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TEACHING ON MEDIA VIOLENCE

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Review Scientific Paper

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Abstract:The media at the end of the 20th century, especially at the beginning of the 21st century got great freedom of behavior. Consequently they have also received the freedom of publication and transmission of information that is true, but also information that is inaccurate. In this article I will write about the media in today's conditions, its editorial schemes, stimulate and incite violence code, especially the young generations, and then among the elderly, who become daily media addicts , because studies have shown that a large percentage of respondents by a few hours a day, their free time spend with media.

Key words: media, youth, media violence, aggression.

I. INTRODUDION

In today's conditions of life, we can state that the media is a great evil, without we can't . A special influence media have on young people who spend on between 4-6 hours of free time on media. With this data, the researchers agree, not only in our country but in the world. The media have a lot of help to create and affirm the belief that the brutality is the integral regulator in all social relations. In this way, slowly but surely raise a generation of fans of violence.[1] In sociological interpretations and studies, television is viewed more as a boosting agent, rather than as a direct cause of the formation of attitudes and behavior patterns. The spirit of time did that the reality is shown through the prism of television. The television generation is significantly different from previous ones. TV took over the educational role of parents. Time of their lives is soaked by banality, aggressive advertising and images of evil. It is particularly sad that the current generation witnessed how supposedly "righteousness" can be achieved through violence. Delinquency and violence on television deprive young people of their faith in the future. They are dived by abundance of real and imaginary violence, they often do not try to separate truth from nonsense. For film and television violence has become one of the market sphere. If the violent tendencies that involve film and television visible if there is no return to the old, families and schools have to, if you have the strength, return to their tasks. Bearing in minds that the real violence sourrounds us and that there is a saturation by many, and above all by informative scenes of massacre and its consequences in our former country, until recently among the close people and nations, the media will be critical to determine its attitude to these phenomena, maintaining the informative value of contributions, rather than going into explaining the violence.

Special attention is required to scene that may disturb young children. The child - especially emotionally unstable child - harder take violence than a mature man. Violence, malice and threats have many different forms - emotional, physical, verbal. Scene of family conflicts, although not need to be accompanied by physical violence, can easily cause fear and insecurity. The research results show that socially and an emotionally insecure individual is particularly sensitive, especially in the age of adolescence.[2] It also notes that these individuals more prone to dependence on television. The media,

[1] Most often displayed behaviors lead to success; one who has better mastered the technique of violence that broke. Moral complete TV-series and movies in style ("crime does not pay, the actor has always caught") notcaught ") does not change a lot of things, because the attacker owns properties that are recommended to be a model of imitation; He is rich, powerful, has a good reputation and power. Ethical end, when the villain is punished, can prevent unwanted viewers in reproducing the form, but does not keep them forget how to do. Ethics is pushing the violence to the end, but violence is not destroyed.

[2] Check in: Михић, И; Зотовић, М; Петровић, Ј. Ране дисфункционалне когнитивне шеме: повезаност са афективном везаношћу у блиским релацијама у млађем одраслом добу. Примењена Психологија, Филозофски факултет, Нови Сад, 2008. Број 1-2, стране 57-77.

particularly television, will continue to weakest and most unstable members of society, not to expose to content that may have a particularly frustrating fact.

II. MEDIA AND MEDIA VIOLENCE

The mass media, television in particular, encourage violence and stimulate aggressive actions. Day by day, the children become witnesses of horrible wars, murders, terrorist attacks, massacres. The violence a child absorbs from the screen is precipitated and creates uncertainty. All the mentality of the media and film violence has devastating. Children and adults are becoming gloomier, harder, more prone to rivalry and aggression. It is open to violence and other people's anguish. Observing the brutal scene, by the time, everyone gets the numbing effect. The outcome is a concern, we all become complacent. During an investigation of the impact of television programs for children is that one of the biggest fears in children is caused by the discovery that the seemingly "good" and trustworthy parent is in fact a villain. Children can somehow endure violence and death, and everything else that could be expected to disturb them, as long as good and evil are separated from each other. Each glorification of violence and raw passion illegitimate . Cultural policy in this area can greatly influence that violence in films and the media do not assume catastrophic effects. In societies where there is a greater need to use violence, as a rule, appears greater tolerance towards the presentation of violence in the means of mass communication. Art, theater, mass media are full with vivid and visual scenes of horror and torture.[3]

Violence in art is shown as a symbolic threat. This raises the question: how is it possible to educate in the ideology of violence? For the film is said to be the most fundamental and the most prominent documentation phenomenology of violence; as if it was created to serve this and not some higher artistic purpose. Indeed, the films often do not see the purpose and need to be shown the violence, even when it is in a meaningful way with the overall concept of operations and size. The so-called. a naturalistic approach to the presentation went in favor of this tendency of painting of violence and destruction. Even the film at the highest level, that did not stream to the violence as a decoration, accepted manners and forms of violence.[4]

Violence is not an epiphenomenon of the epoch, it is deeply in the spirit of the times. If it once was the tool in human relations, it is now moved to the center of interest and importance of the relationship. Bullying almost becomes normal, every day, pose, style, symbol. There are many sources of violence. The portrayal of violence in films and on means of mass communication was again called into question the moral problems.

Violence gets more than ideologysing real character; simply, it serves to ideology. Film and television violence are effective socialization, because the norms, values, attitudes, and "technique training" for the violence is quickly spread and absorbed. The media have a lot of help to advance ,to create and affirm the belief that the brutality is the integral regulator in all social relations. In this way, slowly but surely is raised a generation of violence fans[5]

In sociological interpretations and studies, television is viewed more as a boosting agent, rather than as a direct cause of the formation of attitudes and behavior patterns. The spirit of time did that reality is seen through the prism of television. The television generation is significantly different from previous ones. TV took over the educational role of parents. The time of their lives is soaked banality, aggressive advertising and images of evil. It is particularly sad that the current generation witnessed how supposedly

[3] Check in: А. Арто, Позориште и његов двојник (одељак: Позориште и суровост, Позориште суровости и Писма о суровости), Прометеј, Нови Сад 1992. и С. Босанац, Едукацијски изазов (одељак Одгој и антикултура и идеологија насиља) Школске новине, Загреб 1983. П. Љубојев, Етика и естетика екрана, Просвета, Београд 1997, Европски филм и друштвено насиље, Нови Сад-Београд 1995.

[4] Rightly points out that the distinction should be made use of scenes of violence as a means and end. Violence as a means, as a backdrop or even a "beautification" raises very destructive passion for horror. Where the goal is to show the senselessness, the horror and the truth of the spirit of violence that one unexpected system, such scenes have the opposite effect, at least in normal average people and they provoke disgust. Only inveterate destructionists are able to remove every context and meaning of the message and enjoy the voyeuristic scenes of violence.

[5] Most often displayed behaviors lead to success; one who has better mastered the technique of violence that broke. Moral complete TV-series and movies in style ("crime does not pay, the actor has always caught") does not change a lot of things, because the attacker owns properties that are recommended to be a model of imitation; He is rich, powerful, has a good reputation and power. Ethical end, when the villain is punished, can prevent unwanted viewers in reproducing the form, but does not keep them forget how to do. Ethics is pushing violence to the end, but violence is not destroyed.

"righteousness" can be achieved through violence. Delinquency and violence on television deprive young people of their faith in the future. They dive into abundance of real and imaginary violence, they often do not try to separate truth from nonsense. Film and television violence have become one of the market sphere. If the violent tendencies, that are involved into film andtelevision are visible if there is no return to the old, families and schools, if you have the strength,have to return to their tasks. Having violence that surrounds us and the real violence as common and that there is a saturation of many, and above all informative shows scenes of massacre and its consequences in our former country among the close people and nations, the media will be critical to determine its attitude to these phenomena, maintaining the informative value of contributions, rather than going into explaining the violence.

Special attention is required to scene that may disturb young children. The child - especially emotionally unstable child - harder take violence than a mature man. Violence, malice and threats have many different forms - emotional, physical, verbal. Scene of family conflicts, although not need to be accompanied by physical violence, can easily cause fear and insecurity.The research results show that socially and an emotionally insecure individual is particularly sensitive, especially in the age of adolescence[6]

It also notes that these individuals are more prone to dependence on television. The media, particularly television, will continue not to expose the weakest and most unstable members of society to the contents that may have a particularly frustrating facts. In every culture there are inevitable obstacles. One of the reasons because aggression creates difficulties to the modern man is the attempt to master his environment and in the other side the restraint, which will inevitably lead to frustration. A bully, an aggressive person is the one who has not established its identity, and by acts of violence proves to themselves and others of their existence and power. Aggressive emptying brings satisfaction and emotional relief to such individuals. Violence and primitive forms of such action occurs, in a way, because the educational process didn't enable individuals to control their own impulses. Bullies very often use knowledge and intelligence to justify the violent behavior, and so in the long run, to avoid punishment. There are different forms of violence, and it is usually grouped mainly by the place it is done. Thus, there is violence in the family, in the street, in the workplace (mobbing), at school, etc. In searching for a new identity, the perpetrator is identified with the heroes of action movies. School and teachers for their former authority, to be humiliated, rejected or destroyed.[7] Students who are prone to violence come from all spheres of life, what can be said for students who are victims. Violence can not be interpreted only as a result of scarce socio-economic conditions in the family. Serious studies have not revealed any association between family socio-economic conditions and educational factors. The share of "good" and "less good" parents, was about the same for all socio-economic levels. These results were obtained in a Scandinavian study.

The authors rightly point out that the disconnection with the socio-economic conditions can be visible as the consequence of the homogeneity of the Scandinavian countries. It is therefore quite possible that research in other countries with greater inequality (for example, in the United States and England), can show a stronger connection between the presence of a bully-victim problems among children and socio-economic conditions in the family. That regularity and the results, to a large extent, can be apply to our situation. Studies have shown that a much higher percentage of boys than girls participate in violence. In junior high school, four times more boys than girls admitted to the abuse of other students. It is also evident that the physical violent is more frequent at boys. In contrast, girls often used more subtle and indirect ways of harassment such as slandering, spreading rumors and manipulation of friendly relations (for example, disruption of "best friends"). However, the abuse by not physical dids (words, gestures, etc.) is the most common form of violence among boys. In short, boys are more often victims, especially

[6] Михић, И; Зотовић, М; Петровић, Ј. Ране дисфункционалне когнитивне шеме: повезаност са афективном везаношћу у блиским релацијама у млађем одраслом добу. Примењена Психологија, Филозофски факултет, Нови Сад, 2008. Број 1-2, стране 57-77.

