – Одсек за педагогију Филозофског факултета, 1996.

е) Уколико пак извор има три или више аутора, у уметнутој библиографској напомени наводе се презимена прва два аутора, док се презимена осталих аутора замењују скраћеницом et al. Примера ради: Осим тога, појам „доживотног образовања“ приписује се Џону Дјуију, али овај концепт почиње се шире користити тек пошто га је преузео и популаризовао UNESCO (Düerr et al. 2002).

ж) Цитати из дела на страном језику, у зависности од функције коју имају у раду, могу се наводити на изворном језику или у преводу, с тим да одабрани начин цитирања мора се доследно примењивати.

з) Ако се у загради упућује на радове два или више аутора, податке о сваком следећем раду треба одвојити тачком са запетом, нпр. (Rosandić 2005; Николић 2009).

и) Фусноте, обележене арапским цифрама (иза правописног знака, без тачке или заграде), дају се при дну странице у којој се налази део текста на који се фуснота односи. Могу садржати мање важне детаље, допунска објашњења, коментаре на текст навода и сл. Оне саме не користе се за навођење библиографских извора цитата или парафраза датих у основном тексту, будући да томе служе упућивања на литературу у заградама.

ј) За прилоге преузете с интернета у основном тексту наводи се, осим презимена аутора, и година када је прилог преузет (Егорова 2011), док се пун библиографски опис даје у попису литературе на крају рада.

к) Уколико је реч о зборнику радова, ставља се у загради презиме аутора цитираног рада (Барић 1972: 124).

Цитирана литература

На крају рада даје се списак референци, који треба да обухвата само и искључиво референце наведене у тексту. Библиографске јединице (референце) наводе се по азбучном или абецедном реду презимена првог или јединог аутора како је оно наведено у парентези у тексту. Прво се описују азбучним редом презимена првог или јединог аутора радови објављени ћирилицом, а затим се описују абецедним редом презимена првог или јединог аутора радови објављени латиницом. Ако опис библиографске јединице обухвата неколико редова, сви редови осим првог увучени су удесно за два словна места (висећи параграф). Презимена страних аутора наводе се у оригиналу само уколико је и цитирани текст преузет с језика оригинала.

Референца у књизи треба да садржи презиме, име аутора, наслов књиге написан у курзиву, издавача, место издања и годину издања, овим редоследом: Презиме, име аутора. *Наслов књиге.* Податак о имену преводиоца, приређивача, или некој другој врсти ауторства. Податак о издању или броју томова. Место издавања: издавач, година издавања. На пример:

Петковић, Новица. *Огледи из српске поетике*. 2. изд. Београд: Завод за уџбенике и наставна средства, 2006.

Rank, Oto. *Mit o rođenju junaka: pokušaj psihološkog tumačenja mita*. Preveo s nemačkog Tomislav Bekić, Novi Sad: Akademska knjiga, 2007.

Уколико библиографски извор има два или више аутора принцип навођења у попису литературе је следећи:

Дотлић, Љубица и Емил Каменов. *Књижевност у дечјем вртићу*. 1. изд. Нови Сад: Змајеве дечје игре – Одсек за педагогију Филозофског факултета, 1996.

Фототипска издања наводе се с подацима како о првом, тако и о поновљеном издању:

Презиме, име аутора. *Наслов књиге.* Место првог издања, година првог издања. Место поновљеног, фототипског издања: издавач, година репринт издања.

Пример:

Мразовић, Аврам. *Руководство к славенскому красноречију*. Будим, 1821. Нови Сад – Сомбор: Матица српска – Учитељски факултет, 2002.

Литература у зависном формату (ред у часопису, тематском зборнику, текст из периодике и сл) наводи се по следећем принципу:

Презиме, име аутора. „Наслов текста у публикацији“. *Наслов часописа* број свеске или тома (година, или потпун датум): стране на којима се текст налази.

Ćalović, Dragan. „Teorija medija kao naučna disciplina: predmet i ciljevi“. *Kultura: časopis za teoriju i sociologiju kulture i kulturnu politiku* br. 124 (2009): 143–152.

