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Section 1. Other aspects of Psychotechnology

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INSIGHTS FOR A 'SLOW EPIDEMIC' OF HPV-RELATED OROPHARYNGEAL CANCER: CHARACTERISTICS OF ENGAGEMENT IN ORAL SEX BEHAVIOUR AMONGST YOUNG PEOPLE IN BRITAIN

Abstract: This paper aims to identify the factors that predict engagement in oral sex amongst young people in Britain using a nationally representative sample from NATSAL II survey. Descriptives and Chi-Squire tests were used to explore characteristics of oral sex behaviour. Resulted set of significant predictors was a subject to analysis that involved a logistic regression to identify the model providing the best fit of indicators. 72% of the total sample across all UK regions reported engagement in oral sex, both in fellatio and cunnilingus. The highest level of engagement in oral sex was found amongst Roman Catholics and Anglicans, the lowest — among Muslims. Engagement in oral sex was predicted by academic qualification, type of source of sex education, alcohol intake, religiosity, and the personal importance of religious beliefs. In light of the increase in HPV-related oropharyngeal cancer in younger Caucasian male patients, this indicates that young people's sexual health is becoming a matter of high importance for public health.

Keywords: oral sex, UK, young people, HPV-related oropharyngeal cancer

Introduction

The evidence from surveys on adolescent and young people's sexual behaviour indicates that the prevalence of oral sex among adolescents has increased over the last decade [17; 24; 15; 19; 5] while the age at onset of oral sex practice has reduced [14; 25]. Research revealed that a significant percentage of adolescents got engaged in oral sex prior to their engagement in vaginal inte rcourse [1; 27]. The main reason for this is their perception of oral sex as a recreational activity that provides them with an opportunity for risk-free

sexual intimacy and thereby allows them to delay a penetrative vaginal intercourse and 'technically' preserve their virginity [30; 3; 12].

However, oral sex was proven to be an efficient mode of transmission for many STI's, such a candida, chlamydia, gonorrhoea, syphilis, herpes, hepatitis B, HIV and HPV [8]. Recently, HPV infection, linked to the practice of oral sex, was found significantly associated with a development of oropharyngeal cancer among younger Caucasian generation of cancer patients [10; 20].

Research revealed that adolescents apparently realise that sexually transmitted infections (STI's) can affect the oropharynx during oral sex with an infected partner and that subsequently oro-oral and oro-genital contact can spread this infection to other sexual partners [26], but still fail to protect themselves during oral sex. British researchers found that more than eighty percent (80%) of college and university students aged 16–21 do not use condoms during oral sex [28].

While investigation of adolescent's oral sex practices in the USA is traditionally based on analyses of National surveys of adolescent's sexual behaviour [17; 2], oral sex practices of British adolescents has mainly been studied on micro-level in college students' population. To compensate for this gap in research, the present article offers the analysis of British young people's oral sex behaviour on national level, based on the National Survey of Sexual Attitudes and Lifestyles in Britain (NATSAL II) data set (National Centre for Social Research, 2005) [21]. NATSAL II was conducted between 1999 and 2001 by a collaborative research team from three UK organisations: National Centre for Social Research (NatCen), Royal Free and University College Medical School (UCL), and London School of Hygiene and Tropical Medicine (LSHTM).

Using the NATSAL sample of young people aged 16–24, the current study aimed to determine which factors predict the engagement in oral sex practices in young people in the UK. The range of potential predictors was chosen from the pool of available explanatory variables based on previous research on adolescent and young people's engagement in oral sex behaviour [16]. We thus hypothesised that their socio-economic status, religious beliefs, source of sex education, level of alcohol intake and their engagement in vaginal sex would be significant predictors for their engagement in oral sex above.

Method

The NATSAL II used a nationally representative sample of 12,110 respondents aged 16–44 years old (42.7% males and 57.3% females). The sample was designed to over-represent people living in the greater London area to account for higher prevalence of many HIV-related risk behaviours in London than elsewhere in Britain. Due to the increased interest in understanding and reducing inequalities in health (including sexual health) and to account for ethnic minority respondents, NATSAL II also included a boost sample of people from four ethnic minority groups – Black Caribbean, Black African, Indian and Pakistani. The data was collected in 1999 by NATSAL II survey administrators. The general population sample involved a multi-stage stratified probability design, with postcode sectors selected as the primary sampling units (PSUs), addresses selected at the second stage, and finally one eligible adult randomly selected at the final stage. The introduction letter was sent to the selected households asking for their residents' willingness to participate in the survey. When the consent was obtained, the trained NATSAL II interviewers visited households in order to conduct the interview. The interview format involved a combination of computer-assisted personal interview (CAPI) and computer-assisted self-interview (CASI) questionnaires on sexual behaviour.

The response rate reached 63.9% for the general population sample and 62.9%.for the boost sample. After applying the non-response weight, the distributions of age, sex and region for the NATSAL II, the sample was considered closely reflect the general population [9].

Table 1. – The sample profile

Demographics	Gender				All valid cases	
	Male		Female			
	N	%	N	%	N	%
1. Academic qualification	1187	47.4	1317	52.6	2504	85
Degree	139	49.8	140	50.2	279	11.1
A-AS level	280	46.6	321	53.4	601	24
GCSEs A-C	518	46.7	591	53.3	1109	44.3
GCSEs D-G	141	50.1	139	49.7	280	11.2
Other	109	46.4	126	38.8	235	9.4
2. Parents' social class	1217	46.5	1401	53.5	2618	89
Professional/managerial	277	48.8	291	51.2	568	21.7
Managerial/technical	278	48.7	293	51.3	571	21.8
Skilled non-manual	79	41.8	110	58.2	189	7.2
Skilled manual	345	47.0	389	53.0	734	28
Partly skilled/unskilled	174	44.2	220	55.8	394	15.1
Never had a job	64	39.5	98	60.5	162	6.2
3. Belong to particular religion	1365	46.6	1564	53.4	2929	99.7
Yes	590	45.5	708	54.5	1298	44.3
No	775	47.5	856	52.5	1631	55.7
4. Religious affiliation						
Christians, no denomination	578	45.4	694	54.6	1272	43.3
Roman Catholics	150	46.7	171	53.3	321	25.2
Church of England	111	44.2	140	55.8	251	19.7
Church of Scotland	111	39.8	168	60.2	279	21.9
Other Christians	12	34.3	23	65.7	35	2.8
Muslims (Islam)	34	43.6	44	56.4	78	6.1
Asians (Hindu, Sikh,	117	52.7	105	47.3	222	17.5
Buddhists)	43	50.0	43	50.0	86	6.7
5. Government region	1371	46.7	1567	53.3	2938	100
North East	80	2.7	81	2.8	161	5.5
North West	147	5.0	184	6.3	331	11.3
Yorkshire and Humber's	110	3.7	116	3.9	226	7.7
East Midlands	101	3.4	101	3.4	202	6.9
West Midlands	110	3.7	122	4.2	232	7.9
South West	91	3.1	87	3.0	178	6.1
Eastern	101	3.4	116	3.9	217	7.4
London	328	11.2	370	12.6	698	23.8
South East	153	5.2	184	6.3	337	11.5
Wales	44	1.5	69	2.3	113	3.8
Scotland	106	3.6	137	4.7	243	8.3

Note: 55.7% of the respondents in the sample did not report any religious affiliations

Study Sample

This study sample included 2,938 participants (46.7% males and 53.3% females) aged 16–24 years old (*Mean Age* = 19.96; *SD* = 2.59) from 11 regions of the UK, extracted from NATSAL II data set. Participants were equally distributed by age and gender. The characteristics of the sample could be seen from the (Table 1).

Measures

The predictor variables included gender, respondents' academic qualification, parents' social class, religiosity, geographical region of their living, alcohol intake, previous engagement in vaginal sex and source of sex education. The criterion variable was engagement in oral sex practices (e. g. ever given/received oral sex, with the possible answers as *yes* or *no*). In this study, only heterosexual sexual practices were explored.

Academic qualification was obtained by asking participants to indicate what the highest level of formal education they had completed before entering the survey, and consisted of 5 following categories: (0) a degree, (1) A-AS levels, (2) GCSE's A-C, (3) GCSE's D-G, (4) others.

Respondents' parents' social class was represented by six categories, as follows: (0) professional/managerial, (1) managerial/technical, (2) skilled non-manual, (3) skilled manual, (4) partly skilled/unskilled, (5) had no job.

Religiosity was measured by three variables resultant from asking respondents whether they 1) belong to a particular religion; 2) which religion they belonged to, and; 3) the personal importance of religious beliefs them. The first variable was coded as: (1) *yes*, and (2) *no*. The second variable was represented by 7 following categories: 0) Christians, no denomination, (1) Roman Catholics, (2) Church of England, (3) Church of Scotland, (4) Other Christians, (5) Muslims (Islam), (6) Asians religions (Hindu, Sikh and Buddhism). The third variable was coded as: (1) very important, (2) fairly important, (3) not very important, and (4) not important at all.

Alcohol consumption was determined by respondents' average alcohol intake when they do drink (excluding parties/special occasions) and was coded as: (1) low; (2) medium; (3) high.

Source of sex education was represented by the following categories: (1) mother and the family members; (2) lessons at school; (3) friends of the same age/first sex partner; (4) doctor/nurse/clinic; (5) media.

Engagement in vaginal sex and engagement in oral sex were determined by respondents' answers to the question whether they ever had vaginal or oral sex (e. g. ever given/received oral sex), and was coded as *yes* (0) or *no* (1), in the same manner for all variables.

Results

Data was analysed using PAWS version of SPSS-18 (SPSS Inc, 2011).

Gender differences and the patterns of engagement in oral sex were assessed by a series of Chi-Square tests. Primary analysis involved a sequence of logistic regression's models predicting index of engagement in oral sex practices. As we aimed to develop a subset of variables that are useful in predicting engagement in oral sex behaviour, all potential predictors were entered using backward stepwise regression in order to eliminate all non-significant (Wald's $p >. 05$) predictors, then the analysis was re-run with the most influential of them. Large and representative sample allowed us to avoid statistical regression's tendency to capitalise on chance and overfit data. Multicollinearity issue was assessed by examining regression outputs and running the linear equivalent of the logistic analysis. Impact of outliers on regression analysis was also considered by checking Cook's D for instances where $D > 1.00$ [29].

Patterns of engagement in oral sex

Overall, among 16–24 years old, 71.5% of the sample reported ever given/received heterosexual oral sex, among them 67.5% reported to ever having given oral sex and 69.5% – ever having received oral sex. There was no significant gender difference in engagement in oral sex ($p = 0.45$), both in giving

(p = 0.06) and receiving *(p = 0.54)*, in total and across all age groups.

In this study, we found no difference in engagement in oral sex amongst youngsters by their parental social class *(p = 0.35)*.

Young people who reported to belong to any particular religion were found to give/receive less oral sex than those who did not report any religious affiliations (χ^2 = 87.209; df = 1; p < 0.001). Those of them for whom religion was important (very important and fairly important) reported a significantly lower level of engagement in oral sex than those for whom religion was not very important or not important at all (χ^2 = 224.183; df = 3; p < 0.001).

Among different religious affiliations, Roman Catholics and Anglican Protestants were found to report more oral sex than other Christians, Muslims and Hindu *(χ^2 = 159.987; df = 6; p < 0.001)*. The lowest engagement in oral sex was reported by Muslims *(χ^2 = 252.334; df = 6; p < 0.001)*.

Those young people, who reported their friends/first partner to be the main source of their sex education, were more likely to report higher engagement in oral sex (χ^2 = 138.498; df = 4; p < 0.001). A higher level of alcohol intake and having a higher education level were also associated with a higher level of engagement in oral sex (χ^2 = 229.790; df = 4; p < 0.001 and χ^2 = 36.317; df = 4; p < 0.001, respectively).

A strong association existed between engagement in vaginal and oral sex *(χ^2 = 1829.297; df = 1; p = 0.001)*. The engagement in oral sex increased with the engagement in vaginal sex and was lower than engagement in vaginal sex across both genders and across all age groups.

In terms of regional differences, the highest amounts of oral sex engagement among young people were reported in Scotland and Wales (around 75%), the South East (74%), the Eastern region (73%), the South West (72%) and the North West (72%). The UK regions with lowest percentage of engagement in oral sex were London (64.7%) and the West Midlands (65%). The difference in oral sex patterns between these regions was significant (χ^2 = 22.828; df = 10; p = 0.01).

Predictors of engagement in oral sex

As there were no significant differences in engagement in oral sex (giving or receiving) by gender and across ages, in the final regression analysis we tested the predictor variables against the single dichotomous outcome measure, namely, engagement in oral sex (giving/receiving).