[7] З. Груден, Едукација едукатора, страна 239 “Children are forbidden too many things, to work or to do, so that all of us who grew up in Western civilization, especially in the urban environment, there must be suppressed inventories and because of this dangerous aggression caused by the limitation which we have all been subjected in early childhood. " If addiction is higher, there will be more hidden aggression.

the direct perpetrators of violence. This conclusion is quite fit with the expected results of research on sex differences in aggressive behavior.[8]

The mass media, and especially television and the internet, are sentenced to incite violence and encourage aggressive actions. Day after day we witness the various murders, massacres, assassinations, collective tragedy and similar events, looking at the screen while drinking coffee or other drinks. Earlier, about such events were read in the press, which created the impression of distance and abstraction. In today's conditions, television and internet repeal abstraction and also in humans dull the sensitivity. As a result, the sight of the massacred men on the street ceases to be a stressful scene, but it is seen as if it is on the screen, where emotions are absent, because, unfortunately, the crowd is accustomed to torment someone else. It is today the norm, and where is no feeling,there is no everyday life. This is the best sign that the human connections become loose or simply disappear. Besides the impact of the war in this region, for this situation are to blame the media with the maximum freedom to show one and all. By "media" we mean newspapers, magazines, radio and television stations, and internet and mobile phones. The influence of the media on the formation of attitudes in children is not at all insignificant. The media is in third place as a source of violence, just behind the family and social environment.

Children from an early age are exposed to violence in the media. At the very beginning I have stated that it was at birth, when mothers put them in front of the TV in sleds. Today it is television that dominates the lives of children in urban and rural areas. Studies show that children usually spend free time watching TV, ie. an average of three to five hours. In addition to television, the children at early stage are in contact with computers, but through the internet and the information on it, they can get very easily and quickly come up with the idea how to use them, unfortunately, very often in a negative context. More than 50% of free time children spend watching films and more frequent they play computer games, which are sometimes filled with violent content and which are not adapted to children's age, and that children often understand and mimici it, literally. These things get children through everyday life and are applied in the same or similar situations. The violent characters become role models for children around the world. The negative effects of media violence are the following: -children are becoming more tolerant to violence and it bothers them less

- they develope wrong attitudes about violence and have a loss of sympathy for those who suffer violence
- they start to see the world as a violent, fearing that they will be in a position to suffer violence
- they show more and more antisocial and violent behavior
- they are exposed to violent behavior and they are in need of more violence in the game
- conflict situations are tried to be solved by using violence as an acceptable and desirable
- they live in a virtual world, do not develop optimally intelligence and selfconfidence
- their is leck of creativity, they increase ability to develope depression and insecurity
- there is a lack of understanding of the real meaning of violence, and it followed by the wrong conclusion
- violence performs a constant influence on the habits and way of life.

To put down the effects of media violence on children, it is becoming common to broadcast warnings on television for viewers, referring to the lower age limit for the content that followsas harmless. And this practice has been coming to life in recent years. Also, it is necessary to draw attention to journalists, when reporting on violence against children that have the obligation to protect the identity of children involved in acts of violence, to take in account of their dignity and opportunities for rehabilitation, which will be difficult if the children remain publicly celebrated in this act. A special contribution to this problem gives the Ombudsman for Children of RS and Ombudsman for children's rights BiH. This is sometimes not easy, because it is in a constant struggle for ratings and circulation, sensational, very popular journalistic practice, in our country and in the world. However, it must be borne in mind that journalistic codes have provisions for the protection of minors in the media and it is especially important to respect these rules when reporting on violence.

[8] Dan Olweus, Nasilje među djecom u školi, Školska knjiga, Zagreb, 1998. Strane 28-29.

This is important because of the damage that can be caused to children to whom the particular case relates, and can have counter effects of promoting violence instead of fighting against it. However, violence is always attractive theme for television and film, whether it is the physical or spiritual violence. Already in the late sixties there was an expansion of violence in television and film, where violence became one of the most commercial areas. All this is connected with the expansion of terrorism, which apply diverse forms of violence, creating new hotbeds of war, application of violence on the streets, stadiums, schools and other public facilities around the world. Public presentation of violence in the media has caused controversy and division among critics. One group aligned in a radical critics, who oppose the public display of violence and others who defend and approve of violence, which are classified as apologists.

The big problem is when the violence is shown because of violence. Some dramatic scenes of violence do not represent much of a problem, as far as those media that directly glory violence. In the 21st century, we live in, violence has become an "aesthetic" and "ethics" of the screen; keep violent belongs to the style, form and fashion. Television violence is "effective socialization" because it is not only the norm, attitudes, but also "training techniques" for the violence are quickly spread and absorbed. The media have helped a lot to create and affirm the belief that the brutality is the regulator in all social relations. In this way, slowly but surely raise a generation of violence fans. The most common displayed behaviors bring to success. Good wins at the end, because they draw the gun faster and shoot better; one who has better mastered the technique of violence, he goes through. Moral endings of TV series and movies like "crime does not pay, because the bad man is eventually discovered and caught," does not change a lot of things, because the abuser often has properties that are recommended to be a model of imitation; he is rich, powerful, has a reputation and power.Ethical end, when the villain is punished, it can prevent viewers from reproduction of violence, but does not keep them forget how to do it. Ethical end is pushing violence to the end, but violence is not destroyed - social psychologists warn. When it comes to social scientists, television is treated as reinforced agent, rather than as a direct cause of the formation of attitudes and modelsof acting. The spirit of the time did the reality that children viewereality through the prism of TV. They are in front of television and spend a lot of time, more than in the environment of their parents and teachers. That they understand or what did not, sitting in front of TV screen, has left a strong impact on their later development. Television youth, judging by the opinions and habits, are significantly different from the previous ones. The time of their lives is soaked with banality, aggressive advertising and images of evil. It is particularly sad that the current generation witnessed how the supposed "fairness" can be achieved through violence, delinquency and violence on television deprive young people of their faith in the future. They dive in abundance of real and imaginary violence, they often do not try to separate the truth from nonsense. For film and television violence has become one of the market sphere. If the social tendencies that involve television are irreversible if there is no return to the old, families and schools have to, if they have strength, to return to their tasks.

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INOVATIVE STRATEGY OF ADULT EDUCATION IN MONTENEGRO

UDC 374(497.16)
Professional Paper

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Abstract - This paper processed the adult education reform in Montenegro, the review of the reform of adult education for the period 2005-2015 year plan of adult education for the period 2015-2019, adult education strategy for the period 2015-2025 as statistical data of the Statistical Office of Montenegro (MONSTAD).

Keywords: education; adult education; strategy; plan; formal education, non-formal education;

I. INTRODUCTION

Testing that was done by the Monstad in 2011 served as a basis for understanding the situation of adult education in the Montenegrin society and consequently as a determinant for continued efforts to develop adult education, through the plans, strategies and legislation [1].

Statistical results showed:

- Gender structure of persons who attend school have shown that up to 18 years of age more men who attend the school. From 19 years up to 41 years there are more women who are on education, and after that age again, more men who are on education.
- School attendance is highest among children of primary school age, and in children aged 6-14 years. In those years, about 97% of children attend school.
- In the age that corresponds to the attendance of high school is somewhat smaller percentage of children attending school and with increasing age, this percentage decreases, 96% of fifteen years old to 82% of eighteen years old.
- After gaining adulthood leads to a larger decline in the number of persons who continue their education, so that 59% of persons from the age of 19 years attending either still attending high school or enrolled college.
- We can certainly say that about half of the population of twenty years are enrolled in college, but with increasing age, this percentage decreases and the abandonment of the Faculty of the population of 22 years is about 10%.
- Oko 10% stanovnika starosti 30 godina pohađa neku visokoškolsku ustanovu.
- About 10% of those aged 30 years are attending a higher education institution.
- The average age of persons attending higher education institutions is 25.5 years. According to Eurostat data, the average age is 22.1 in the EU27.

Bringing of strategies of adult education was preceded by adjusting the legal framework, the bringing of the Law on Adult Education.

II. ADULT EDUCATION IN MONTENEGRO

News obtained during the education reform in Montenegro, and they relate to adult education, in addition to means of formal, non-formal and informal education with a focus on continuing education throughout their lives. This kind of education is necessary not only because of new technologies (digital era) that are present both in Montenegro and throughout the world, but for the economic recovery. Economic recovery is planned through the education system, education personnel and the working age population who are carriers of economic reforms [2].

Montenegro has a regulated system of adult education that is regulated by passing special legislation:

- Adult Education Strategy (2005-2014)
- Adult Education Strategy (2015-2025)
- General Law on Education (2002, 2011)..... (framework law)
- Adult Education Act (2002, 2011)
- Law on National Vocational Qualifications (2008)
- Law on the National Qualifications Framework (2010)
- By-laws (methodology, rules)
- Adult Education Plan (2010-2014)
- Adult Education Plan (2015-2019)
- Annual operational plans for adult education (for each current year)
- Montenegro has a regulated system of adult education: There is a legal framework and regulated procedures
- Regulated procedures of drafting and adoption of the Programme of adult education;
- Regulated procedures for licensing and registration of adult education institutions.
- Regulated procedures of external evaluation of acquired knowledge, skills and competencies for the acquisition of publicly valid certificates [3].

A. The importance of adult education

All three forms of adult education form one unit which is the basis of the concept of lifelong learning. Adult education in Montenegro is part of a unified education system in Montenegro is conducted in accordance with the law on education and has the same importance as other aspects of education.

It is believed that the 21st century, life skills and the digital age, and it is not surprising that the success of adult education is essential for economic prosperity. All the more reason that each modern countries including Montenegro defines adult education as an important educational and economic priority.

In the area of human resources and target development, adult education has a clearly stated role, and is an essential factor in the successful management of human resources [4].

B. Target groups for adult education

Target groups for adult education are: employees, the unemployed, the population in the older age group (third time) and persons with special needs.

Employees - employee training is conducted in accordance with the needs of the employer (specialization and training for the implementation of new technologies, manufacturing or working with a new product, learning foreign languages for business with foreign partners and others This form of education is very important both for the employer and for the face that is educated. Education is successfully in implemented innovation without risk to come to the radicalization of innovation. If we consider that the ultimate goal of any innovation profit, we come to a clear conclusion how important education employees.