Барић, Хенрик. „Трагика у песми о Хасанагиници“. *Народна књижевност*. ур. Владан Недић. Београд: Нолит, 1972, 119–125.

Монографска публикација доступна online наводи се по следећем принципу:

Презиме, име аутора. *Наслов књиге*. <адреса с интернета>. Датум преузимања.

Пример: Rhyman, Geoff. *253: a novel for the Internet about London Underground in seven cars and a crash* < http://www.ryman-novel.com> 10.10.2011.

Текст из серијске публикације, доступне online, наводити по моделу:

Презиме, име аутора. „Наслов текста.“ *Наслов периодичне публикације*. Датум периодичне публикације. Име базе података. Датум преузимања.

Левич, А. П. „Общая теория систем как метатеория теоретического научного знания и темпорологии.” *Пространство и время*: физическое, психологическое, мифологическое. Москва: КЦ «Новый Акрополь» (2006): 70-88. <http://www.chronos.msu.ru/RREPORTS/levich_metateoria.htm> 13.10.2011.

У основном тексту рада даваће се скраћени облик адресе (Левич: 2011)

У библиографском опису цитиране литературе користи се MLA начин библиографског цитирања (Modern Language Association Style) као један од најфреквентнијих и општеприхваћених начина цитирања. Стога, ради предупређивања евентуалних недоумица око правилног начина цитирања, ауторе упућујемо на интернет-адресу <http://library.concordia.ca/help/howto/mla.php>

Аутори своје радове треба да доставе електронском поштом, на адресу часописа: norma@pef.uns.ac.rs у формату MS Word (.doc).

Норма излази два пута годишње.

ПУБЛИКАЦИЈЕ У ИЗДАЊУ
ПЕДАГОШКОГ ФАКУЛТЕТА У СОМБОРУ

1. *Лабораторијске вежбе из природних наука 1*, Обадовић, Ж. Душанка; Бошњак, Марија 200,00
2. *Природне науке 1*, Обадовић, Ж. Душанка; Бошњак, Марија 680,00
3. *Биологија човека*, Петровић, Данијела; Богосављевић-Шијаков, М.; Кривокућин И. 380,00
4. *Психологија и учење*, Сакач, Марија 645,00
5. *Ментално здравље*, Марић, Миа 1352,00
6. *Математика*, Петојевић, Александар 180,00
7. *Методика упознавања околине 1*, Цвјетићанин, Станко 496,00
8. *Теорија физичког васпитања*, Родић, Недељко 850,00
9. *Управљање и руковођење у образовању*, Бранковић, Наташа; Лукић-Родић, Весна 388,00
10. *Како предавати природу и друштво*, Цвјетићанин, Станко; Бранковић, Наташа 650,00
11. *Методика наставе познавања природе 1*, Цвјетићанин, Станко 680,00
12. *Методика наставе познавања природе 2*, Цвјетићанин, Станко 630,00
13. *Дете истраживач околине*, Цвјетићанин, Станко; Кривокућин, Илинко 458,00
14. *Дидактика физичког васпитања*, Родић, Недељко 770,00
15. *Криптографија*, Ламбић, Драган 750,00
16. *Једноставни физички огледи у разр. настави*, Обадовић, Ж. Душанка; Бошњак, Марија 295,00
17. *Комбинаторика и вероватноћа – теорија, примери, задаци*, Опарница, Љубица 401,00
18. *Српски језик и књижевност у савременој стратегији развоја образовања* (српски језик и књиж. у саврем. настави-одабране књиж. интерп.), Елез-Голијанин, Сања 783,00
19. *Управљање пројектима*, Пећанац, Рајко 928,00
20. *Теорија и пракса образовања ученика са сметњама у развоју*, Николић, Гордана 627,00
21. *Методика спортских активности*, Родић, Недељко 377,00
22. *Информатика у образовању*, Надрљански, Ђорђе 600,00
23. *Информатика*, Надрљански, Ђорђе 800,00
24. *Сценска уметност*, Петровић, Тихомир 200,00
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