A regression model of adolescents' engagement in oral sex behaviour was formed on the basis of variables that showed significant associations with criterion variable. From this model, one further model was considered due to a problem with the data on religious affiliation (Model 2). The nature of religious affiliation variable meant that those respondents who had not reported any religious affiliations (55.7%), have been excluded from the analysis (Model 1). Both models were statistically significant. Using Nagelkerke R^2 as a measure of effect size and defining a large effect where R^2 > 0.26 [6], a large effect was present in all two models, with around 72–73% of the variance explained by the predictors. Table 2 summarised the results of regression models undertaken.

Table 2. Summary statistics for each of the logistic regression models

	Model 1	**Model 2**
Valid N	946	2185
Number of variables	7	6
Cases%	32.2	74.4
Model accuracy%	91.8	93.1
Nagelkerke (Pseudo)R^2	0.732	0.722
Model χ^2	709.69	1467.53
Df	7	14
Model p	0.000	0.000

Note: p-values were not absolutely zero; they appeared so because of an artefact of reporting to three decimal places

The variables in the equation for Model 1 and Model 2 are presented in (Table 3).

Table 3 Logistic regression results for Model 1 and Model 2

Predictors	Model 1						Model 2					
	B	SE	Wald	p	Exp (B)	95% CI for Exp (B)	B	SE	Wald	P	Exp (B)	95% CI for Exp (B)
1. Alcohol intake			13.252	0.001					16.998	0.000		
1) low (vs. high)	–0.877	0.375	6.027	0.014	0.416	0.206 –.838	–0.804	0.255	9.966	0.002	0.447	0.271 –0.737
2)medium (vs. high)	0.060	0.410	0.021	0.884	1.061	0.475–2.372	–0.089	0.275	0.106	0.745	0.914	0.533–1.568
2. Vaginal sex	–5.565	0.409	185.066	0.000	0.004	0.002 –.009	–5.716	0.290	389.312	0.000	0.003	0.002–006
1) no (vs. yes)												
3. Source of sex education									10.691	0.030		
1) mother &family (vs. media)							0.012	0.292	0.002	0.967	1.012	0.571 –0.1.794
2) school lessons (vs. media)							–0.162	0.271	0.358	0.549	0.850	0.500–1.446
3) friends (vs. media)							0.529	0.276	3.684	0.055	1.698	0.989–2.915
4) doctors/clinic (vs. media)							–0.166	1.136	0.021	0.884	0.847	0.091–7.851
4. Academic qualification									23.168	0.000		
1) degree (vs. other)							0.796	0.394	4.083	0.043	2.218	1.024–4.802
2) A-AS Levels (vs. other)							0.916	0.336	7.416	0.006	2.499	1.293–4.830
3) GCSE's A-C (vs. other)							0.115	0.293	0.154	0.695	1.122	0.631–1.994
4) GCSE's D-G (vs. other)							–0.384	0.344	1.244	0.265	0.618	0.347–1.337
5. Importance of religion									18.543	0.000		
1)very important (vs. not at all)							–1.160	0.296	15.377	0.000	0.313	0.175 –0.560
2)fairly important (vs. not at all)							–.705	0.259	7.989	0.005	0.494	0.303 –0.806
3)not very important							–.277	0.233	1.418	0.234	0.758	0.480–1.196
Constant	2.654	0.458	33.558	0.000	14.218		2.890	0.411	49.355	0.000	17.985	

Note: B is the logistic regression coefficient; P-values of.000 are not absolutely zero; they appeared so because of an artefact of reporting to three decimal place

The variables with negative regression coefficients (*B-values*) presented factors protecting from engagement in oral sex; the odds of being engaged in this behaviour drop as scores on this variables increase. Conversely, the variables with positive B-values presented the risk factors of being engaged in oral sex behaviour; the odds of being engaged in this behaviour increase as scores on this variables increase. Thus, according to the Model 1, risk factors for engagement in oral sex among young people aged 16–24 who belong to particular religions were high alcohol intake and experience of vaginal sex. Model 2, representing the overall sample, added to these significant risk factors three additional factors: having an academic degree/completing A-AS levels, a source of sex education and the personal importance of religious beliefs.

However, although the effect of predictors such as high (vs. medium) alcohol intake, a main source of sex education, the lower academic qualifications (vs. other), and considering personal beliefs not personally important (vs. not important at all), was questionable, the examination of the odds ratio (OR) of the remaining predictors tells us about the degree of risk or protection hold by each predictor. Those with a degree demonstrated twice the odds of being involved in oral sex behaviour than those with 'other lower than GCSE's' academic qualifications' (OR = 2.218). Similarly, those with A-AS level degree have around two-and-half-fold the odds of being the case than others (OR = 2.499). As far as protective factors are concerned, young people who had drunk less alcohol showed around two-fifth of the odds of being involved in oral sex behaviour, compared with those who had drunk a lot (OR = 0.447). Young people with strong personal religious beliefs have demonstrated around one-third of the odds to be involved in oral sex behaviour, compared with those for whom religion was not important at all (OR = 0.313), whereas youngsters with fairly important religious beliefs had only half of the odds of being a case (OR = 0.494).

Discussion

The current study aimed to explore demographic, behavioural, and socio-cultural predictors of engagement in oral sex amongst young people in the UK. The results demonstrated that higher academic qualification, greater amount of alcohol consumption, previous engagement in vaginal sex, friends and media as the main sources of sex education and personal unimportance of religious beliefs were the key predictors of engagement in oral sex amongst young people in Britain.

Overall, about 72% (33% of males and 39% females) from the total sample reported to have oral sex experiences. Although females demonstrated slightly higher rates of being engaged in oral sex, the difference between genders was statistically not significant. These findings are in general consistent with those from Stone et al's (2006) study on oral sex and condom use, although their study showed somewhat higher percentages of engagement in oral sex, which is likely to represent the student population used in that study.

The current study found a high correlation between engagement in oral sex and engagement in vaginal sex. This finding is similar to the finding from Lindberg et al (2008) study from the USA, which was drawn on data from National Survey of Adolescents Males and the National Survey of Family Growth. NATSAL survey did not include the question whether respondents had oral sex before or after the time when they had first vaginal intercourse, thus we cannot explore the relationships between the time point of initiating/performing oral sex and initiating/performing vaginal sex among young people.

Our study indicated that higher academic qualification was associated with more engagement in oral sex practices. These results were in accordance with findings that college students from a higher socio-economic background and from a white ethnic background have a greater chance to be engaged in oral sex practice [15, 23]. However, contrary to the

American studies, we found no significant associations between social class and young people's engagement in oral sex practices.

Finally, our study revealed a significant difference between different religious affiliations. Young people who belong to Muslim British reported the lowest level of engagement in oral sex behaviour, whereas Roman Catholics – the highest. These findings can be explained by differences in the religious practices and cultural norms as related to sexual behaviour.

The findings from this study have several important implications for health workers, in particular GPs, and for health educators and policy-makers. In terms of consequences of practising oral sex, medical research indicates that there is a link between oral sex and a possibility to develop HPV-related oropharyngeal cancer. Researchers revealed that males have twice as high incidence rates of acquiring this type of oral cancer compared to females [13]. Males also found to initiate most sexual behaviours earlier than females [22], and both the young age of oral sex initiation and the prevalence of oral sex among Caucasian males are higher than among males of other races and ethnicities in the USA and, as the current study indicates, in the UK. Therefore, Caucasian young males seem to be at greater risk of acquiring oral HPV infection in comparison with males of other races and ethnicities, and at an earlier age than Caucasian young females.

Although the use of condoms proves to be effective against other STIs, the effectiveness of using condoms for prevention against HPV infection during oral sex is not clear [18]. The alternative route for prevention of HPV-related infection is prophylactic vaccination by type-specific vaccines. Currently in the UK only teenage girls aged 11–12 are offered HPV vaccination, teenage boys are still not included in this preventative medicine programme due to the cost-effectiveness of male HPV vaccination to remain unclear. The recent medical research indicates that HPV vaccination for boys aged 12 years may be a cost-effective strategy for the prevention of HPV-related oropharyngeal cancers [11]. In October 2011 Advisory Committee on Immunization Practices (ACIP, Centre for Disease Control and Prevention, USA) has recommended routine HPV vaccination for males aged 11–12 in the USA, noting that the vaccination series can be started from 9 years old [7].

As far as social care and social services provision are concerned, HPV-positive oropharyngeal cancer is mainly a disease of younger, white, educated males, who are generally healthy. These patients have better recovery options, and as a result, they will live longer with the functional and psychological consequences of their treatment and will obviously require long-standing support from health and social NHS services [20].

Taken together, this indicates that preventive health education programmes in the area of oral sex behaviour will be highly important and cost-effective for public health.

Strengths and Limitations of this study

This study was to our knowledge the first study that analysed oral sex behaviour of British adolescents using a nationally representative sample. The findings from this study identified the common determinants of engagement in oral sex behaviour in this population. They highlighted the possible intercorrelations between demographic, behavioural, social, cultural and religious variables accounting for the differences in this engagement.

This study was also the first study that explored the impact of religious affiliations on the practice of oral sex, controlling for all other variables. Although research on religiosity and sexual practices has been established for decades [4], this study illustrated how the range of main religious practices in the UK may influence the patterns of sexual behaviour.

This study contained some noteworthy limitations. Firstly, our analysis was based on cross-sectional surveys which did not cover respondents younger than 16 years old. Ideally, future research on the practices of oral sex amongst adolescents in the UK should rely on longitudinal data. NATSAL Survey did not include the question whether respondents had oral sex

before or after the time when they had first vaginal intercourse, and also about frequency of oral sex.

Secondly, ethnicity was not included in our analysis. In the future, longitudinal studies need to account for the race, ethnicity and cultural differences and the diversity of the British population, and take into consideration religious affiliations and inter-relations between them as powerful elements that could affect oral sexual behaviour among young people within the UK regions and cultures.

Finally, as the data was collected in 1999, it is possible that the reported findings may have undergone some changes over the last sixteen years. However, there is no reason to suspect drastic changes.

Conclusions

In summary, findings from this study demonstrated that the level of engagement in oral sex among British adolescents is relatively high. They also indicated that oral sex is particularly popular practice amongst white Christian young people on predominantly university level.

The results of medical research pointed out the high possibility of the development of oropharyngeal cancer from obtaining HPV-related infection in early age, particularly among white educated men, and that the population of such cancer patients is becoming significantly younger.

In light of this medical research, the findings from this study can significantly contribute to the public health through providing a guidance to practice for young people at most risk of exposure to HPV-related sexually transmitted infections, and to practitioners delivering health, social and educational services.

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Section 2. Information Technology and Education

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EVALUATION OF VIRTUAL AGENTS' EFFECTIVENESS IN HISTORY CLASS

Abstract: In this paper the effectiveness of virtual agents' application in educational process is examined. An approach for implementing virtual agents is presented and a methodology for their effectiveness' evaluation is introduced accompanied by an experiment that is conducted in order to provide results of their application in real class scenarios. This approach focuses on the effect of virtual agents on students' performance in history course, while taking into consideration their attitudes towards history course and towards the use of virtual agents. The research model, the research hypotheses and the applied experiment methodology are presented. The results show that the proposed approach has positive influence on students' performance in history course and provide insights into the effect of students' attitude regarding history course and use of virtual agents.

Keywords: virtual agents, education, virtual worlds, history course, ICT.

I. Introduction

Virtual reality is one of the latest tools that technology has offered to education. Contemporary learning and psychology theories claim that virtual reality offers unique affordances to the learning process [43; 44]. Accordingly, educators seeking to engage students in deeper learning and intrigue their motivation, have initiated to implement virtual worlds in classrooms [36].

Over the last 20 years, efforts have been made globally to systematically introduce *Information and Communication Technologies* (ICT) into schools and educational institutions at all levels [1–6]. In Greece, for more than 10 years, the Interdisciplinary Framework Program of Studies refers to the need to use the computer from preschool education, emphasizing the familiarization of students with the computer and its utilization as a learning tool [7]. *Virtual worlds* and, more specifically, *virtual agents* are a new tool in education. In Greece, according to our knowledge, the use of virtual worlds in education is limited.

This research exploits implementation of virtual agents serving as tour guides through standalone videos providing virtual tours at places of interest in an application for use in primary school classes in the history lesson. It attempts to examine the extent of influence of use of virtual agents on students' performance, their attitude towards the use of ICT and their attitude towards the subject [8–10].