The unemployed - for the needs of domestic and foreign employers is a common need for skilled labor in certain areas, the labor market is often invites tenders for vocational training performed by licensed institutions. Unemployed registered appear to contest, after the completion of training continue to operate. This form of employment with the retraining helps adults in employment, and therefore a positive effect on the economic recovery of Montenegro.

Population in old age - the members of this population are often in a position to change jobs and to further educate themselves for a new job, change professions often done because of the nature of work that can not perform the elderly persons.

Persons with special needs - adult education aims to integrate into the community of persons with special needs. Formal and informal education of persons with special needs can adopt the necessary knowledge, skills and competences.

III. EDUCATIONAL STRUCTURE OF POPULATION IN MONTENEGRO

Census in Montenegro were collected data on the highest educational attainment for all persons except for preschoolers and elementary school students. Under the highest attained in this study, which was carried out on the basis of the statement, it is considered the highest finished school or university education, exclusively in the field of formal education, while courses and informal education was not included in the study [5]. All courses that do not give testimony regular schools are not considered to be "the highest completed school" (eg. typists course, accountants course, etc.) but they taking data on previously completed school. The response was collected on the basis of the statement. Data on the highest educational attainment refer to persons aged 15 and over.

Figure 1. The level of education of the citizens of Montenegro

Figure 2. Gender structure according to the school level

Gender structure in Figure 2 shows that in a population with no schooling or with incomplete primary school women are the majority. In all other levels of education men are the majority.

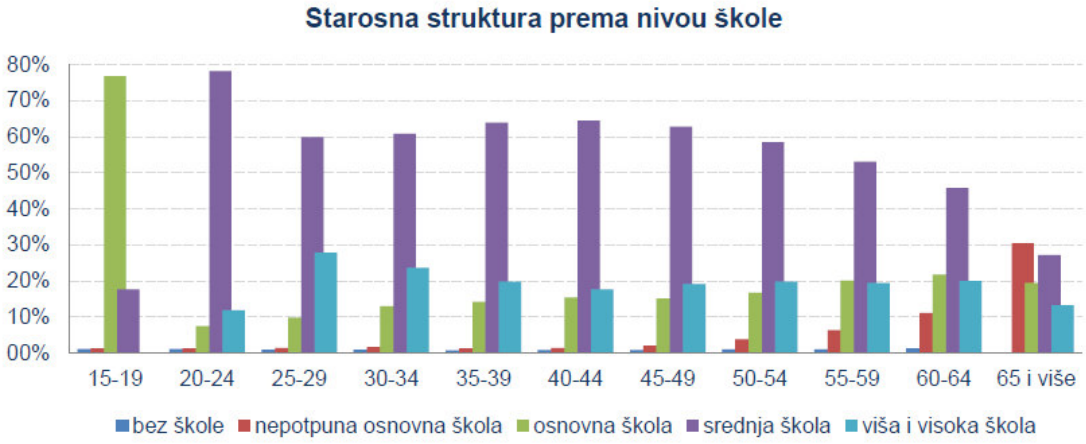

Figure 3. The age structure by the level of education

In Figure 3 we can see that the most educated group is a age group of 25-29 years, 28% of the population have university education.

IV. LITERACY IN MONTENEGRO

Literacy is defined as the ability to read and write. A person who can, with understanding, both read and write a short, simple statement on his everyday life is literate. Literacy data were collected for all persons aged 10 years and older.

In Montenegro there are 542,649 persons aged 10 and over. From that numeral 8 149 illiterate, which makes 1.5%. The average age of illiterate persons is 62 years.

Figure 4. Age and gender structure of illiterate people in Montenegro

- There are more illiterate women than men.
- The illiteracy rate among men was 0.6% and 2.4% for women.
- Illiterate women are average 66 years old and illiterate men are on average 44 years old

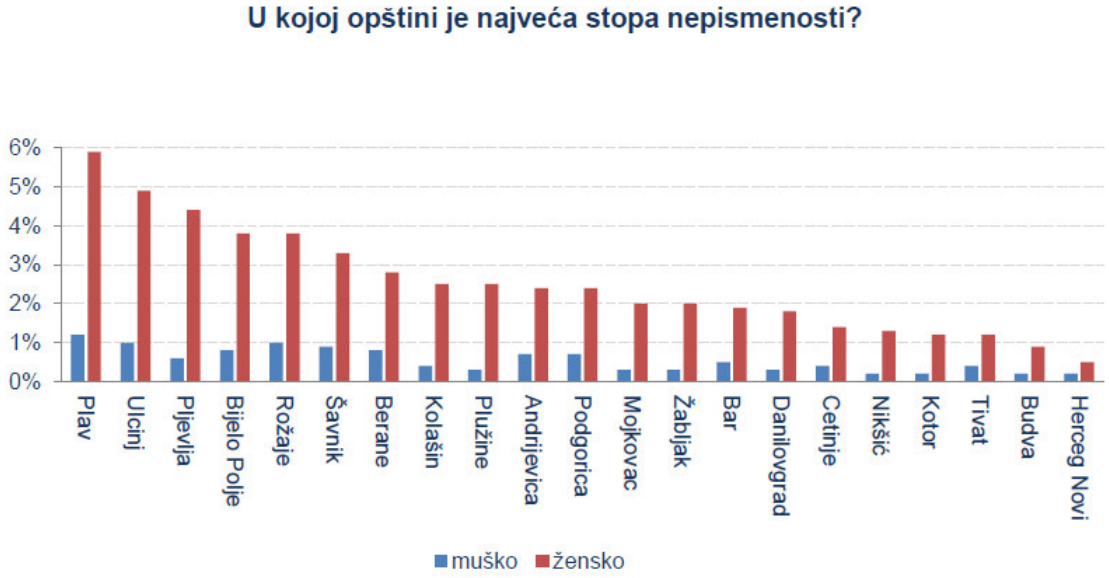

Figure 5. The rate of illiteracy - review by municipalities

In Herceg Novi, Budva, Kotor, Niksic, Cetinje, Tivat and less than 1% of the population is illiterate. The highest rate of illiteracy is in Plav, 3.6% and 3% of Ulcinj. In Pljevlja, Rozaje, Bijelo Polje and Savnik is from 2.1% to 2.5%.

V. FUNCTIONALITY (ARRANGEMENT) SYSTEM OF ADULT EDUCATION IN MONTENEGRO

Functionality (arrangement) in Montenegro is a precondition for successful adult education. Adult education is the target designed dynamic process oriented towards formal, non-formal and informal acquisition of knowledge in the form of permanent functional competencies, knowledge and skills.

Formal education - formal forms of adult education in Montenegro are: elemetary education, secondary education (high school and vocational education), higher education (higher education in an environment exists only in the context of formal education Montenegro) and higher education.

Non-formal education for the acquisition of this form of education, participates voluntarily in order to acquire the knowledge and skills of special importance, which aims to training courses for adults. As well as training of individuals for various social activities and personal and professional development.

Informal education is considered to be a self- initiated education that man acquires life experience.

VI. LICENSING INSTITUTION - LEGAL FRAMEWORK

Establishment of institutions in the field of education is regulated by legislation. Adult education institutions (organizer of adult education) may commence operation only when it receives a license for the operation of the Ministry of Education and make registration with the Central Registry of the Commercial Court.

- General Law on Education ("Official Gazette of RM no. 64/02, 31/05 and 49/07)
- Adult Education Act ("Official Gazette no. 20/2011)
- Ordinance detailed conditions for the establishment of institutions in the field of education ("Official Gazette of RM no. 40/06)
- Ordinance licensing procedures institutions in the field of education and the manner of keeping aregistra licensed institutions ("Official Gazette of RM no. 45/06) and
- The Law on Administrative Fees Republic of Montenegro ("Official Gazette of RM no. 81/05)

VII. CONCLUSION

Montenegro is in transition, using the experience of advanced countries such as Japan, the target reforming education to the education of the population came to economic revival. After World War II, Japan was through education, training and education of society that has traditionally been able to make a step forward technologically in comparison to other countries in the region. Adult education has an important role for industries in Montenegro, the education of the entire population, with an emphasis on Adult Education, Montenegro plans to encourage creative innovation as a precondition for a better standard of living. A novelty in adult education is reflected in the fact that adults can be educated at licensed organizers continue. This kind of education creates a whole range of options when it comes to adult education. Adults can perform training with licensed organizers, acquire skills, competencies and functional skills. For the purposes of tourism and hospitality Montenegro as a tourist destination has retained the only higher education in the region.

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MASSIVE OPEN COURSES (MOOCS) HELD IN SERBIAN

UDC 37.018.43:004.738.5(497.11)
Professional Paper

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Abstract - Massive Open Courses represent one of the significant tendencies in education this years. These courses allow teaching and learning without limitations either in time or place, while communities are formed on the basis of the members' fields of interest. The world`s leading universities offer their courses on several massive open online course provider sites, such as Coursera, Udemy, MITx, edX and Udacity. The greatest disadvantages of this type of learning and teaching are the language barriers, because the languages of these courses are English or other world languages. This paper presents a personal learning environment which allows creating MOOCs. This environment and the learning contents have been designed in Serbian and all support text, presentation and videos.

Key words: MOOCs; Serbian; Webuni

I. INTRODUCTION

Massive open online courses (MOOCs) are the latest revolution in online teaching and learning (Liyanagunawardena, Adams, & Williams, 2013). These academic courses are available to the general public, worldwide; there are no preconditions; and they are usually free of charge (Johnson, Adams Becker, Cummins, Estrada, Freeman, & Ludgate, 2013; Allen & Seaman, 2014; Adams, Liyanagunawardena, Rassool & Williams, 2013; Fini, 2009; Stewart, 2013).

The field of open and distributed learning has experienced a surge of media coverage and public interest in the last several years, largely focusing on the phenomenon of massive open online courses (MOOCs). The term MOOC has been used to describe a diverse set of approaches and rationales for offering large-scale online learning experiences. MOOCs have been delivered using both centralized platforms and services including learning management systems (LMSs) and decentralized networks based on aggregations of blog sites and social media feeds. MOOCs have been designed to support university curricula, academic scholarship, community outreach, professional development, and corporate training applications (Anders, 2015).