In Section II, research work related to the role of virtual reality in education is discussed. In Section III, the implemented educational application integrating the virtual agents is presented and its educational oriented design is discussed. In Section IV, the purpose and the research questions are presented. In Section V, the followed methodology focusing on the applied research model, the related concepts and the examined variables is presented. In Section VI, the conducted experiment as well as the conditions and the examined dataset are discussed. In Section VII, the results of the experiment and their consistency check methods are presented. Section VIII summarizes the overall approach, the provided results, takes into consideration the existing limitations and draws the line for future work.

II. Related Work

In this section the role of virtual reality in education is discussed through literature research of the latest relevant work focusing on: (i) virtual agents; (ii) virtual reality artworks; and (iii) interactive videos applications in the educational process.

Use of agents

Animated agents are used in virtual environments in order to provide a more personalized interaction between human and computer [11]. Embodied, or better yet humanoid, agents act as virtual guides or instructors and are able both to lead the users to the required places and to provide information. With respect to other forms of guidance, an agent can draw users' attention with a pointing gesture or its body orientation [12]. Thus, agents have been being used as guides in virtual tours, training agents for the military [13] and furthermore, in pedagogical and training applications.

USC/ISI (University of Southern California/Information Sciences Institute) developed a pedagogical agent called Steve (Soar Training Expert for Virtual Environments) that acts as a tutor and collaborator, supports the learning process by answering students questions and gives advice if students run into any difficulty or if the user is passive and undecided [14]. Steve continually monitors the state of the environment and periodically controls it through virtual motor actions. Agent Steve can be rendered either as an embodied agent or as a disembodied one, represented by a virtual hand which points to objects, grasps and manipulates them. Finally, it can either behave as a tutor for a student learning a particular role in the team, or play the role of a teammate when an actual collaborator is unavailable [15].

Agents are often used in culture heritage projects. In a preliminary effort to enhance a virtual museum tour, the development team of SAGRES virtual museum, exploited software agents in order to help users by monitoring their actions and helping them during navigation. By incorporating personal assistants, the agents used introduce the idea that the users actually interact with real characters, which servers the initial purposes of the project, thus a more interactive and reallike virtual tour [16]. In

a similar context an agent was used in a game developed for a culture heritage exhibition [17]. The game, called Solis Curse aims to test the knowledge acquired during a museum visit.

Agents have also been used in mobile device applications. Carletto the Spider was developed for a historical location in order to transform the visit of the location into an immersive experience. The agent is an anthropomorphized spider, named Carletto, which appears on the screen of the visitor's mobile device. The spider in order to deliver its presentation engages in a dramatic monologue, while at the same time further information is displayed on the screen. The application's most crucial affordance is that it is aware of the user's location, which enables the agent with the capability to adapt the information to the visitor location. Furthermore, in accordance with the general principles of agent implementation [15], Carletto keeps the control of the interaction, politely directs the visitor's attention to relevant aspects and objects and gives instructions and information in a dramatized style [18]. An additional example of a somehow anthropomorphized agent is that of a fish in E-Junior virtual world. The agent, representing Brown Grouper specie, serves as a visual tutor and guides the students through the different stages of the virtual world and the games entailed [19].

A Web-compliant system has been proposed in order to develop an interactive training simulation aiming to teach elements of the Iraqi dialect, culture and customs. In this application virtual agents are used both as role — playing actors and as instructors who present important elements of the dialect and culture and provide feedback on the user's answers [20].

Agents have been successfully implemented in training professionals. JUST-TALK is a system designed to teach users basic techniques for managing encounters with mentally ill people and is mainly addressed to law enforcement professionals. Through observations and dialogue with a virtual agent the user has to stabilize the situation and decide whether to release or detain the subject [21]. Virtual Medical Trainer combines medical procedures databases and virtual patients to provide an interactive environment which mimics the demands of a real medical emergency and furthermore, provides the opportunity to the trainees to experience a variety of trauma scenarios [22].

Virtual reality artworks

Virtual World use in an educational context has grown rapidly since the early 2000s. In the beginning, educators implemented already existing virtual worlds such as Second Life [45] and ActiveWorlds [46] as teaching tools. However, worries expressed considering the dangers of virtual harassment as well as the lack of environment control have led to the adoption of virtual worlds strictly designed for educational purposes [23]. For example, ALIVE is suggested as an alternative to Second Life and ActiveWorlds. The ALIVE DX editor is a user-friendly 3d virtual world editor, which allows the users to drag and drop 3d scenes from a gallery and create 3d learning environments which can be distributed via the Internet or a CD-ROM [24].

This orientation towards "serious" virtual worlds is based on the advantages that they potentially offer to education. According to [25], students have the ability to collaborate within the virtual worlds; they are accessible 24/7, as long as users have an Internet connection; they allow students to apply skills and knowledge to model solutions; they provide a large community within which students can learn from each other.

Mitologies, an early attempt of representing a virtual world, is loosely inspired by the myth of Minotaur. Even though it was created and exhibited on a VR platform, which by nature allows plenty of interactivity opportunities, in most cases the user has no actual control. Instead, a cinematic narrative form and a film-like structure was selected because it was considered more familiar to users [26].

In World Skin the visitor is in a very dominant position. Armed with a tracked camera, visitors are positioned in a 3d land of war where they embark

on a photographic safari. Every click of the camera extinguishes a fragment of the virtual world and the photographed fragment of the virtual world is replaced with a blank white space. Even though technically the interaction is limited to the simple click of the button, conceptually the system's response to the user's simple action is a complex sequence of social, political and moral correlations [27].

Multi Mega Book is an effort to compare two historical periods, the Renaissance and a futuristic electronic age. The user is able to navigate and explore two cities, an idealized Renaissance city and a fictional digital one. There is additionally an agent available who proposes a tour, which the user may follow or ignore [28].

The Thing project is designed in order to engage users in interactivity by communicating with an agent rich in emotional expressions. For the story to progress, the user has to complete an array of activities, which the agent assigns, an element which makes narration and interactivity strongly connected. In this case, storytelling is actually a motivation which drives users to highly interact with the agent [29].

When it comes to virtual worlds and education, a special reference is required for the projects which the Foundation of the Hellenic World has undertaken. The programs include virtual reconstructions of ancient cities, namely ancient Olympia and ancient Miletus, and various educational virtual applications which demand active participation [31]. Olympic Pottery Puzzles allows students to assume the role of an archaeologist and piece together ceramic shards in order to restore ancient vases. In compliance with the constructivist theory, children, by learning-by-doing, learn about the process of restoration as well as details about ancient sports, athletes and the Olympic Games. Respectively, in the Workshop of Phedias in Olympia visitors find themselves in the workshop of the sculptor Phedias and by taking the role of the sculptor's helpers, assist him in order to reconstruct the famous statue of Zeus, one of the seven wonders of the ancient world [32].

The aforementioned E-Junior is another example of a virtual world designed with an educational orientation. Even though it was designed with Spanish education needs in mind, it can be implemented by many Mediterranean National Curricula in order to introduce students to natural science and ecology, and in particular, to basic elements of the Mediterranean ecosystem. It is considered highly immersive and interactive, while in the same time it encourages active learning. In accordance with the suggestions of [33], E-Junior offers an exquisite alternative of a field trip in a Mediterranean ecosystem, avoiding, thus, high costs, safety and organizational logistics [19].

Interactive videos

The scope of the present paper focuses on developing interactive videos, in which virtual agents have the leading role, hence a brief review of their use in education is considered essential.

In general, educational and instructional videos are seen as a fruitful support of students' self-learning and motivation. Their novelty in education lies on the benefit of using the visual perception. A moving image can help the learner to see a process or understand how something works, moves or performs. In addition, videos, when done objectively, have the advantage of explaining in a few seconds something that needs several pages, when written. Besides, videos offer students the opportunity to gain insight into events that they cannot experience in real life. Specifically, during a history course videos may serve the purpose of giving students a glimpse of a past era, whereas in a biology course documentaries may be shown to students in order to demonstrate the hunting behavior of wild animals [32]. These specific affordances, alongside with their continuous availability, that is that students can play and watch them as many times as they need, makes them an invaluable tool for enhancing learning [34].

Video applications can be used to effectively present the content of a virtual environment to users. In this case, a camera path is predefined and followed automatically as the virtual environment is

executed. The advantages of this method is that users experience the virtual environment without having to select the route and the time devoted to each object, since the producers of the video have previously defined the followed path and the objects which will be focused on. This characteristic results in easiness to use even for users with no prior knowledge or experience on virtual environments and for individuals with disabilities related to their hands. Moreover, in fixed navigation, the entities of interest are highlighted and it is suitable for focused guiding [48].

Even though empirical evidence of the benefits of interactive videos in education is still in its infancy, researchers suggest that they are potentially invaluable for the learning process. More particularly, interactive videos include video, audio, PowerPoint slides and other features provided by an interactive video player. Additionally, apart from start, stop and pause buttons, they also include a timeline divided into many sessions, allowing, thus, users to navigate through the video and adjust the pace of information presentation to their own needs [32].

In the case of interactive videos, nevertheless, the concept of interactivity goes beyond control behaviors, that is the capacity of the learner to match their learning pace with what will appear on the next frame. In addition, interactivity can be incorporated in order to yield the possibility to change the viewpoint, which is a crucial element if a place or a phenomenon is to be examined from different perspectives, similarly to the real world [35].

III. The Educational Application

The presented educational application takes advantage of the abilities provided by virtual agents to act as actors that impersonate historical personalities. These virtual agents when appropriately designed can be used for storytelling and serve educational purposes. The presented application is designed for use by Greek students and the provided information is available in modern Greek.

Image 1: Application's welcome screen

One of the most ambitious promises of implementing virtual reality in education is to increase students' motivation. This very effort starts with the designing of three virtual agents representing three personalities who are all connected to the history of Corfu, Greece. Furthermore, even though the agents are not embedded in a virtual world, a simple application is as well designed in order to demonstrate their function as instructors and tour guides. The three agents are enhanced in existing virtual worlds and videos are produced in order to be used in a history course. The focus was on designing the aforementioned agents with high fidelity and resemblance, which according to literature [36] contributes to

learning motivation and engagement. They have the ability to realistically talk moving the muscles of their face as well as making gestures with their limbs.

The presented educational application is developed using world wide web technologies and standards in order to be accessible through the world wide web and by plethora of computer machines. Its design is simple enough to facilitate users navigation and avoid confusion. The historical personalities are listed using their profile images and users can select any of these by clicking on them (Image 1).

When users select each one of the listed historical personalities the application executes the corresponding storytelling screen (Image 2). In order to facilitate users navigation the storytelling screen overlays the welcome screen so that users are able to return to the welcome screen by closing the storytelling screen. The educational scenarios for the represented historical personalities are organized in sections. Each section is a video visualizing the selected historical personality by the virtual agent that is used to communicate the section's information. Sectioning of the educational scenarios is preferred in the specific implementation as an early user test resulted that users can easily repeat a selected section instead of having to search the video for the desired section. The videos are vertically aligned so that users view the videos in logical sequence according to the educational scenario which is designed to facilitate learning.

Image 2: Application's storytelling screen

IV. Purpose and Research Questions

The purpose of this research is to investigate the effectiveness of virtual agents in the educational process. There are many surveys referring to the same issue, but the results do not seem to be universally consistent. In contrast to the study of which the results were positive for the use of ICT [37], in 2002 an overall approach of the until then research activity showed small deviations between the teaching with the use of new technologies and traditional methods [38]. The situation has become even more obscure in the sense that it is difficult to make foregone conclusions due to the lack of sufficient evidence in order to evaluate ICT use in schools and its effect on learning outcomes [39]. However, later, positive findings have emerged from the research community claiming that a computer-assisted teaching method might be able to bring significant results to the acquisition of knowledge and the achievement of cognitive goals [40].

Based on the above, the first research question was formed as follows:

Q1: Does the use of virtual agents affect the performance of the students in the History course?

The research hypotheses that occurred were formed as follows:

H 1.1. *The* use *of virtual agents affect the performance of the students in the History course.*

H 1.0 *The use of virtual agents does not affect the performance of the students in the History course.*

It has been suggested that the attitude of a student towards a subject, forms at least at one degree their success on it. [8; 9; 41; 42]. Based on this suggestion, another research question was formed:

Q2: Does the performance of the students is being affected by their overall attitude towards the History course?

The corresponding research hypotheses were formulated as follows:

H 2.1 The performance of the students in the History course is affected by their attitude towards the course.

H 2.0 The performance of the students in the History course is not affected by their attitude towards the course.