Similar to some popular MOOC systems, the authors created their own MOOC, and placed emphasis on students' activities and multimedia contents. Although the impact of video and multimedia technologies in educational outcomes is a field of ongoing research, the pedagogical impact of using videos can be summarized by three key concepts (Castells, 2005).

Functional learning environment enhances a kind of openness that is defined by social communication, and its qualitative and quantitative factors. In this developing process using modern ICT devices is not the reason but the essential condition of forming the functional learning environment. In this sense, multifunctional ICT devices support each other in real-life as well as in the virtual reality, which learning forms advance to combining the two worlds with great effectivity (Siemens, 2012). From the pedagogical point of view, exploring and forming the relationship, work and development of functional learning environments are crucial and actual for researchers, developers and especially for lecturers at teacher training.

Online teaching has been acknowledged by teaching theory strongly related to distance and e-learning. The complex innovation developed in 2012-2013 for the higher education scene in the US called MOOCs (Massive Open Online Courses) is considered a great strategic development by the European University Association (EUA). This innovation is also a fine example for the new kind of learning form that demolishes the traditional boundaries and that has an ever-progressive approach to the learning environment.

From the professional aspect it is noteworthy that innovative learning ways have appeared in the conservative higher education area. The new learning forms have many characteristics such as the online courses, free – non-formal – entry, the lack of attendance limit, free access, and finally the greatly-disputed lack of credits earned. Based on the aforementioned aspects, the experiment could have been valued as a non-formal learning support within the frame of traditional information spread, however, given the fact that the free open online courses were administered by the best and most prestigious universities in the USA, the phenomenon is now discussed professionally.

The following summary chart shows the history of MOOCs. The initiating higher education institutions were: MIT (2009), Stanford (2010) Harvard (2012).

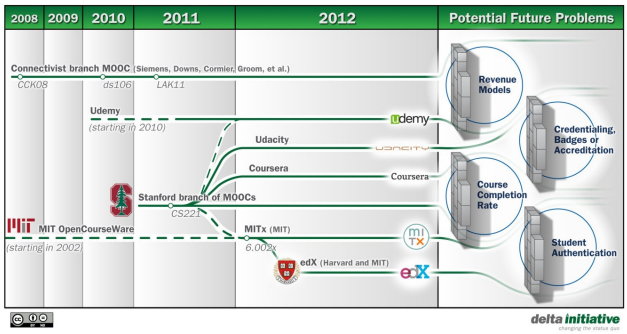

Figure 1. The history of MOOCs, source: Phil Hill, e-literate, 24/07/2012:

Four Barriers That MOOCs Must Overcome To Build a Sustainable Model, http://mfeldstein.com/four-barriers-that-moocs-must-overcome-to-become-sustainable-model/

II. ONLINE COURSES IN SERBIA

The paper sets out with the analysis of Serbia's online courses with a general description concludes with the presentation of this particular service. Google finds more than 170k of results for the "online courses Serbia" query (online kursevi srbija). The results point to many small and large educational company. The main difference between these companies is the amount of courses they provide. The field of these courses tends to be management, business and some specific area in computer science. In most cases the courses are not free. The fee ranges from a few tens to few hundreds of Euros. The price could be higher if student requires additional contact, feedback from the lecturer, or other services. When completing the courses, the student is awarded some type of certificate, but generally it is not recognized or accepted by the society. Certain providers of online courses adopted principles of some western educational centers therefore enabling them to issue a certificate which has a wider spectrum of acceptance.

III. WEBUNI

Webuni is an open and free Personal Learning Environment (PLE) created in Hungary. This site is a Startup and created by Inostart in Budapest. Webuni defines itself as a social network based-knowledge-sharing platform. The initiative follows current trends from the United States such as online education, Coursera and edX.

Webuni has determined the legitimacy of the system: Today's younger generation is much more open to online content, channels of communication in the world are completely transformed in recent decades, while the educational system has remained essentially unchanged. For these changes, the accelerated flow of information and new types of teaching and learning approaches also require new kinds of teacher competencies. The main goal of Webuni is creating the technical background for these modern forms of

education, which not only provide an opportunity for educators to adapt to today's digitized expectations, but also to get revenue. (Source: http://www.webuni.hu)

Webuni`s business model is based on revenue sharing. If an online course will be sold, the instructor and Webuni share the revenue (Source: Wikipedia).

At present the environment is available in Hungarian language (www.webuni.hu) and Serbian (www.webuni.rs). The system offers individual teachers, institutions and companies an opportunity to create online courses. The topics include: computer software, finance and accounting, design, art, film making, law, business development, marketing, presentation and communication, programming.

The Hungarian Webuni features some 132 courses and has over 9000 registered users. Some of the courses are offered for free, while others contain premium contents.

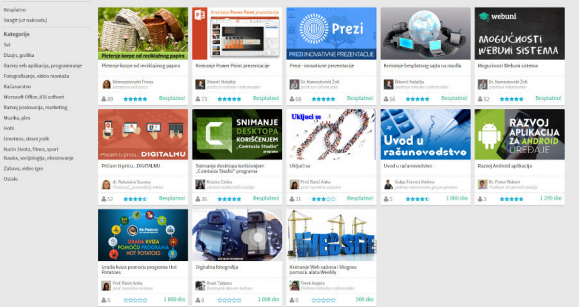

Figure 2. www.webuni.rs

IV. KURSEVI.COM

Those interested in such courses on the local, Serbian market should start their search for courses at the website www.kursevi.com . On this website , more than one thousand courses can be found when clicking on the “Search the courses” (Pretraži kurseve) option, (Fig 3.).

Figure 3. Number of available links to courses

By specifying the search, for example, clicking on the “MBA studies“ (MBA studije) option, one can see the list of available MBA studies. The list contains information about price, duration and the location of the course (Fig 4.)

Figure 4. Details about courses

The following section presents one particular provider of online courses. Under the link http://www.link-elearning.com there is a site which offers a wide range of courses. They provide many courses in the fields of language, business, ECDL, Microsoft applications, and Computer Sciences education, among others (Fig 5.).

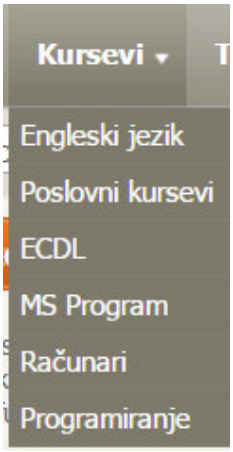

Figure 5. List of available topics

A Click on, the topic “Programming” (Programiranje) for instance, will provide the list of all available courses. The list contains important information about the courses, as presented in Fig 5.

This provider offers interesting options for those eager to learn via online courses or those still considering whether or not to apply for the course. These options include:

- free video lectures from topics;
- self-testing to assess the current knowledge in one specific topic;
- self-testing to determine which level of the given course to attend (for example, which level of language study to choose);
- course packages. It is a predefined list of courses for acquiring some specific competence. This list means that the students do not need to figure out for themselves which of the courses are connected, as these relationships are clearly marked. For example, the course “Effective business skill” contains the following four courses: Time management, Business ethics, Effective negotiation and Effective decision making;
- IT Academy. This option is a form of specialization. The student can choose one of these modules, which are: Programming, Network administration, Design and multimedia, IT business, CAD. Via this specialization, which takes 12 months, the students will participate in a number of courses. Passing exams with a more than 75% rate will grant them a widely accepted certificate.
- Business Academy. This specialization contains modules in various fields of business, marketing and management. Student who pass the specialization will also receive a certificate which is recognized internationally;

In conclusion it can be stated that there are more online course providers in the private sphere than in, for example, state educational institutions, such as colleges, faculties or universities. Despite the fact that these courses may at times far from cheap in terms of fees, there is a pronounced need for these courses. There are some topics, e.g. law or accounting which have to be comprehended in Serbian. Also, the need for courses in Serbian is increased by the fact that not everybody has English skills at a level, which would enable them to follow a certain course from abroad.

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INTRODUCING E-LEARNING TECHNOLOGIES TO STUDENTS OF »INDUSTRIAL ENGINEERING IN OIL AND GAS EXPLOATATION«

UDC 37.018.43:004.738.5(497.11)
Professional Paper

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Abstract – Project named »Establishing e-learning system at study programme Industrial Engineering in Oil and Gas Exploatation« has been conducted at Technical Faculty »Mihajlo Pupin« in Zrenjanin, Serbia. In this project, electronic material has been formulated as text and images that are aligned with educational topics from the subject Theoretical Mechanics. This project gradually introduces transition from traditional to new educational technology. Important goal of this project was to explore students attitudes regarding the proposed new educational technology.

Key words: e-learning, video-conferencing, Theoretical Mechanics, questionnaire

I. INTRODUCTION

Study programme at bachelor level of studies at Technical Faculty »Mihajlo Pupin« from Zrenjanin, Serbia (within University of Novi Sad) named »Industrial Engineering in Exploatation Oil and Gas« is interdisciplinary study programme that is conducted within international cooperation since 2014/15 school year. This study programme could be considered as raised from business environment, as initiative from company NIS Gazprom Neft and with cooperation with Uhta University, Russia. Company NIS Gazprom Neft has initiated establishment of this study programme because of the need for high educated employees in the area of oil and gas exploatation in the middle Banat region.

In aim to enable teaching process, Technical Faculty »Mihajlo Pupin« has included teaching staff from the same faculty and other faculties and universities such as University of Uhta, Russia, Faculty of Technology University of Novi Sad and Faculty of Technical Sciences, Novi Sad. Some teaching subjects are conducted with expert support from company NIS Gazprom Neft. Part of professional practice is performed within NIS Gazprom Neft laboratories. In May 2016, first group of students have attended laboratories of Uhta University within two weeks period of professional practice. City of Uhta represents the center for Russian oil industry and their university is one of the worldwide most prestigious universities in the area of oil and gas. This university brings future employees of worldwide-giant corporations in this area: »Gazprom Neft«, »Lukoil« and others.

The need for engaging many foreign professors within the study programme »Industrial Engineering in Exploatation Oil and Gas« (located at Technical Faculty »Mihajlo Pupin« in Zrenjanin, Serbia) influenced the idea of using e-learning technologies for remote teaching sessions. This paper presents introducing e-learning technologies to students of this study programme. Special focus of this paper is in exploration of students' attitudes regarding using these technologies which could lead to improving the proposed technologies and including within regular teaching process.

II. Analysis of contemporary e-learning technologies

During recent two decades, technologies have changed many aspects of our lives including how we communicate, how we spend our free time and, particularly, how we work. Internet resources could help in education of pupils and students, that are already living in new information era. Teaching process should be performed within flexible environment, able to present information with multiple forms, with

access to diversity of information resources and maximal flexibility for support to interaction among teachers and students. To enable this flexibility, there should be combined computing technology, video technology and network technology. [1]

E-learning is present in teaching practice for more than two decades and it is related to learning with using information and communication technologies. In this technology moment, e-learning is based on computer with using additional devices such as digital television, tablet computers, mobile phones. WiFi wireless connection to internet, interactive table and others. Communication includes servicing of users with e-mail, social networks, android applications, systems for collaborative learning and others. E-learning does not ignore traditional types of learning, but enhances and enriches them. [2]

Some of contemporary e-learning technologies are explained with basic features: [3]

- World Wide Web (WWW). IT represents a network-based service for organizing information, available to Internet users in the form of hypermedia documents (web sites). By using web browsers (such as Google Chrome, Mozilla, Opera etc.), users explore contents made of text, images, animations and other elements organized in previously designed ensemble. Today, it is common that every school has a website, which include data about school, teachers, pupils/students, class schedule, competitions and other types of information. Web sites in education usually are in the form of portals, designed for the porpose of pupils/students gathering with common subject of interest.
- Blog is type of website that is used for publishing news, usually sorted by date in descending order. Blog is characterized as a type of interaction among authors and readers, where readers could leave comments about every published article and receive answers from the authors. In teaching process, using blog is useful, since teacher is a moderator that starts a new topic and publishes links to other related Internet contents.
- E-mail is the simplest type of asynchronous interaction and usually is used as an additional type of communication, together with others. Advantages of using e-mail: usage simplicity, private communication, enables enough time for thinking and answering. In teaching process, it enables individual communication between teacher and pupil/student, as a chance for pupil/student to address teacher independently of physical barriers in communication process. Communication via e-mail between teacher and students could be semantically categorized at two levels: activity level and description level. At the activity level, student and teacher could talk about the process of performing some educational activity (e.g. algorithm of creating a model). At description level, student and teacher could talk about implication of activities with narrative or technical description of theory and explanations.
- Chat or Discussion forums usually consist of set of discussion groups that have particular names according to specific subject. Specialized software enables users to send messages to particular discussion group and that software disseminates these messages to other computers via Internet. Some discussion groups have moderators, that take responsibility for approving contents to be published in public and disseminated to other users.
- Share tools are group of tools for collaborative work support. Within digital classroom, they are named digital classroom managers. Example of such tool is NetSupport School. The purpose of this tool is communicating, directing, monitoring, control, observation and generally managing of educational process. After simple presenting of educational content, teacher could include each student into teaching process by allowing separate working window, where the student could continue particular activities related to educational content. Teacher could continue monitoring work from each individual student by having all separate working windows within his central window.
- Video-conferencing tools (such as Skype tool and others) could be used for remote communication between students and teacher where they could create an ambient of virtual classroom, with real-time communication. Video conferencing is interactive communication that uses combination of video, audio and communication technologies. This technology is an ideal solution in case when the original presentation of information is important (such as gestures, live interpretation, explanation, emphasizing of terms) to users that are geographically dislocated.

There are many high quality video-audio conferencing solutions available, such as web conferencing software, multipoint conferencing solutions etc. Some solutions provide synchronous interaction with sharing work results.

- Social networks are structures that consist of elements – nodes, which are individuals or organizations connected with specific types of dependency. Social networks are applied in the area of education. Today, social networking and services are one of most popular types of on-line communication. Facebook, as one of the most popular social networks, is used for information exchange between teachers and pupils.

III. E-learning in teaching theoretical mechanics

Aim of the project of introducing e-learning to students within teaching subject »Theoretical Mechanics« was to prepare and apply innovation to teaching process [4,5,6,7], by creating and presenting electronic study material for teaching particular topics within this subject. By using interactive e-learning system, the Faculty could improve education process quality by accessibility of foreign experts and teaching staff, especially with professors from Uhta University (that our Faculty cooperates in educational process).

Previously described project included several activities: preparation of content and technical form of lessons for e-learning in Theoretical Mechanics, technical preparation of software tools and multimedia classroom for implementation of video-conferencing presentation of lesson, testing of system with students participation and questionnaire to explore students' opinions about implementation of this educational form.

Preparation of content and technical form of e-learning teaching material

Within implementation of the project, complete educational content of teaching subject Theoretical Mechanics is covered by appropriate Power Point presentations. These Power Point presentations are uploaded at the website of Technical Faculty »Mihajlo Pupin« Zrenjanin, under »E-lessons« subdivision within the website section for subject Theoretical Mechanics.

Another form of suitable e-learning material represents a video, created for the purpose of off-line tutorial lessons for the same subject – Theoretical Mechanics. Within this project, video tutorial lesson is created for introductory class, with aim to make a model for creating video lessons for all other classes in future.

Technical preparation of software tools and multimedia classroom for implementation of video-conferencing presentation of lessons

Technical Faculty »Mihajlo Pupin« Zrenjanin has specially dedicated room »35« that could be used for video-conferencing, with all necessary equipment. In this room, video conferencing could be established with several technology types. Within this project, interactive software for video-conferencing Skype is selected for the purpose of demonstration possibilities of using video-conferencing as one of e-learning technologies. For particular purpose of Skype video conferencing within Theoretical Mechanics teaching subject, a special account »Teorijska Mehanika« was created.

Technical preparation of room »35« for video conferencing was conducted for connecting laptop, with previously installed Skype, to other equipment, such as high resolution LCD monitor, microphone, speakers, as well as USB HD camera. Camera was adjusted to appropriate height (higher than 180 cm) to enable all persons in room to be covered with video on-line recording. After connecting all devices, the system and each component were initially tested.

Within preparation for this project, alternative hardware technology support was explored. One of such systems is Cisco Telepresence SX20. That system consists of several components, such as: SX20 Codec, Cisco TelePresence Precision Camera, Cisco TelePresence Table Microphone 20 set, remote control, cables, speakers, power supply and high resolution display with HDMI connection. Mobile, remotely controllable camera is assembled with monitor (display) of high resolution that has been previously attached to the wall. This system enables communication with the other system of the same technology or with any other system that enables video and voice communication based on H.323/SIP protocols, from any equipment manufacturers such as Cisco, Polycom and others, supporting standard protocols.

There is also alternative software support to video-conferencing connections, such as Microsoft Lync, Adobe Connect and others. Software usage for video-conferencing is dependent on coordination between the participants of video-conferencing, where both sides usually use the software from the same manufacturer.

Testing of e-Learning technologies with students participation

Students of second and third year of study (total number of 36 students) were invited to participate in e-Learning technology demonstration within teaching lessons. The demonstration was conducted with material previously prepared, that are of three technology types:

1. Static text and image presentation within Power Point
2. Dynamic presentation of teaching as video tutorial lesson (Figure 1).
3. Video-conferencing lesson (Figure 2 and Figure 3) by using Skype.

First type of e-Learning technology (Power Point presentations) was demonstrated by a professor that was present in the classroom (room »35«), in front of students. The professor (Desnica Eleonora) started Power Point presentation and presented the content by talking and using Power Point presentation from laptop attached to high resolution monitor.

Second type of e-Learning technology (video tutorial) was demonstrated by teaching assistant (Ivan Palinkas) that was present in front of students in the classroom (room »35«) and started video tutorial that presents a professors talking about the particular topic from the subject Theoretical Mechanics (Figure 1), occasionally using Power Point as additional supporting tool.

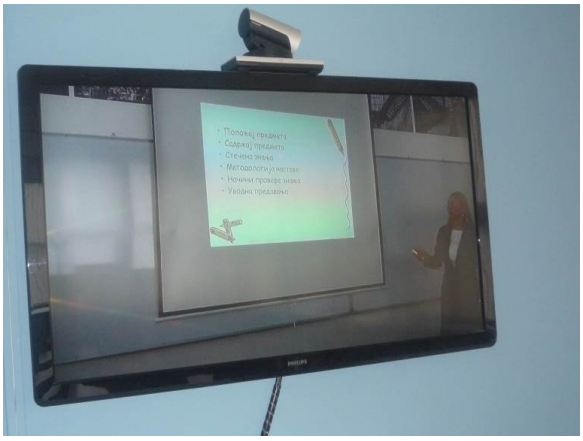

Figure 1. Video tutorial lesson

Third type of e-Learning technology (video-conferencing) was demonstrated to students by both professor and assistant. Professor was in another room (teacher's office) in front of computer, equipped with microphone, speakers and installed Skype. Assistant was with students in room »35«, coordinating video conferencing. Professor was talking about the particular educational content, while students could interact with her during the lesson, with questions. During presentation of content, the professor used and shared Power Point presentation to demonstrate students, as if she is in the classroom. Her live talk (when students could see her face – Figure 2) was combined with Power Point presentation (Figure 3).

Figure 2. On-line teaching within Skype video-conferencing

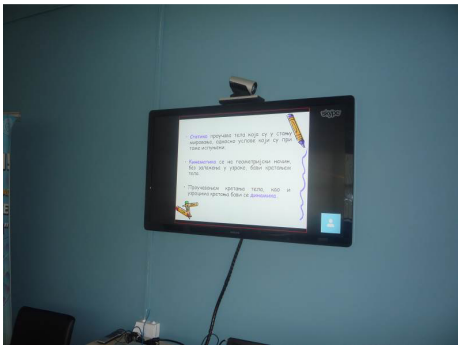

Figure 3. Power Point presentation within Skype video-conferencing

Conducting questionnaire with students' oppinions about e-Learning

After teaching process, the professor and the teaching assistant talked with students about their opinions on e-learning technology that were demonstrated (Figure 4). After introductory oral expression of oppinions, student could fill questionnaire where they could describe their attitudes and suggestions for improving the proposed technologies. Questions in the questionnaire were related to: power point presentation, video tutorial, video-conferencing, technical aspects of presentation (quality of sound, images etc...) and their attitudes about suitability of the presented technologies to their learning needs – does it support efficiently the learning process and is it suitable for them to use these technologies to communicate with teaching staff from Russian University?