The third research question was formulated on the basis of surveys that want the students' view of ICT history teaching to be shaped according to their ease in history and the use of technology:

Q3: Does the students' attitude towards the software use during the History course is being affected by their overall attitude towards the History course together with their attitude towards the software use?

H 3.1. The students' attitude towards the software use during the History course is being affected by their overall attitude towards the History course together with their attitude towards the software use.

Y 3.0 The students' attitude towards the software use during the History course is not being affected by their overall attitude towards the History course together with their attitude towards the software use

V. Methodology

The design of the research model requires the adoption of methods which have examined similar research questions. Table 1 lists the surveys to which the method was used to conduct our research and the each time examined concepts.

Table 1. – Examined concepts

Examined Concept	Definition	Source
Performance	Conquest of knowledge depending on the method that was used	Carr (2012)
Ease towards History course +	HC – > The belief that the student can deal successfully with the History course	Fogatrv et al. (2001)
Ease towards the use of technology =	TC – > The belief that the student can handle computers	
Sense of how to use technology in the teaching of History (UTL)	UTL – > Attitude towards the use of computers during the History course	

In order to answer to E1 we will use 2 groups of students, one control group and one experimental group. In the control group the students will be taught a section of History (relating to the local history of Corfu where the school belongs to) using the traditional teaching method (CLASS 2), while the experimental group of students will be taught the same section with the use of virtual agents (CLASS 1), All students will be asked to answer a test before and after the instruction, so that their performance will be measurable and comparable, before and after teaching.

To answer Q2 and Q3, the students will be asked to complete a questionnaire that comes from the evaluation model proposed by [10]. This evaluation model examines the student's ease in mathematics and it was adapted in order to be used in History class, the ease in technology and the sense of the ICT use as a way of teaching. *History Confidence*

(HC) is defined as the student's perception that he can be effective and that he can handle any difficulties. *Technology Confidence* (TC) is defined as the student's perception of being able to handle an educational software. As a sense of the use of ICT (*Use of Technology for Learning* – UTL). The use of Technology for Learning (UTL) is defined as the student's perceptions of using the computer for circumstances in which computers are used as a learning tool. Figure 1 presents the research model as it was formulated for conducting the research.

In order to process the survey data the statistical package "IBM SPSS Statistics Version 23" is used.

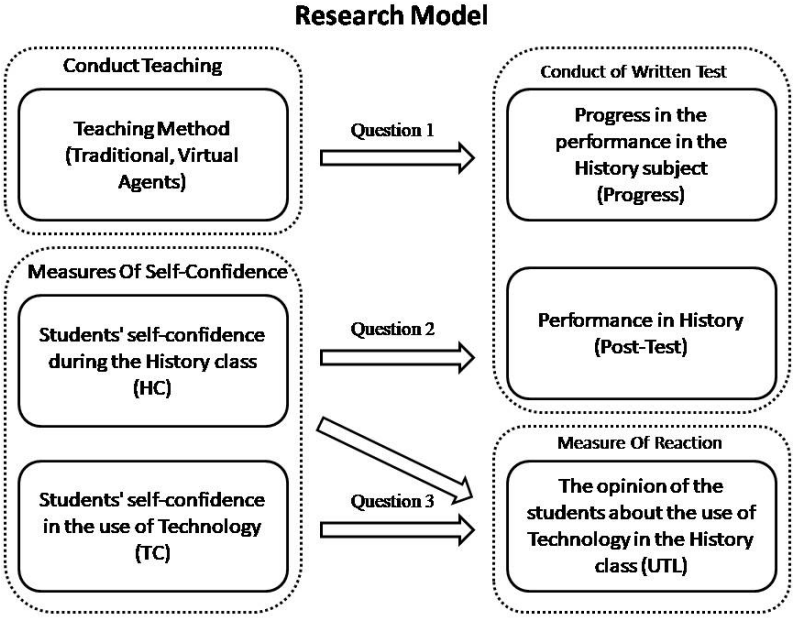

Figure 1. The research model

VI. Experiment

The survey was conducted in a primary school in a middle-class area of Corfu, Greece in October 2017. The participants are students of the 4th, 5th and 6th grade (N = 75) (Table 2). The topics that are chosen for the test are related to the local history of Corfu, where the primary school where the research was conducted is also located. These topics are associated with the three virtual agents who would present the subject.

Table 2. – Distribution of pupils and teaching method classes

	4th Grade Class 1	4th Grade Class 2	5th Grade Class 1	5th Grade Class 2	6th Grade Class 1	6th Grade Class 2	Total
Boys	7	5	5	7	5	5	34
Girls	6	5	9	7	6	8	41
Total	13	10	14	14	11	13	75

Two tests are given to each group. The first test is given before the teaching (PRE-TEST performance) and second test when the teaching process is completed (META-TEST performance). We also took into account that all of the exercises would be within the cognitive abilities of all the students so that they could be completed at a fixed time. After teaching and completing the second test, the students were given questionnaires and they were provided with sufficient oral instructions in order to complete them.

The structure of the questionnaire is based on the research model, as presented in the previous chapter. The possible answers to the questionnaire were given in a Likert scale [50] of 5 points, ranging from 1 (absolutely disagree) to 5 (totally agree). At the end of the questionnaire, a set of questions relating to the demographic data of the students are added.

VII. Results

In the questionnaire there are reverse questions and the corresponding responses are reversed during the data entry. Prior to the analysis of the data and before any conclusions about the research questions are made, the reliability of the questions for each examined concept is checked. To investigate the internal reliability of the statements related to the ease of the students towards history class (HC), the ease of using the software (TC) and the sense of using a software as a way of teaching (UTL), the Cronbach's alpha [47] rating scale is used. HC variable has satisfactory internal reliability ratio with a = 0.768 and TC a = 0.707. The marginally low ration 0,672 of the variable of UTL could perhaps be justified, bearing in mind firstly that the sample of the respondents was small and secondly due to the young of the students' age and the probability for them to have encountered difficulties while trying to understand the related questions (Table 3).

Table 3. – Cronbach´s alpha rates

Examined Concept	Cronbach's alpha
HC	0.768
TC	0.707
UTL	0.672

In the process of responding to Q1, the Progress variable was initially set to as the difference in the grading of the 2 tests. Performance mean values and progress's mean values are calculated and depicted in Figure 2, for comparison reasons. According to the results, students that attend the virtual agents' teaching method provide 15.1% increased performance when compared to the students attending the traditional teaching method.

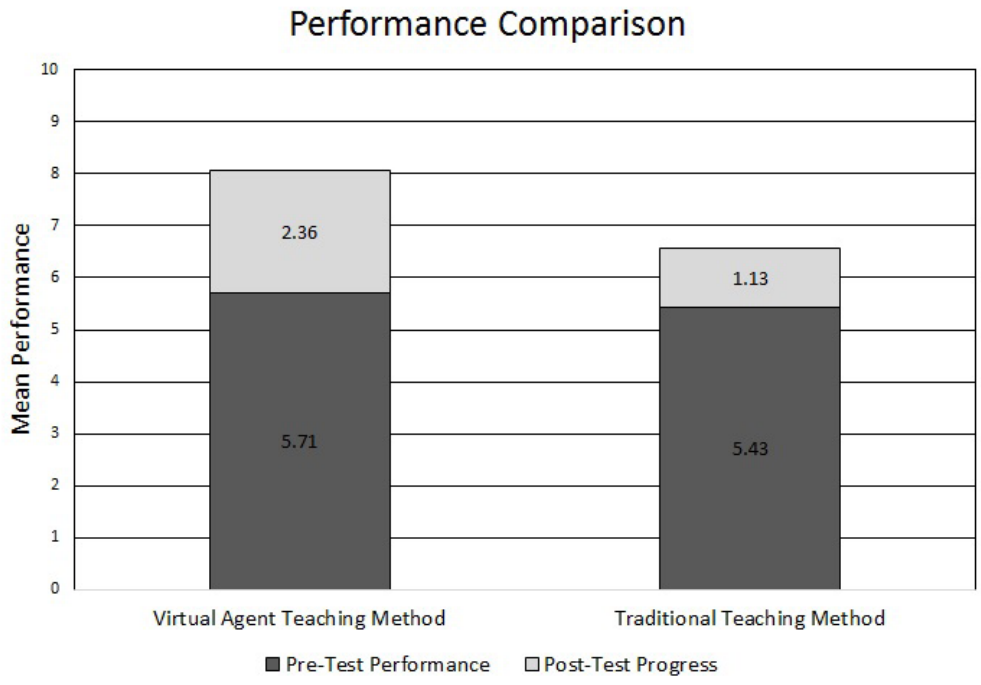

Figure 2. Performance comparison

Given the improved performance results in class 1 and 2, class emergence is considered in the performance groups. So, we divided the results of the meta-test in 10 groups of performance from 0 to 10. In

these groups we look for the percentage of emergence of the teaching method in the result. We notice that higher rates of performance show a greater emergence of the virtual agents' teaching method. We consider the virtual agents' method as a whole to be more effective than the traditional method. therefore, the comparison of the average of the progress of the two teaching method classes is also confirmed.

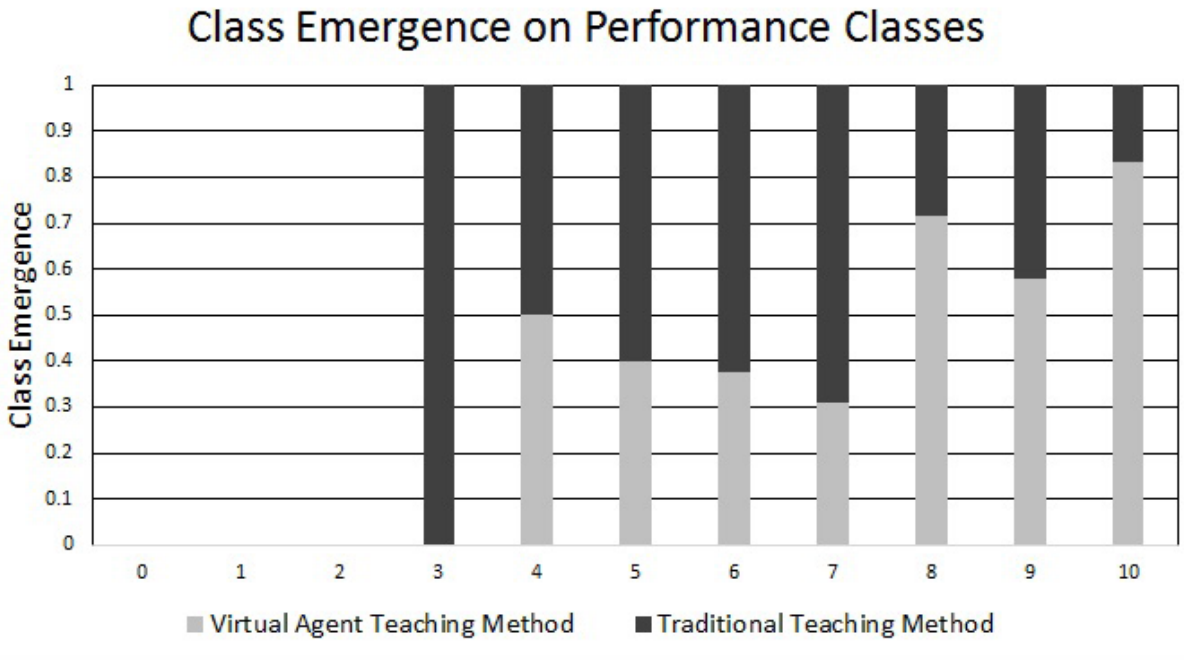

Figure 3. Class emerge on performance classes

To investigate a possible difference between the average rates of progress between the department of teaching history with the use of virtual agents and the department of teaching using the traditional method a t-test was carried out (Table 5) for independent samples (Independent samples t-test). The analysis showed a statistically significant rate for the sig. of the Levene' s test [51] for equality of variances: 0,07 (< 0,05). Therefore, observing the second line of sig. (2-tailed) which is 0,000 (p < 0.001) we conclude that statistically, there is a significant difference between the averages of the progress between the department of teaching history with the use of virtual agents and the department of teaching using the traditional method, with 2,3 ± 1,1 1,1 ± 0,7, respectively (mean ± standard deviation) (Table 4). According to the results of the t-test, we can conclude that the use of virtual agents affects the students' performance positively in the course of the story. The null hypothesis is therefore rejected.

To investigate the possible correlation between the degree of self-confidence of the students in the History class (HC) and their performance (post-test), we applied the Pearson's r correlation coefficient [49] (Table 6). The results showed that statistically there was a significant positive correlation (Figure 2) between the self- confidence of the students in history class as well as their overall performance with r = 0,643, p < 0.001 (sig. 2-tailed).

Table 4. – Classes progress means

Class	N	Mean	Std. Deviation	Std. Error Mean
Progress 1	38	2.3684	1.17222	0.19016
Progress 2	37	1.1351	0.75138	0.12353

Table 5. – Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F.	Sig	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
								Std. ErrorDifference	Lower	Upper
Progress	Equal variances assumed	7.831	0.007	5.408	73	0.000	1.23329	0.22804	0.77880	1.68777
	Equal variances not assumed			5.439	63.240	0.000	1.23329	0.22676	0.78018	1.68639

Table 7. – Linear Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1.113	0.275		4.051	0.000		
HC	0.265	0.057	0.414	4.629	0.000	0.877	1.140
TC	0.334	0.067	0.443	4.958	0.000	0.877	1.140

* *DependentVariable: UTL*

Table 6. – Pearson´s Correlation

		Metatest	HC
Metatest	Pearson Correlation	1	0.643**
	Sig. (2-tailed)		0.000
Metatest	N	75	75
HC	Pearson Correlation	0.643**	1
	Sig. (2-tailed)	0.000	
	N	75	75

*** Correlation is significant at the 0.01 level (2-tailed)*

Table 8. – Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.704*	0.496	0.482	0.39976

* *Predictors: (Constant), TC, HC*

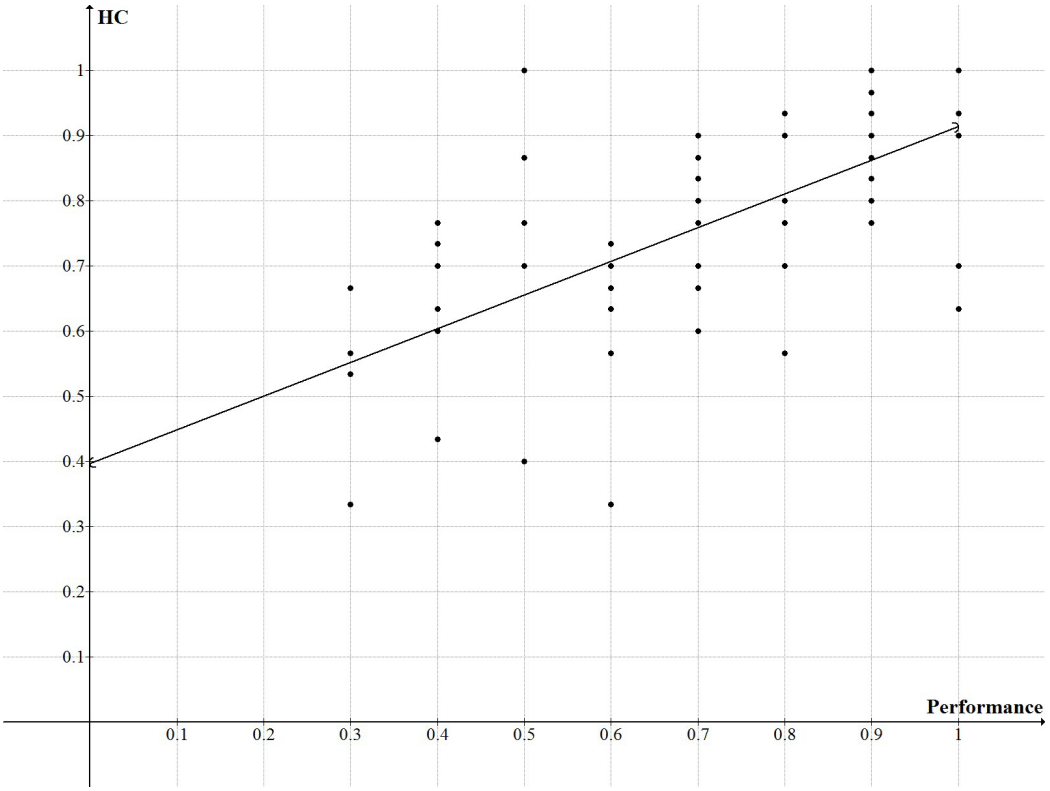

Figure 2. Performance-HC scatterplot

In order to investigate the percentage of the dispersion of the student's opinion regarding the use of software in history class (UTL – which for the needs of the query was considered as a dependent variable) which the independent variables justify [their self- confidence in history class (HC) and their self-confidence while using technology (TC)], regression analysis was applied". The values of VIF and tolerance indicate that there is no issue regarding the collinearity, therefore there is no issue regarding the high correlations among the independent variables (Table 7).

The two independent variables justify almost 48% of the dependent variable dispersion (Table 8). Both two variables had a statistically significant contribution to the model. The self-confidence of the students in history class (41% Beta) had less influence than the self-confidence of the students with the use of technology (44% Beta) ($p<0.001$ in both cases). Therefore, we conclude that students' opinion about the use of software in the history lesson is influenced by both independent variables more than their self-confidence in using technology.

VIII. Conclusions

This research is conducted in order to examine whether virtual agents designed to present historical information on points of interest can be used to provide positive results in history courses. In addition, the examination of whether the use of virtual agents in teaching can influence the student's performance in history class more than a traditional teaching-oriented method is carried out.

The results show that the progress in the performance of the students who attend teaching assisted by virtual agents is increased in comparison with the performance of students whose method of teaching had as its sole visual material the classroom blackboard and printed material.

The further stage of the research is to ascertain whether the opinion of the students towards the lesson of history and their self-confidence about the specific subject is likely to affect their performance. The results reveal a correlation between the opinion of students about their abilities and their final performance. Also, it is examined how receptive the students are to use technology in the teaching of history depending on their attitude to history and to technology in general. The results show that the attitude towards the history class and the attitude towards technology, although these are not directly connected with each other, affect the student's opinion of using technology in the teaching of history.

The results show positive feedback for the use of virtual agents in teaching of the history lesson but these results are enclosed by a number of particularly important conditions. The limited sample number, the study of only short-term results in the performance of the students are the characteristics that draw the lines for future work in order to provide universal conclusions.

In more detail, in addition to the small number of students who participated in the research, it should be noted that all of the students came from a primary school whose teachers are using ICT in their course of teaching, which is likely to have influenced the students' view to a greater extent compared to students coming from different schools with different teaching methods. In addition, the direct evaluation of the effect of the methods of teaching and the non-interference of a reasonable period of time did not allow the assessment in achieving meta-cognitive goals (learn how to learn).

It is clear that similar research should be conducted in larger and heterogeneous samples of students. Finally, apart from the attitude of the students that participated in the research regarding their acceptance of the teaching method in history class using ICT, additional potential components, such as usability, behavioral and emotional factors, could be taken into consideration.

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SOME METHODS TO DEVELOP MATHEMATICS TEACHING COMPETENCE FOR STUDENTS AT PEDAGOGICAL INSTITUTIONS IN VIETNAM

Abstract: In order to investigate the situation of developing mathematics teaching competence (MTC) for students (S) at teacher training institutions, the researchers conducted a survey to understand and evaluate the practice of developing MTC for S, then discuss the advantages and disadvantages of this process. Based on these findings, we propos a number of measures to develop MTC of students at pedagogical universities in Vietnam. From the results of pedagogical experiments, it is initially shown that the integration of various techniques in developing MTC into teaching can help students gain the necessary competencies and improve their professional skills in their later teaching career.

Keywords: Teaching competence (TC), students, Vietnam.

1. Introduction

Over the past years, pedagogical institutions in Vietnam have taken different measures to improve the quality of teacher training. Based on our investigation and also the consultation with experts, it is found that the development of MTC has the following advantages:

– Pedagogical institutions have good facilities and equipment for the development of MTC for S.

– Professional standards have been paid attention by educators as well as mentioned in many coursebooks and research at all levels; it is also recognized that the developing teaching competence for S is essential, all of which are reflected in the "output standard" for S at pedagogical institutions.

– The curriculum is reformed and updated in accordance with changes in the syllabus and textbooks in use at high schools; teaching materials on pedagogical skills are relatively abundant.

– The experienced teaching staffs also provide certain advantages in developing TC for S.

– The development of information and communication technology contributes to the development of TC for S, thus helping S to update information, get access to Internet video clips on good lectures as sample for teaching as well as improve their knowledge and skills.

– Pedagogical S are now learning and maturing in the developing society, so most of them have life skills, study skills and flexibility. Many students have clear career goals and study plans to develop their professional skills so they have the will to strive for all of these aforementioned things.

However, the development of MTC for S also has some limitations:

– Methodological teaching staffs are limited in terms of quantity and age. Their teaching experience is limited due to short time of teaching;

– The cirriculum are not balanced with more focus on theory and less on practice. Teaching methods cannot encourage the dynamics and creativity of learners, so it hasn't fully fostered ability for independent thinking and practical skills of S;

– According to the cirriculum, S study both basic science courses and pedagogic modules. Due to the demanding content and the large number of credits of basic science subjects, many S tend to neglect pedagogic modules. Moreover, many lecturers who teach basic science courses are not interested in the mission of developing TC for S;

– The method of evaluating the development of TC for S still focuses on encouragement, which cannot reflect the real TC of each S. These all affect the process of formation and training TC for pedagogical S;

– Some students are not aware of the importance of developing their TC so they lack the initiative and self-discipline in training their pedagogic skills. Moreover, it is a matter of fact that the enrollment process does not take the pedagogical aptitude into consideration; thus, many students still have speech defect, difficulty in expressing their ideas fluently and coherently, or weak and barely perceptible voice …

– The school cares about developing TC for S; however, there are still many activities that are superficial and temporary rather than in-depth, thus they are not efficient enought for the demand for developing TC for S.

Based on the findings on the development of MTC for S at pedagogical schools in Vietnam, this paper proposes some measures to develop MTC for S at pedagogical schools in Vietnam.

2. Content

2.1. Current situation of developing MTC for S at teacher training institutions

In order to understand the current situation of developing MTC for S at teacher training schools, we conducted a survey which dated from 8/2016 to 12/2016.

– We have consulted 35 lecturers of Mathematics of 5 universities with training in Mathematics (College of Education – Thai Nguyen University, Tay Bac University, Tay Nguyen University, Dong Thap University, Hanoi National University of Education) on the need to develop TC for S. The survey results are as follows (Table 1).

The survey results show that 100% of the lecturers think that the development of the content of the unit for S is necessary; more than 90% of the respondents affirm that the development of choice of methods suitable for the content and qualifications of students should be paid attention; over 80% agreed with the development of making lesson plans for students; the ability to manage the classroom, expression, and behavior is only approved by 43 to 77%. As many as 71% agreed with the need to develop assessment skills for students and 74% agreed with the need to develop the capacity to organize activities outside the classroom.

Table 1. – Results of survey on mathematics lecturers

No.	Questions	Answer	
		Necessary	Unnecessary
1	*2*	*3*	*4*
1.	Studying the main content of the lesson.	35/35	
2.	Identifying the basic and core knowledge.	35/35	
3.	Selecting suitable methods for the teaching content and Students' level.	34/35	

1	*2*	*3*	*4*
4.	Designing lesson plans as standard forms.	29/35	6/35
5.	Classroom management skills	15/35	20/35
6.	Interpretive skills.	25/35	10/35
7.	Behavioral skills.	27/35	8/35
8.	Board presentation skills.	31/35	4/35
9.	Assessment skills.	25/35	10/35
10.	Extra-cirriculum activity organising skills	26/35	9/35

– We also consulted 35 mathematics teachers of 5 high schools in Thai Nguyen province. All these teachers have instructed practicing pedagogy for mathematics students at College of Education – Thai Nguyen University in the academic year 2016–2017 (Luong Ngoc Quyen, Dong Hy, Dai Tu, Gang Thep and Chu Van An) on the level of attainment of the teaching skills of these S. The survey results are as follows (table 2).

The results of the survey show that among the students who are on the fieldtrip, some of them are capable of teaching fairly well, still some others are just at the medium level or no lower. The weakest skill of S is the ability to understand the facial expressions (48%); Questioning skills are also a limitation of students (37% of the opinions are not satisfactory and 48% of the opinions of the average). The skills of preparing class assignments, lesson plans and test-taking skills were only moderate, and the ability to handle teaching situations was weak (74% Average or not). It can be seen that mathematics teachers in schools assess the level of current TC of S is not high, so it is necessary to focus on developing the TC for mathematics students in teacher training schools.