Figure 4. Conducting questionnaire with students

Questionnaire results

Results from questionnaire conducted in aim to geather oppinions from students that were participated in the project are presented in Table 1. and in diagrams at Figure 5.

TABLE 1. STUDENTS' ATTITUDES ABOUT E-LEARNING TECHNOLOGY

Question	Yes	No	Partially
Question 1 – Is the teaching material in the form of Power Point Presentation adjusted to your previous knowledge?	18 (50%)	-	18 (50%)
Question 2 – Did the teaching material in the form of video tutorial enable sufficiently illustrative presentation of content?	14 (38,89%)	5 (13,89%)	17 (47,22%)
Question 3 – Was the video-conferencing presentation of teaching content according to your expectations?	26 (72,22%)	-	10 (27,78%)

Previously presented statistics from Table 1. is presented graphically in diagrams below (Figure 5).

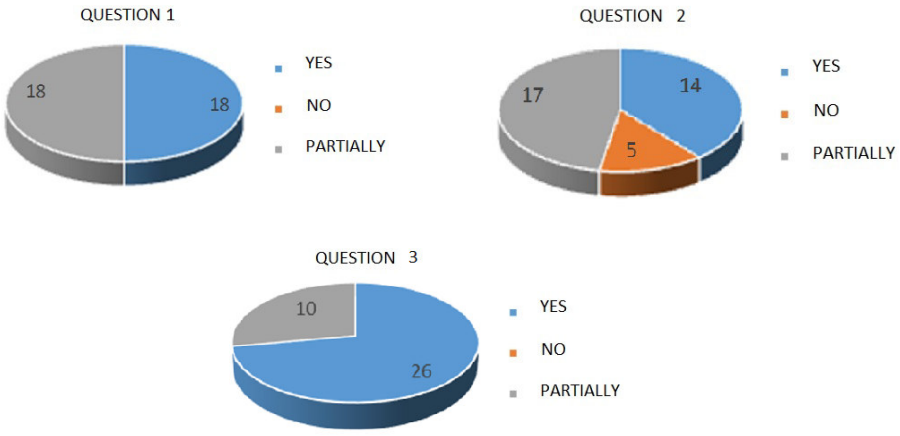

Figure 5. Diagrams from statistics on students' oppinions in the questionnaire

In the part of questionnaire where students could express their suggestions, the most students gave descriptive answers that could be concluded as:

- As the most suitable, students prefer to have available the combination of all three forms of presentation. If they had all e-learning materials prepared and available in advance, then the video-conferencing could be more understandable, since students could prepare themselves for the class and ask questions to professor.
- If students had to choose between video tutorial and video-conferencing, students gave priority to video-conferencing (concluded from answers on question 2 and 3).
- Within examination of quality in technical aspects of video conferencing, students emphasized the quality of sound within video-conferencing, since the most important aspect of video-conferencing is voice supported on-line interaction.
- Students are very much interested for this form of communication (video-conferencing) with professors from Russia. They gave a suggestion to organize a round-table event in cooperation with students' organization at Uhta University. The cooperation with the students' organization from Uhta University was previously established within professional practice collaboration with Uhta University.

IV. Conclusion

The importance of this project is long-term. It is initiated with the idea of taking all advantages of contemporary communication technologies to establish distant education with professors from Uhta University, Russia to the students from Technical faculty »Mihajlo Pupin« Zrenjanin, Serbia. Organization of the distant-learning process is supported by video-conferencing hardware and software that enable real-time communication of professors in Uhta and students in Zrenjanin. The important prerequisite is to enable suitable speed in Internet access, as well as Wireless and LAN networking with appropriate data flow support, in aim to enable video-conferencing presentation of a high quality.

The project did not have any direct financial requirements, since there was already well-equipped room that enabled realization of the project. This project results could have long-term positive influence to financial aspect of the institution business, since including e-learning to teaching process could decrease expenses for accommodation of professors from foreign countries.

It is of a great importance to have responses from students regaring their opinions and attitudes about e-learning system. It has been shown that students are very interested for new technology inclusion in teaching and learning process.

The previously presented e-learning system could be a well-established basis for the implementation of other teaching subjects within the same and within other study programmes that are conducted at Technical Faculty »Mihajlo Pupin« Zrenjanin, Serbia.

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TOWARDS OBJECTIVE EVALUATION OF STUDENTS' DATA MODELS

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Professional Paper

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Abstract: Assessment as a way of evaluating the students' knowledge plays a very important role in educational process. This paper presents a system for data model semantic evaluation that is based on comparing ontology with model elements. This approach is based on domain ontology and data model formalization at predicate calculus form that is suitable for reasoning. A set of reasoning rules for ontology to data model mapping was defined. The whole process is empirically verified and confirmed. For this purpose it has been developed a software tool for ontology and data model transformation to predicate logic form and then to a set of Prolog-like clauses. After integration of these sets of clauses and rules, a Prolog-system was used for reasoning in order to quantitatively express the quality of data model with appropriate metric.

Keywords: students, assessment, data model, ontology, objective evaluation.

I. INTRODUCTION

Assessment as a way of evaluating the students' knowledge plays a very important role in educational process. The assessment is a process that may lead to inequities due to the difficulty in applying the same evaluation criteria for students' answers [1]. The modeling competence is one of the core competences that need to be fostered and developed at all educational levels. Assessment of the modeling competence should also be considered as an important domain of research in science teaching and learning and also of science education [2]. Modeling, the process of constructing and deploying scientific models, has received widespread attention as a competence whose development facilitates student learning and knowledge. It is known to be challenging for both students and teachers [2], [3], [4], [5]. Attempts to validate models construction, comparison between models, model revision and modeling-based designs as a student competence in models and modeling are presented in [4], [6], [7].

II. DATA MODELS EVALUATION

Methodologies and frameworks for data model quality evaluation are generally classified as [8]: data-driven vs. process driven methodologies; measurement vs. improvement methodologies and general vs. specific (related to particular model types or notations) methodologies. Paper [9] presents conceptual modeling errors as human errors at three performance levels: skill-based, rule based and knowledge based. Research [10] shows analysis of proposed solutions to evaluation of conceptual data models. Over than 50 various proposals to conceptual data modeling evaluation are published, but less than 20 percent of them are empirically validated. None of proposed solutions is accepted in practice, outside the research environment. These solutions are at different level of generality, researches ones are more general and difficult to be implemented in practice, while practically motivated are more focused on particular modeling notation. The proposed solutions show lack of agreement of terminology, lack of consistency with related fields and standards, lack of measurements metrics and evaluation procedures, lack of guidelines for improvement (proposed solutions are mostly focus on error detection), lack of attention to process quality (i.e. process of creation of conceptual data models and prevention of errors), but rather to product quality detection (and some of them correction), lack of empirical studies from practice (i.e. studies on how conceptual data model evaluation is made in practice).

Other empirical validation included action research with collaboration of researchers and practitioners in the field and with practical projects and issues in conceptual data modeling evaluation.

Metrics for evaluation of conceptual data models could be classified as:

- Quantitative-based: checking the number of entities, relationships and attributes with certain characteristics [11], complexity of elements and a model [12],
- Qualitative-based: subjective judgment on quality characteristics such as: completeness, integrity, flexibility, comprehensiveness, correctness, simplicity, integration, implement ability [10] and preciseness, completeness, consistency, reliability, timeliness, uniqueness, validity [13],
- Ontology-based [14]: structure-based (suitability, stability, consistency) and content-based (completeness, cohesy, validity),
- Behavioral-based [14]: applicability from user and designer aspect, maintainability, correctness and performances.

Recent researches in the field of automating conceptual data models evaluation consider conceptual data model as a "product". Certain software tools are developed as prototypes that enable: analysis of conceptual data model elements quality [15], comparison of created conceptual data model with other models [16], and automated reasoning on quality of conceptual data models [17].

Combining action research with practitioners and laboratory research with both experts and novices in conceptual data modeling, progress is made toward generality and applicability of proposed conceptual data model evaluation framework in practice [16]. Still, empirical verification of the proposed framework is subjective in quality criteria metrics ranking, i.e. ranking of created conceptual data models is performed by qualified persons and it is not automated. Recent research results are related to automation in evaluation of conceptual data model [14], [18], [19]. Other prototypes consider process of conceptual data model creation and improve it by enabling assistance or complete automation in: consulting support to novice designers related to conceptual data model elements quality [9], and automated creation of conceptual data model design [20].

III. SYSTEM FOR DATA MODEL EVALUATION

Motivated by previously presented problems and researches we started a project related to Entity Relationship (ER) data model semantic evaluation. The main idea was integration of automated reasoning system, ontology, data model and reasoning rules in aim to evaluate the ER data model semantic quality. The ontology is proved to be the adequate technique for dealing with semantic of data. The approach is formulated in the context of data model quality measurement and formal theories [10], [11], [13], [14], [16], [21]. Our research goal was to develop and empirically verify an automated system for reasoning that will have features such as:

- Rule-based system,
- Enable automated reasoning on ER data model quality,
- Provide answers related to particular element of a created conceptual data model and an overall data model quality evaluation,
- Enable evaluation of semantic aspect of the created ER model and therefore should be based on comparison with "semantically rich" models that enables presenting semantic variations,
- Scalable, i.e. should be applicable to any size of the conceptual model.

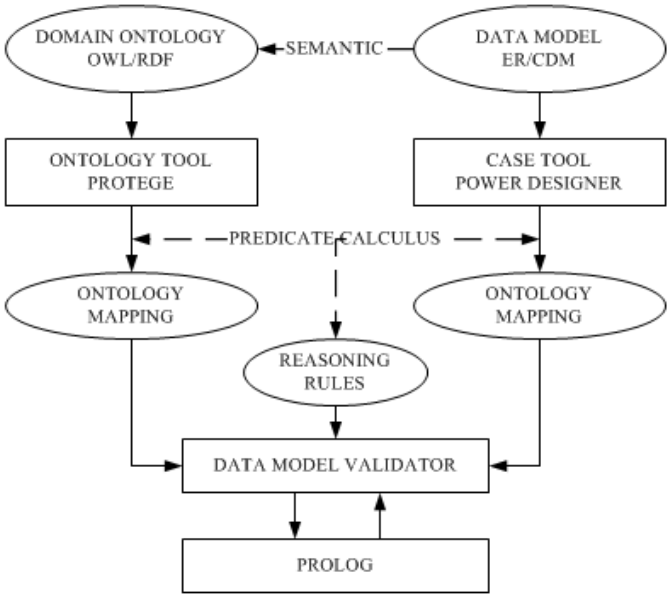

Figure 1. Proposed system for data model evaluation

The developed reasoning system consists of several modules, i.e. software tools integrated to a complex system. These modules are: ontology editor/tool for creating ontology, CASE tool for creating ER data model, Data Model Valuator (DMV) tool for transformation and integration of ontology and ER data model into formal language sentences, and Prolog as a core reasoning system that computes answers to queries. This system was introduced in [22] and fully described in paper [23].

Data model is a formal abstraction through which the real world is mapped in the database [24]. It enables representation of a real world concepts and elements through a set of data entities and their connections. They can be represented in various ways: graphical representation with schemas, data dictionary representation and formal languages representation, such as predicate logic calculus. Formal presentation of ER data model is extension of formalization presented in [25] where data model is represented as S = (E, A, R, C, P), where:

- E is a finite set of entities,
- A is a finite set of attributes,
- R is a finite set of relationships,
- C is a finite set of constraints concerning domain, definition, relationships and semantics associated to the elements and attributes,
- P is a finite set of association rules among entities, attributes, relationships and constraints.

Formalization of an ER model includes creating sets of elements that are written as Prolog-like clauses.

Ontology is often used to capture and share knowledge in a specific domain of interest [15]. Ontology describes the concepts in the domain and also the relationships that hold between those concepts [24]. The basic characteristics of ontology are hierarchy of concepts/objects, which is established by using different semantic links [26]. Ontology elements like type, class, subclass, property, sub-property, domain and range could be mapped to predicate logic form according to [27]. Predicate logic form of ontology could be written in Prolog-like form like ER model elements. Structure of ontology is a collection of OWL/RDF elements that re transformed into RDF expression as a collection of triplets, each consisting of subject, predicate and objects [28]. Facts that are described with RDF triplets represent a relation between things denoted by subject and object of the triplet, or even their properties: RDF (Subject, Predicate, Object).

Mapping RDF/OWL ontology elements into Prolog-like clauses considered an RDF name for predicate name in Prolog system.

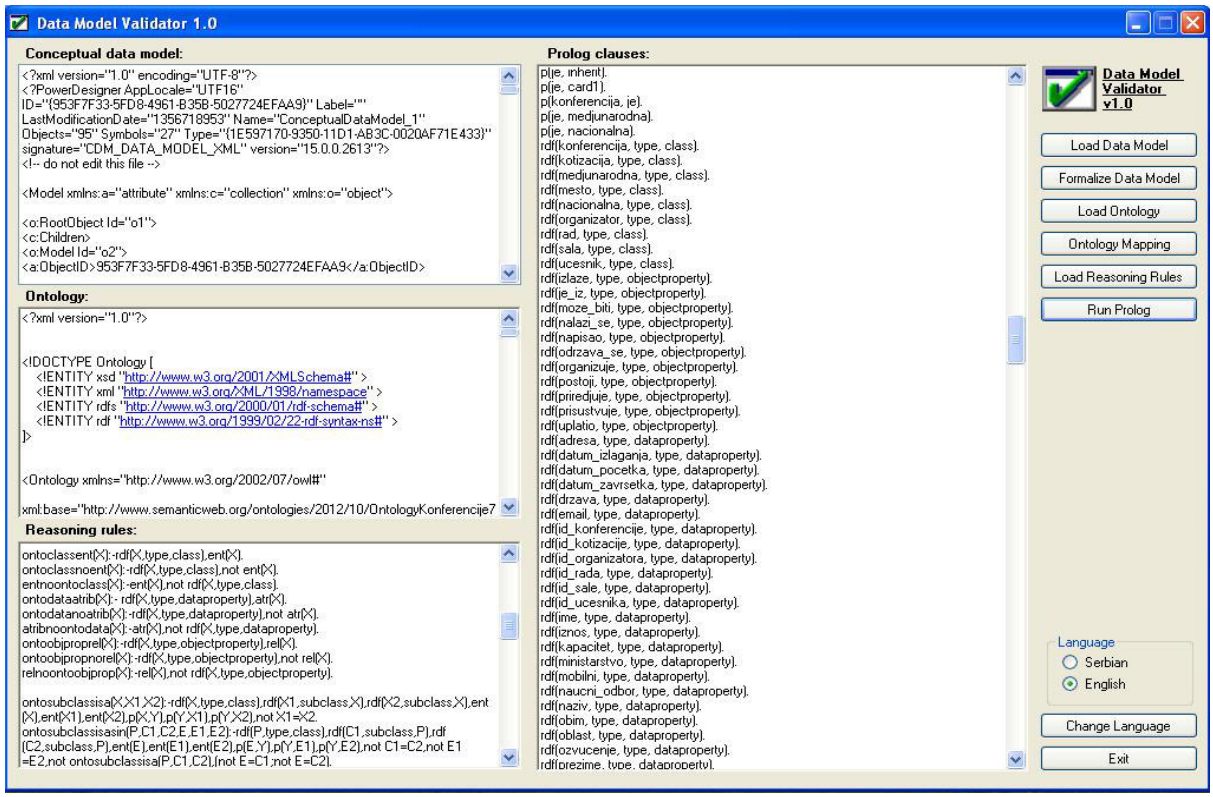

Figure 2. Data Model Validator software tool

Model evaluation in this system is performed by applying a set of reasoning rules to formalized representation of ER data model and ontology in aim to compare them. Mapping ontology to data model elements are based on research [27], were:

- Ontology class is mapped to entity type,
- Ontology data property is mapped to attribute,
- Ontology data property range is mapped to attribute data type/domain,
- Ontology object property is mapped to relationship,
- Ontology property constraint is mapped to relationship property (cardinality, dependency).

The reasoning rules for evaluation of ontology-to-conceptual data model mapping are presented in [23]:

- Rule 1 - Ontology classes that are covered by entities in ER model. For each class from ontology must be defined named entity set in data model.
- Rule 2 - Ontology classes that are not covered by entities in ER data model.
- Rule 3 - Data properties from ontology that are covered by attributes in ER data model. For each data property in ontology must be defined named attribute in data model.
- Rule 4 - Ontology data properties that are not covered by attributes in ER data model:
- Rule 5 - Data properties and data properties ranges from ontology that are covered by attributes with defined data types in conceptual data model. For each attribute in data model from set of attributes there is a restriction with data type name.
- Rule 6 - Object properties from ontology that is covered by relationships in conceptual data model. For each object property from ontology must be declared named relationship in ER data model.
- Rule 7 - Ontology object properties that are not covered by relationships in conceptual data model.
- Rule 8 - Ontology object properties that are covered by relationships in conceptual data model that are defined between entities that match to appropriate ontology classes.
- Rule 9 - Ontology object property ranges that are covered by relationship cardinality in conceptual data model that are defined between entities that match to appropriate ontology classes.
- Rule 10 – Ontology classes and subclasses that are covered by IS_A hierarchy entities in conceptual data model. According to [27] for each class from ontology must be defined a named entity super-class

type in data model, and each ontology subclass is presented with entity subtype, with restriction that subtypes in data model must be different objects.

- Rule 11 – Ontology classes and subclasses that are not covered by IS_A hierarchy entities in conceptual data model. For each ontology class must is not defined named entity super-class type in data model, and each ontology subclass is not presented with entity subtype.

For each ER data model final rank evaluation from the aspect of ontology mapping (OM) is quantitatively represented as a sum of ontology mapping evaluation points for each element of the data model. These particular marks for elements are measured by handling the Prolog answers on goals. For each data element is given a "weight factor" Kx, where x represents an ER element type. Weight factor, according to [16], represents a quantitative expressed significance of an element in the analysis of the whole conceptual data model.

An ontology point for entities is calculated as [23]:

$$OM_E = \frac{\sum_{n_E}^{i_E=1} E(Rule1)_{i_E} \cdot 100}{\sum_{n_E}^{i_E=1} E(Rule1)_{i_E} + \sum_{n_E}^{i_E=1} E(Rule2)_{i_E}}, \quad (1)$$

An ontology point for attributes is calculated as:

$$OM_A = \frac{\frac{\sum_{n_A}^{i_A=1} A(Rule3)_{i_A} + \sum_{n_A}^{i_A=1} A(Rule5)_{i_A}}{2} \cdot 100}{\sum_{n_A}^{i_A=1} A(Rule3)_{i_A} + \sum_{n_A}^{i_A=1} A(Rule4)_{i_A}}, \quad (2)$$

An ontology point for relationships is calculated as:

$$OM_R = \frac{\frac{\sum_{n_R}^{i_R=1} R(Rule6)_{i_R} + \sum_{n_R}^{i_R=1} R(Rule8)_{i_R} + \sum_{n_R}^{i_R=1} R(Rule9)_{i_R}}{3} \cdot 100}{\sum_{n_R}^{i_R=1} R(Rule6)_{i_R} + \sum_{n_R}^{i_R=1} R(Rule7)_{i_R}}, \quad (3)$$

An ontology point for classes and subclasses is calculated as:

$$OM_{SC} = \frac{\sum_{n_{SC}}^{i_{SC}=1} SC(Rule10)_{i_{sc}} \cdot 100}{\sum_{n_{SC}}^{i_{SC}=1} SC(Rule10)_{i_{sc}} + \sum_{n_{SC}}^{i_{SC}=1} SC(Rule11)_{i_{sc}}}, \quad (4)$$

Total ontology mark for entire ER data model is calculated as:

$$OM = \frac{K_E \cdot OM_E + K_A \cdot OM_A + K_R \cdot OM_R + K_{SC} \cdot OM_{SC}}{4}, \quad (5)$$

Explanation for equation (1)-(5) elements:

- OM is ontology points for each data model,
- OM_E is ontology points for entities,
- OM_A is ontology points for attributes,
- OM_R is ontology points for relationships,
- OM_{SC} is ontology points for super-classes entities and sub-classes entities,
- K_E ,K_A ,K_R ,K_{SC} are weight factors.

Minimum values for OM, OM_E, OM_A, OM_R and OM_{SC} particular marks are 0, while maximum value could be 100 for particular and also for total ontology mark for a whole data model [23].