Table 2. – The results of the survey of teachers in upper secondary schools in Thai Nguyen province who have led the teaching practice for students

No.	**Skills**	**Level**			
		Good	**Fairly good**	**Average**	**Not good**
1.	Board presentation.	3	7	22	3
2.	Speaking and reading expressively, effectively using facial expressions		5	13	17
3.	Questioning skills		5	17	13
4.	Presentation skills	2	8	20	3
5.	Identifying basic and core knowledge		15	20	
6.	Selecting suitable methods for the teaching content and Students' level.		19	16	
7.	Handling teaching situations		9	13	13
8.	Using lesson plans and board presentation	7	16	8	4
9.	Designing tests		9	17	9
10.	Making lesson plans		11	13	11

– We consulted 392 mathematics students from universities with training program for Mathematics teachers (College of Education – Thai Nguyen University, Tay Bac University, Tay Nguyen University, Dong Thap University, Hanoi National University of Education) on factors influencing the development of their TC. The survey results are presented in (table 3).

Table 3. – Results of survey on mathematics students at Mathematics teacher training universities

No	Factors	Degree of importance			
		very important	important	quite important	not important
1.	Lessons of pedagogical skills at universities	336	54		
2.	Lecturers' teaching styles	252	130	8	
3.	Self-practice in pedagogical skills development	328	62		
4.	Teaching fieldtrip	119	271		
5	Pedagogical skill competitions	45	124	209	12
6.	Peer influence in pedagogical skills development	80	197	113	
7.	Family support		17	313	60
8.	Friends encouragement	16	101	230	33
9.	Mastering knowledge and math problem solving competences	383	7		

The survey results show that 85% of the respondents think that the teaching of MTC is very important. In addition, 83% of the respondents affirm that the self-development of TC of S themselves has a great influence on the level of achievement. At the same time, 64% of teachers assert that teacher's teaching style will greatly influence students' learning and development of TC; 32% of the respondents affirm the impact and 68% of the respondents affirm that the development of TC for S is from the field trip. In addition, the factors from collective activities, the help of friends also greatly affect the results of S' TC development. In particular, up to 98.2% of respondents think that the most affirmative impact on the development of S' TC is to master their knowledge and problem-solving skills.

From the aboved results, it can be concluded that:

– Currently, students have not paid much attention to the skills of lesson planning; not interested in standards in Math skills and knowledge; Knowledge of general math is not stable, math-problem solving skill is weak; The skills of designing questions and activities in classroom teaching are limited; Students are not good at selecting and using suitable teaching method for each specific lesson, the ability to use basic elements in teaching math is weak; There is no skill in applying information technology in teaching; Presentation skills, expressions and intonations when teaching in class do not meet the requirements of teaching in high school; The training of skills in examining and evaluating learning outcomes has not been paid proper attention.

– From factors influencing the development of S' MTC, pedagogical universities should strengthen the practice of organizing classroom activities during pedagogic teaching hours, using micro-methods for transmission, develop the pedagogical style from the teaching staff in the faculty of Mathematics for students, the rational organization of activities in the pedagogic practice in high schools so that students have more conditions to train their teaching skills in class to develop their TMC.

3. Some methods to develop S' MTC at high schools

3.1. Training the students to compile main parts of a lesson plan

1) Ask each student or group of students to clearly identify the objectives, issues related to knowledge and content of each unit in the mathematics program in high school.

To meet this requirement, students must study the textbooks and other reference materials to: Define basic knowledge, the focus of the lesson; understand the intent of the textbook content; identify the knowledge related to the unit; practical knowledge in life related to the unit.

2) Let the S to practise designing questions for the activities in the unit through specific examples.

To enable students to correctly and deeply understand the types of questions, the instructors ask students to find examples illustrating the following types of questions:

– *The orientation question* (megaphone question which directs S to think about something, S do not need to reply or have the correct answer).

– *Test questions* (to test the former knowledge or to find out whether a student understands a step or a series of inferences already made or not).

– *Question asking for action* (students do the calculations and the next inference. This type of question requires thinking, so it should be suitable for the S).

– *Open questions* (Questions that can have long answers or a variety of answers)

– *Closed questions* (Questions that can be answered with only one word or a phrase).

At the same time, students should be trained to avoid trivial questions, unclear questions, too difficult questions or "hands on" questions.

3) Ask S to make some lesson plans, then exchange or discuss with their friends under the supervision of the teacher.

3.2. Developing the application of information technology in teaching through self-studying or group discussion

To develop the application of information technology in teaching mathematics, the following steps can be taken into consideration.

Step 1: Introduce to S some popular softwares in teaching maths at highschools like Microsoft Powerpoint, Cabri Geometry, Maple…

Step 2: Ask each S to study one of the softwares: how to use it; examples to illustrate the way to organize the typical situations in teaching maths with the aids of the software.

Step 3: Each S or group of S present about the software they have studied.

Step 4: S discuss, give comments and teacher draws the conclusion.

Example 1. Applying information technology to support teaching, the teacher can follow the sample:

– *Step 1:* Teacher introduced about Cabri Geometry

– *Step 2*: Each S was asked to study Cabri Geometry: how to use it; examples to illustrate the way to organize the typical situations in teaching maths with the aids of the software.

– *Step 3*: Each group gave a presentation.

The following is the product of each group proposing using Cabri Geometry software in "Self-arrangement"

Table 4.

Activities	**Teacher's activities**	**S's activities**
1	***2***	***3***
Acvitity 1. Identify the image of a point through self-arrangement $V(I, k)$.	– Open file "VD1.fig" steps by steps: I, k and 3 points on the same line A, B, C (B is between A and C). – A', B', C' is the image of A, B, C through homothetic transformationon $V(I, k)$.	– Describe how to define an image of a point through a homothetic transformation*on.* – Look at figures 1 and 3

1	*2*	*3*
Activity 2. Observe the relative position of three points *A', B', C'*.	Use the function of the software to change the position of points *A, B, C*.	Observe the results on the screen and make predictions: – *A', B', C'* are three straight points; – *B'* is between *A'* and *C'* .
Activity 3. Test the prediction	– Using the software to check the alignment of the three points *A', B'* và *C'*; – Draw straight lines *AC, A'C'* and let *B* move on *AC* (Figure 2, Figure 3). **?** Talking about the rules.	– *A', B', C'* are aligned; – *B'* is always between *A'* and *C'*. *"Phép vị tự biến ba điểm thẳng hàng thành ba điểm thẳng hàng và bảo toàn thứ tự giữa các điểm ấy."*

** Group 1. Teaching characteristic: "The self-arrangement turns three points into three straight lines and preserves the order among them"*

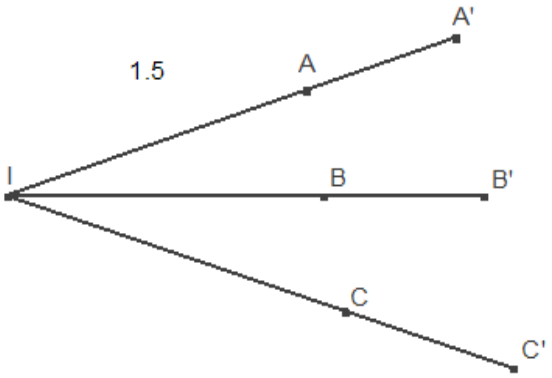

Figure1.

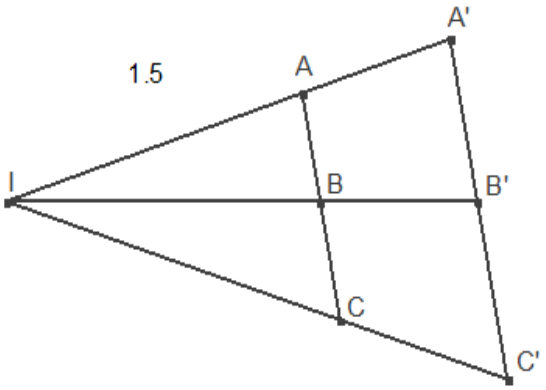

Figure 2.

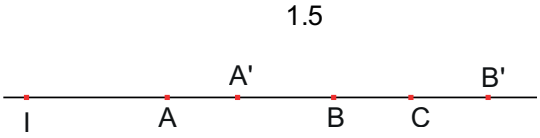

Figure 3

** Group 2. Teaching homework assignments: Two points A, B and the circle with the center O which have no relation to the line AB. Through each point M runs on the circle (O) rendering the parallelogram MABN. Prove that point N belongs to a definite circle*

Table 5.

Activities	**Teacher's activities**	**S's activities**
1	***2***	***3***
Activity 1. Read the question.	Open file "VD2.fig" to let S observe figure 4.	Students observe pictures, draw pictures and define fixed elements; Mobility factor and causal factor.
Activity 2. Predict the locus.	Use the software, M change positions on the circle and leave trace N for the students' observation (Figure 5).	– Observe the position of point N in the process of M changes on a circle; – Make a prediction that the locus of N is round.

Activity 3. Develop the solutions	Use the software, identify point *O'* $O' = T_{\overline{AB}}(0)$. Give comment on the position of *O'*, compares *OM* and *O'N*. Draw conclusion about the locus of *N* (*Figure 6*).	– *O'* is fixed and *OM* = *O'N* Conclusion: The distance *OM* between N and the fixed point O' is constant. So, the locus of *N* is the circle with the diameter *OM*.
Activity 4. Solve the problem	Set the requirements when conducting proof of the agreement and the inversion.	Under the guidance of the teacher, by logical reasoning, the student proves the consensus, the inversion and the conclusion of the equation.
Activity 5. Check the solution found	Use the software to identify the locus of N when *M* moves on the circle (*O*) (Figure 7).	The S visualized the on-screen image of the locus on the screen and found that the point accumulation point N coincides with the result indicated in Activity 4 as the image of the circle (O) through the translation.

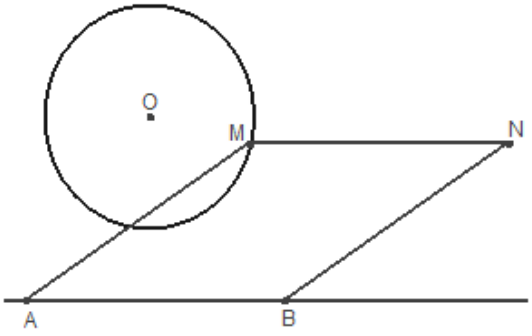

Figure 4.

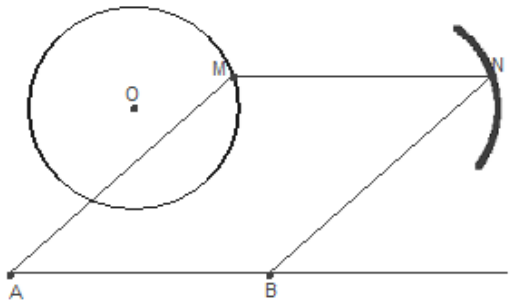

Figure 5

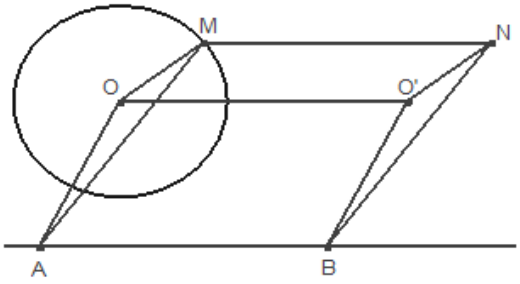

Figure 6.

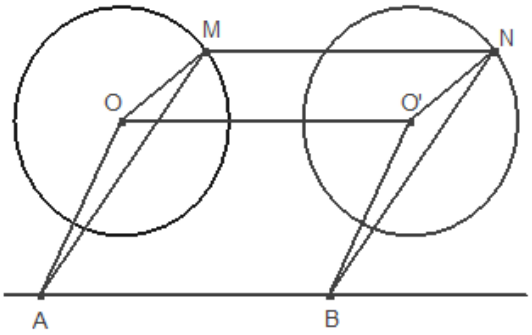

Figure 7

Step 4: S discuss, give comments and teacher draws the conclusion.

3.3. Allowing students to present and giving lecture in the practice of teaching methods and in pedagogical modules: 1) *Allow S to design and organise teaching situations to motivate learners; to help learners discover new knowledge and skills.*

2) Open discussion for S about some hours of teaching mathematics in high school (through video) to draw lessons in teaching.

3) Use micro method: This method is used ti help *S* practise basic teaching skills in the classroom. Teachers organize mini-lessons for students to teach in small classes (from 5 to 10 students play the role of S).

The process that is done during the micro-teaching hours is usually as follows:

– S prepares a short lesson of 10–15 minutes, focusing on a specific teaching skill and a topic that can be introduced in a "mini lesson".

– Lessons are recorded for later exchange, comment on the good and not-yet good points.