IV. PROCESS OF USING THE SYSTEM

The proposed system is implemented by using following software tools [22], [23]:

- Ontology editor Protégé developed at Stanford University for creating ontology.
- CASE tool Sybase Power Designer for projecting ER/conceptual data model.
- Amzi!Prolog as a reasoning system that computes answers to queries.

For the purpose of files transformation and integration to appropriate Prolog program needed for Amzi!Prolog, special Data Model Valuator (DMV) tool was created by using Microsoft Visual Studio.NET development environment. The process of using this tool starts with creating ontology by using an ontology editor. The ER model is created in a CASE tool. DMV tool could be started. A user could start an option for loading ER model and an option for formalization of data model that will parse elements of data model to a set of Prolog-like clauses and present them in user interface. Another option is loading ontology for its transformation to a set of Prolog-like clauses that are also presented. Third step is loading a set of defined reasoning rules. After all clauses are created and ready in integrated list (i.e. conceptual model's clauses, ontology's clauses and reasoning rules), we used Prolog as a core reasoning system for computation of answers to queries related to particular data model and ontology. Answers from reasoning system must be included in previously defined metrics (1), (2), (3), (4) and (5) for ER data model semantic evaluation. On this mode must be calculated ontology marks for all elements of ER model by metrics (1), (2), (3), (4) and then the final ontology mark for entire ER model by (5).

V. EMPIRICAL STUDY AND RESULTS

The empirical testing of the system has been made with a case study in application of initial set of reasoning rules to a single ER data model. Empirical research is conducted as a laboratory experiment with students' data models collected from the practical exam. Participants of this research are students from University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, Serbia. They are all students of the second year of undergraduate (bachelor) studies of information technology engineering. These 44 participants were given the same exam, i.e. a textual specification of a case study for organizing international conferences. A single ontology is created to represent the specified case study and domain of problem area.

Each of students' data model was loaded in DMV tool to be integrated with ontology and set of reasoning rules. Integrated programs were individually loaded in the Amzi!Prolog listener environment for executing queries according to 11 rules. After mapping ontology in empirical study with DMV tool into the Prolog-like clauses we create over 330 facts in RDF triplets. Students' data models results with minimally 160 to more than 250 facts in Prolog sentences. Integrated program for reasoning with rules has from 500 to almost 600 clauses that were all individually loaded into the Amzi!Prolog to be processed. Prolog listener has shown results of each query answer computation.

Statistics is performed upon all results data used for overall evaluation of each ER data model by using equation (5) and K_x=1, which means that each "weight factor" is 1 for any of evaluated model, i.e. all considered as are equally significant.

Table 1: Empirical results for data model semantic evaluation

Data model code	Ontological mark for entities	Ontological mark for attributes	Ontological mark for relationships	Ontological mark for classes and subclasses	Total ontological mark for data model
K01	78	32	34	0	**36**
K02	89	44	59	25	**54**
K03	100	57	81	100	**85**
K04	78	67	50	0	**49**
K05	100	57	63	100	**80**
K06	100	64	69	100	**83**
K07	78	47	41	0	**41**
K08	100	57	63	100	**80**
K09	100	68	75	100	**86**

K10	100	60	78	100	**85**
K11	89	50	31	0	**43**
K12	89	53	50	100	**73**
K13	100	49	44	0	**48**
K14	100	57	41	100	**74**
K15	100	37	63	50	**62**
K16	100	34	47	100	**70**
K17	100	62	56	100	**80**
K18	100	67	22	100	**72**
K19	100	66	44	100	**77**
K20	100	34	28	0	**41**
K21	67	42	22	100	**58**
K22	100	56	53	0	**52**
K23	100	43	59	100	**76**
K24	100	40	56	100	**74**
K25	100	39	56	100	**74**
K26	78	52	44	0	**43**
K27	100	34	59	100	**74**
K28	100	37	56	100	**73**
K29	100	59	63	100	**80**
K30	78	44	50	0	**43**
K31	100	56	66	100	**80**
K32	78	36	50	0	**41**
K33	78	43	41	0	**40**
K34	89	54	19	0	**41**
K35	89	56	19	0	**41**
K36	78	44	50	0	**43**
K37	67	42	41	0	**37**
K38	100	62	66	100	**82**
K39	100	44	34	0	**45**
K40	100	36	56	100	**73**
K41	100	27	56	100	**71**
K42	100	62	56	100	**80**
K43	78	51	19	0	**37**
K44	100	47	16	0	**41**

Analysis of statistics on empirical results shows that ontology classes are covered by entities in ER data model with more than 92%, ontology data properties are covered with 54% appropriate attributes, while object properties are covered by relationships in ER model with 41%. Ontology classes are covered by only 30% of appropriate super-class type entities. At the end it can be seen that ontology sub-classes are covered by 30% subtype entities. Ontology data properties and data property ranges are covered by 41% of attributes and data types in data model. A result of computation of each model's ontology mapping evaluation mark is presented in Table 1. Analysis of empirical results for each ER data model ontology mapping evaluation shows that the best models do not have better than 86% evaluation points, while the worst done models are at 36%. Average result of all tested and evaluated data models is almost 64% of semantically correctness, i.e. completeness and suitability to domain ontology.

Table 2: Number of students' marks when weight factors are: K_E=1.0, K_A=1.0, K_R=1.0 K_{SC}=1.0

Score (points)	Mark	Number of students
<55	5	19
55-64	6	2
65-74	7	10
75-84	8	12
85-94	9	1
>94	10	0

Table 2 shows the distribution of students' assessment to the exam evaluation criteria that is currently used at universities in Serbia. Number of students' marks is determinate with following weight factors values are equally significant: K_E=1.0, K_A=1.0, K_R=1.0 K_{SC}=1.0. The same data is shown on Figure 3. It can be seen that 19 students would not have passed the exam, while 25 would have a positive assessment.

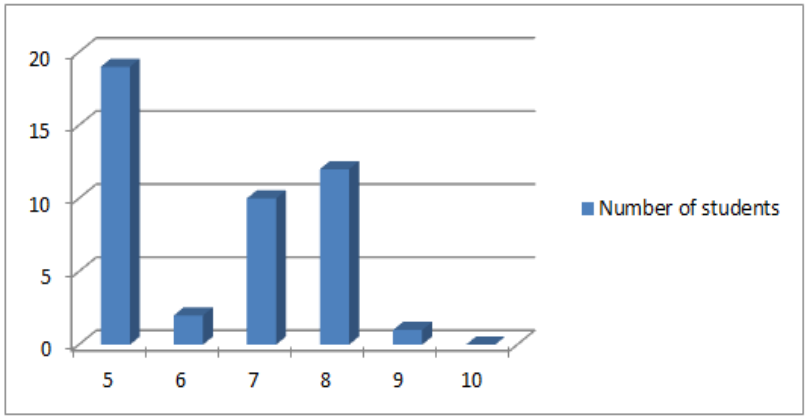

Figure 3. Students' assessment with weight factors values: K_E=1.0, K_A=1.0, K_R=1.0 K_{SC}=1.0

Table 3 shows the distribution of students' assessment with weight factors values that are set different: K_E=1.8, K_A=1.0, K_R=0.6 K_{SC}=0.6. The same data is shown on Figure 3. It can be seen that only 9 students would not have passed the exam, while even 35 would have a positive assessment. Determination of these weight factors that are not equally significant should be done and defined by a professor of the course which is taken.

Table 3: Number of students' marks when weight factors are: K_E=1.8, K_A=1.0, K_R=0.6 K_{SC}=0.6

Score (points)	Mark	Number of students
<55	5	9
55-64	6	10
65-74	7	2
75-84	8	18
85-94	9	5
>94	10	0

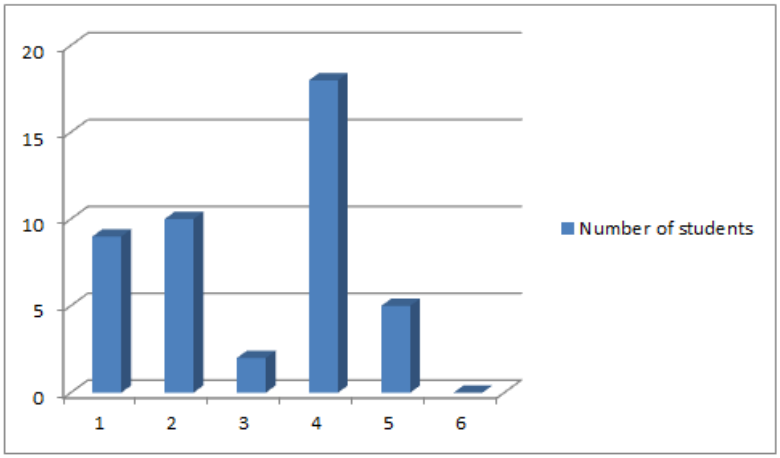

Figure 4. Students' assessment with weight factors values: K_E=1.8, K_A=1.0, K_R=0.6 K_{SC}=0.6

VI. CONCLUSION

The objective evaluation the students' knowledge in courses which deals with databases or information systems theory and practice could be done with a software system for data model semantic evaluation. This system is based on comparing ontology with data model elements. This approach is based on domain ontology and data model formalization at a form that is suitable for reasoning with a set of reasoning rules for ontology to data model mapping. A specific software tool was developed and implemented for ontology and data model transformation to predicate logic form and then to a set of Prolog-like clauses. This system integrates results of using CASE tool for data model creation, ontology editor for ontology creation, reasoning rules for data model evaluation based on mapping with ontology within an automated reasoning system that computes answers needed for metric. After integration of these sets of clauses and rules, a Prolog-system was used for making queries and reasoning in order to quantitatively express the quality of data model with appropriate metric. Final marks are calculated with a spreadsheet program.

Results of empirical testing and verification of the developed system was done with the students of Technical faculty "Mihajlo Pupin". Students' assignments were not evaluated with this system. The evaluation was done according to a certain system in the traditional way. This system is currently not used at the Technical faculty "Mihajlo Pupin", but it could be used with a future work that may include better automatization of whole system for quick answers, adapting DMV software to process other types of data models, extension of reasoning rules to enable both syntax and semantic verification, in aim to enable more complete data model verification. This system must be empirically tested with large data models that are not laboratory cases. One further step could be development of consultation expert module that would provide presentation of data modeling errors and suggestions to improvements.

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