– Then the mini-lessons are taught again to revise and evaluate again.

Example 2. Using micro method to teach "*The distance between two* diagonals *in space*" (Geometry 11 – basic).

One S gave the lecture as follows: "You've learnt about the distance from one point to the other, the distance between two parallel lines. So what is the distance between two straight lines? Today, we'll study the concept of distance between two crossed lines in space" and wrote on the board:" The distance of two crossed lines in space." Finally, this S let his/her S (their peers) do some examples of the distance between two diagonals.

The teacher asks S to exchange, discuss and evaluate whether teaching such "concept of distance" is good?

Then teacher draws some conclusions:

+ This is a traditional way of teaching a concept: Teacher gives lecture and S just listen, so S are passive. In the spirit of renewal of teaching methods, it is necessary to change the teaching methods to theoretical and applied theories. For example, before formulating the concept, teacher should point out the existence of the concept. Therefore, teacher can do the followings:

– Teacher draws the the cubic ABCD. A'B'C'D ' on the board.

– Teacher ask S to identify lines that are perpendicular to both A'A and BC; perpendicular to both A'A and BD

– Among the identified lines, which are both perpendicular to and cut the mentioned lines? Please argue about your comment.

+ From there, the teacher validates the concept (defining the common perpendicular.)

+ To help the S deeply understand the concept, the following issues need to be addressed:

– Is the "shortest" nature of the perpendiculars in the plane true for this concept?

– Is there a perpendicular line of two diagonals in space?

+ This issue can be understood in different ways:

Option 1: *a* and *b* are diagonal and perpendicular. *(P)* is the plane containing *b* and (P) perpendicular to *a*. The intersection of (P) and *a* is H. In (P), set HK perpendicular to b, then HK is the common anisotropy of *a* and *b*. This discovery also provides a process for determining the common anisotropies of two diagonal lines that are perpendicular to each other in space.

Option 2: a and b are two diagonal lines. Call (P) a plane that contains b and (P) is parallel to a, c is the perpendicular projection of *a* over (P), then how can the common anisotropy of a and b be determined? K is the intersection of b and c (why there is always this intersection?), D is the line through K and is perpendicular to (P), d cuts a at H (why d always cuts a?) Then HK is line perpendicular to a and b. From this finding, express a process that defines the common anisotropy of two diagonal lines in space.

+ In terms of presentation, T gives comments on the following things:

The questions must be written in full, not abbreviated, usually in the middle and at the top of the board, in uppercase or capital letters, items are equivalent. In a lesson, the parallel sections must be written in the same font and types; Pay attention when using the board: which parts can be deleted and which shouldn't…

+ In terms of expressions, S should pay attention to using the words in the textbook, to the phrases "the distance between two diagonals", "perpendicular line of two diagonals in space". (Emphasize on the word "between", "of").

+ In terms of teaching style, pay attention when talking, S have to look at the students, avoid saying

and looking at the board only; Use the right hand to hold chalk and wipe the board.

+ Teacher asks other S to have micro-teaching.

4) Let S practise to deal with pedagogical situations during lectures.

During the class, teachers may encounter unexpected situations that require the teachers' pedagogical skills to solve them quickly, skillfull to have successful teaching hours. In order to train students to behave in class, the lecturer first needs to introduce some common situations that occur during the lectures. After that, students have to think of other situations and how to deal with them.

3.4. Results from the teaching experiments

Based on the content and program of Methodology module, we conduct pedagogical experiments with the following contents: Numbers; Equations and inequations; functions; derivative; antiderivative; integral; Combined Algebra; Space Geometry and Vector.

Based on the study results and the number of students in Methodology classes, the specific contents of Thai Nguyen University of Education, we chose N03 as the experimental class and N02 as the control class. Experimental time is from August 2016 to December 2016. The teaching plan follows the plan of the school.

a) Quantitative assessment

Quantitative assessment of the experiment results, we consider two sides: Assess the knowledge of students and assess the development of MTC for students.

– ***Knowledge assessment:*** After the pedagogic experiments, students of grades N02 and N03 finished the Methodology module with specific contents. The results are as follows (Chart 1).

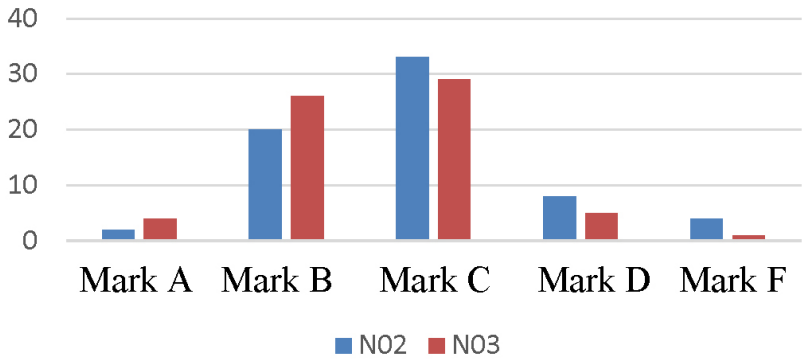

Chart 1. Results of specific contents of Methodology Module

It can be seen that the average grade point for the specific content of Methodology study of class N03 is higher than that of class N02. The ratio of students gain grade A, grade B of class N03 is higher than that of students in N02. The percentage of students who scored C, D in class N02 is higher than that of students in class N03. This leads to the conclusion that the learning quality of the experimental class is higher than that of the control class.

– *Evaluate the development of mathematical syllabus for students*: According to the training plan of Thai Nguyen University of Education, in the seventh semester, the students are divided into small groups of 10 students to 12 students. Each group was instructed by the Faculty of Mathematics to train NVSP and graded. The results are as follows (Chart 2).

From the above results, we see that the average scores of students in class N03 are higher than those of students of class N02. The ratio of students achieving grade A and grade B of class N03 is higher than that of N02's students. The percentage of students achieving grade C of class N02 is higher than that of N03's students. This leads us to conclude that the teaching skill of the experimental class is better than that of the control class.

Therefore, we can affirm that: Through teaching Methodology lessons, specific contents can be integrated to develop MTC for students not only have better scientific knowledge, but also their TC is also better than that of traditional students (i. e., the lecturers only provide content without paying attention to the development of MTC for students).

***b)* Qualitative assessment.** In parallel with the quantitative assessment, we conducted a qualitative assessment of the student's pedagogical results based on the results of the assessment process, through direct communication with students and lecturers, and through student questionnaires and teacher questionnaires, we have gathered the following information:

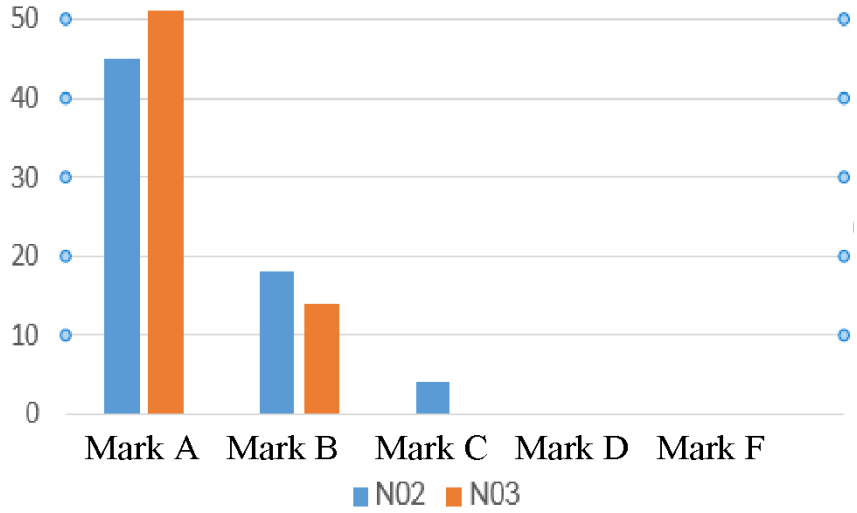

Chart 2. Students' pedagogic training results

* ***For students***. Through the implementation of the work to develop MTC for S, it is found that: the training exercise has brought excitement and stimulated the ability to study for students. Students also actively participated in the discussions and supported each other to complete the assigned tasks. The atmosphere of group work and in the classroom is comfortable and fun. Most students have mastered the content knowledge after completing the specific content of Methodology module; S are more skilled in organizing teaching activities, in the use of teaching methods, active teaching methods to organize teaching in class. Presentation, communication and organizational skills of the students are clearly enhanced.

For more information on evaluating the effects of pedagogical methods on the development of S' MTC, we conducted face-to-face interviews with students and lecturers through questionnaires. The results are as follows:

– Most of the students in the class are actively involved in training during class hours and self-training at home. Many S feel more confident and brave. Their teaching skills have also improved significantly.

– Most students said that developing their TC through the study of specific content of Methodology module has helped them to regularly practice and improve the TC needed.

* ***For training instructors***: For more information, we have conducted the interview and sent the questionnaires to the trainers of N02 and N03. Through direct communication with the lecturers and based on the findings of the survey above, we find that the majority of trainers believe that:

– Most students of class N02 and N03 have the necessary skills of teachers. However, most N03 students are judged to have a better MTC than N02 students. This is reflected in the following aspects: Knowledge of mathematics and knowledge of sci-

ence education; Ability to define lesson objectives, basic knowledge and focus of the unit; Ability to organize teaching and learning activities for students in the teaching process; Ability to ask questions; Ability to rationalize methods of teaching; Ability to give lecture and be able to communicate with people around; Ability to present on the board; Ability to handle pedagogical situations in the teaching process.

However, some students need to actively train some skills in their teaching process in the future, such as the skill of applying TC when communicating with the students in class (Bad hand-writing or skill of designing question).

With the above results, we affirm that organizing the teaching and learning the specific contents of Methodology with MTC can help the students gain the necessary skills to improve the "skills" in the teaching process later and become teachers in the future to meet the requirements of society.

4. Conclusion

Based on the investigation into the development of TC for mathematics S, we have proposed some measures for the development of TC for S in pedagogy universities in Vietnam. It is shown that, the integration of measures to develop TC for S has verified the effectiveness of these measures in the practice of teaching mathematics in Vietnam. These teaching competencies will be the necessary skills for the teachers-to-be to meet the requirements of society in the future.

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CONSTRUCTIVIST TEACHING IN VIETNAM MATHEMATICS CLASSES: A CASE STUDY OF TEACHING EQUATIONS OF STRAIGHT LINES IN THE PLANE (GEOMETRY GRADE 10TH- HIGH SCHOOL, VIETNAM)

Abstract: Innovating teaching methodology, to some extent, means shifting the focus to students' learning process. Among the most popular approaches of teaching innovation is applying theoretical principles to organise dynamic learning activities in the classroom. This paper presents some current viewpoints on teaching mathematics concepts and theorems in high schools and investigates a case study of teaching equations of straight lines in the plane based on Constructivism; eventually proposes some recommendations for teaching mathematics at Secondary Schools as a preparatory step for teaching equations of straight lines in the plane at Grade 10th – at high schools.

Keywords: Viet Nam, Constructivisim theory, equations of straight lines in the, mathematics teachers, High School, learning.

1. Introduction

Together with the reformation of the current cirriculum and coursebooks in Vietnam, teaching methodology innovation also proves essential and practical. There are two main subjects in this process: teachers and learners. Teachers are the designers and organisers of the reformation process while learners are the centre of the process. Thus, it is crucial that teaching innovation centralize innovating learning activities and teachers invest intellectually and emotionally into designing and organising learning activities in the aim of motivating learners, enriching their knowledge and developing learners' skills and competences.

Nguyen Ba Kim [1] distinguished four typical situations in mathematics teaching including teaching concepts, teaching theorems, teaching rules and problem-solving teaching, among which teaching concepts and teaching theorems has been neglected by teachers in the respect of organising learning activities in their classrooms in Vietnam.

Generally speaking, teaching concepts mean teaching about the objective existence of an object, in this particular case, objects in Mathematics. In teaching concepts, it's important that teachers be attentive in instructing learners to recognise the existence of the object through outstanding features, to define the object, and subsequently, to produce eligible outcome.

A mathematics theroem, despite being expressed in different ways, keep the content unchanged no matter how major or minor it is. It is generally stated with the form of a "If… then…" statement. There are two major goals: first, to instruct learners to identify the laws and secondly, to apply the law in solving mathematical or real-life

problems. It is the matter of fact that, in Vietnam, mathematics teachers tend to spend much more time on verifying the laws than helping learners to discover and identify them.

Although it is challenging for teachers to instruct learners to construct knowledge (including the theorem) required in the cirriculum, the more knowledge learners construct and identify through meaning learning activities, the greater their abilities to identify and solve problems, their positive attitude, self-confidence and learning motivation grow.

This paper presents the process of designing learning activities to teach the equations of straight lines in the plane (at grade 10th) based on constructivism. The research questions are: Is this possible for learners to identify and construct the equations of lines in the plane? Are there any obstacles that students encounter to identify and construct the equations of lines in the plane?

2. Theoretical background

Discussing constructivisim, J. Piaget claimed that knowledge construction is an active, rather than a passive process; perception is a process of adapting and reorgansing learners' mind. Individual knowledge and experiences must be "satisfactory" to the demand of the nature and society. Leaners acquire new knowledge through the following procedure: projection –> verification –> failure –> adaptation –> new knowledge [1, P. 208–209].

Constructivism is a learning theory describing the process of knowledge construction. Knowledge construction is an active, rather than a passive process. Constructivists believe that knowledge should not be just deposited into the learners' minds; instead it should be constructed by the learners through active involvement in the learning process. Therefore, Keith S. Taber's framework [8, P. 41] is selected by the researchers to design the teaching situations as follow:

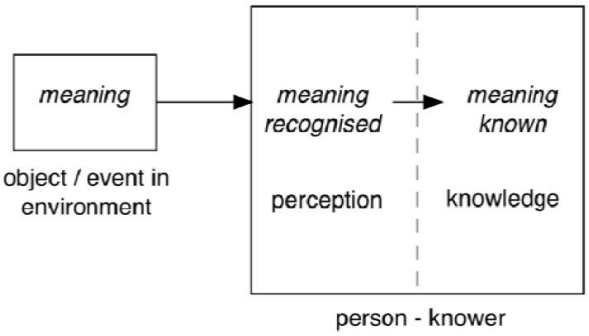


Figure 1. A traditional view of how we come to knowledge.

3. Design of the research

The research was proceeded through the following steps:

– Studying some underlying ideas of constructivisim, several works applying constructivisim in teaching Maths;

– Studying the current cirriculum for high school and secondary levels in terms of lines in the plane and designing learning activities;

– Implementing class observation in 2 classes at Phu Dien High School, Dong Thap province, observed teacher: Le Van Minh Tri (Class 10CB3: 40 pupils; Class CB1: 39 pupils) in the school year 2016–2017;

– Adapting the learning activities, evaluating learner's abilities to identify and construct knowledge.

During the observation, the researchers focused on analyzing the handouts distributed to the pupils and pupil groups to evaluate their abilities to identify and construct the formula of equations of lines in the plane.

4. Findings

4.1. Teaching situations to teach equations of straight lines in the plane.

The following learning activities highlight the inovations in restructruring teaching content. The final goal of those activities are to instruct learners to construct the formula of straight line

equations in various scenarios by themselves; the factors identifying lines such as points of straight lines, direction vector, normal vector

a) Summary of Teaching procedure

Activity 1: Warm-up/Revision

Teacher (T): State the objectives of the lesson: **Pupils (P)** learned about coordinate of a point in the plane, coordinate of the vector in the plane, today, they are learning about straight lines in the plane. T remind/help P to recall their knowledge of straight lines, with Handout 1;

P: Do as required in Handout 1 (individually or in group):

Handout 1;

Question 1: Decide if the statements are Correct or Incorrect. Make any modifications to correct the incorrect statements.

Table 1.

	Statement	Correct	Incorrect	Modification
A	A straight line is a ray.			
B	Straight line is a line in the plane.			
C	A straight line is a set of points in the plane.			
D	In the plane, different sets of points create different shapes.			
E	A straight line is a locus of point satisfactory to a specific requirement.			

Question 2: State the methods to identify a straight line in the plane (note: presented in the secondary cirriculum)

After Activity 1, P understand two main issues: a straight line is a set of points satisfactory to a specific feature (on the straight line with 2 given seperate points, passing a point and being right-angled with a given straight line).

Activity 2: Provide learners with knowledge of direction vector, normal vector of a straight line in the plane.

T: Assign the following task to P;

P: Work individually and in groups to fulfil the requirements of Handout 2.

Handout 2

Exercise 1: Given vector $\vec{u}(-2;3)$ and $\vec{v}(4;8)$. Answer the following questions

1) Identify two parallel vectors with $\vec{v}$ and a normal vector with $\vec{u}$.

2) Identify two normal vectors with $\vec{u}$ and 3 normal vectors with $\vec{v}$.

3) How many parallel vectors with $\vec{u}$ are there?

4) How many parallel vectors with $\vec{v}$ are there?

Exercise 2: Given vector $\vec{u}(a;b)$ and $\vec{n}(A;B)$, with a, b, A, B are real numbers. Find the quickest way to identify a vector:

1) parallel with $\vec{u}$

2) right-angled with $\vec{n}$

Exercise 3: What is the relationship between vector $\vec{u}(a;b)$ and straight line d_1; the relationship between vector $\vec{n}(A;B)$ with the straight line d_2 in the following figure?

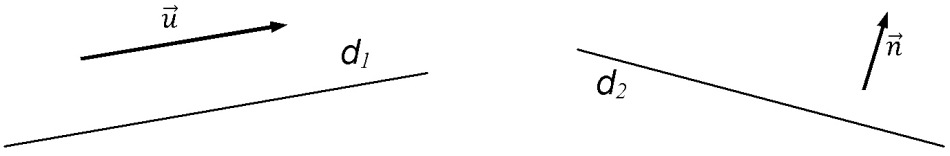


Figure 2.

P: Work in group quickly to solve the questions.

T: Define the vectors: Vector (not vector 0) is defined as the direction vector of a straight line when it is parallel with the straight line; Vector (not vector) as normal vector of a straight line when it is right-angled with the straight line.

Afterwards, teachers ask P to comment on the numbers of direction vectors and normal vectors of a straight line.

P: Work in group, then representatives of the groups answer the questions quickly or write the answers on the board briefly then explain the answer verbally.

Activity 3: Write equations of a straight line

T: Assign pupil groups the following exercises.

Handout 3

Exercise 1: Given a Decard coordinate system with the following points A (2; 1), B (–2; 0), C (–1; –1) as in figure 3:

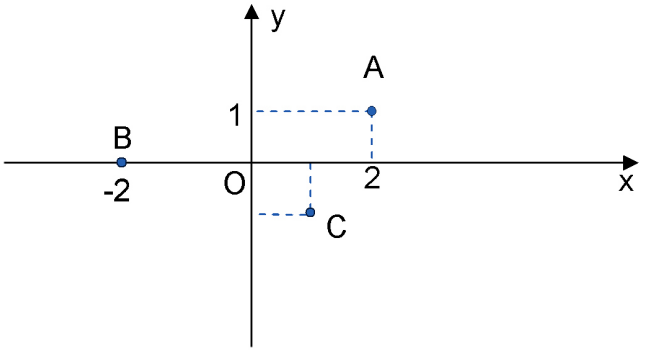


Figure 3.

Draw on the graph the lines which satisfy the following conditions:

1) d_1 identified with 2 points A, B (or straight line AB);

2) d_2 passing C and parallel with stright line d_1;

3) d_3 passing C and right-angled with straight line d_1;

4) d_4 passing C and parallel with horizontal axis;

5) d_5 passing C and parallel with vertical axis.

Exercise 2. Identify the points satisfying one of the following requirements.

a) a point on straight line d_1, different from A, B and a direction vector, a normal vector of d_1;

b) two seperate points on straight line d_2 and a direction vector, a normal vector of d_2;

c) two seperate points on straight line d_3 and a direction vector, a normal vector of d_3;

d) two seperate points on straight line d_4 and a direction vector, a normal vector of d_4;

e) two seperate points on straight line d_5 and a direction vector, a normal vector of d_5;

f) Let M (x; y) is a point on one of the straight lines above. Determine the condition or relationship of x and y in each case respectively.

Exercise 3. Given a De Carter coordinate system with the point M (2;3). Write the equation of a line which satify one of the following requirements:

1) straight line MO (O is the origin);

2) a straight line passing M and having the direction vector $\vec{u}(-3;5)$;

3) a straight line passing M and having the normal vector $\vec{n}(5;3)$;

4) a straight line passing M and being parallel with straight line PQ, with $P(-1;1), Q(2;-1)$;

5) a straight line passing M and being right-angled with straight line IJ, with $I(1;1), J(-2;5)$.

Exercise 4. State the general solution for the question of idetifying a straight line in the plane and present the solutions to the following questions:

a) passing two points A $(x_1; y_1)$, B $(x_2; y_2)$

b) passing M $(x_0; y_0)$ and having the normal vector $\vec{n}(A;B)$;

c) passing M (x_0; y_0) and having the direction vector $\vec{u}(a;b)$.

Exercise 5. Given an equation of the straight line 4x + 3y – 17 = 0. Identify a point on the straight line, a normal vector and a direction vector of the straight line.

b) Implications for teaching

Teachers should bare in mind the following techniques.

+) Activity 1 and 2 are the preparatory steps to help P review their knowledge and obtain new knowledge, combine the old and new knowledge in order to construct the formula to identify the equation of straight line in certain cases. It's important to remind P that a straight line is a set of points. The point M (x; y) is eligible to be on a straight line only when x and y satisfy certain requirements. P, therefore, would intrinsically want to discover the relationship, laws and requirements for x and y by using their own knowledge. Then, at the end of Activity 2, P are able to identify the direction vector, normal vector of a straight line; the relationship between the direction vector and normal vector as $\vec{u} \perp \vec{n}$ or $\vec{u}.\vec{n} = 0$. Moreover, it's necessary to identify just one normal vector and one direction vector of a straight line, because all the other vectors are collinear with the identified vectors.

+) Activity 3 visualizes the figures (exercise 1), helps P to generalise the results in specific situations into a global result (exercise 2), then, applies the outcomes to solve other problems (exercise 3).

+) At the end of all activities, P know how to identify equations (conditions, equality) of a straight line (for all three alternatives: passing 2 seperate points, passing 1 point and parallel with a given straight line, passing 1 point and right-angled with a given straight line). From two equations P have discovered, P understand about two types of equations of straight lines (not including the special type when the straight lines are parallel with either of the axises). In addition, there is another dedicate problem: What type of equations is equations of straight lines? Is there any other type of equations of straight lines? Is it possible to mutually switch the two types of equations? Exercise 2, task 2 and 3 help P to realise that it is possible to switch the two forms of equations. Thus, T need to instruct P to select the most simple way to describe the conditions of x and y: the global equation of straight lines. The problem of equation of line ax + by + c = 0 (given a, b not simultaneously valued as 0) as an equation of a straight line can be solved through the exercises themselves.

+) Following the abovementioned procedure, it's important that P should not read the content of the lesson prior to the lesson; and only use handouts designed by teachers. Thus, P has a natural need to discover and construct new knowledge.

+) Assessment and Evaluation: T need to focus on the learners' activeness and abilities to construct and perceive knowledge; it may be unnecessary to change testing and evaluation process as much as teaching methodology but learners' difficulties must be taken into constant consideration.

3.2. Primary results of experimental teaching

Based on learners' handouts, the researchers finds out that:

+) learners' background knowledge (to prepare for new lessons) is not sufficient. (30/79 pupils)

+) Most learners are unfamiliar to the definition of figure as a set of points (as in Figure 1,2,3,4). Pupils are not aware that a straight line is a set of points. This is not a significant problem with secondary school pupils but impose considerable challenges for pupils in writing equations of straight lines in analytic geometry. It's notable that the definition of a circle as a set of points is quite familiar with pupils as it has been already presented in grade 9th coursebook.

+) Some pupils are not able to memorise all situations (as taught in the syllabus) of identifying a straight line in the plane. This results in insufficient answers to the question of identifying all situations and write all possible equations of a straight line.

PHIẾU HỌC TẬP SỐ 1

Câu 1. Em hãy đánh dấu đúng, sai và điều chỉnh nếu có vào bảng dưới đây:

	Khẳng định	Đúng	Sai	Chỉnh sửa/bổ sung /ví dụ
A	Đường thẳng là một tia		X	đường thẳng không có gốc như tia
B	Đường thẳng là một đường kẻ trong mặt phẳng	X		
C	Đường thẳng là một tập hợp điểm trong mặt phẳng	X	X	
D	Trong mặt phẳng, có nhiều tập hợp điểm trong mặt phẳng khác nhau, tạo thành các hình khác nhau	X		ví dụ: đường tròn hình vuông ...
E	Đường thẳng là một quỹ tích các điểm thỏa mãn một tính chất nào đó	X		đường thẳng là quỹ tích các điểm thẳng hàng

Câu 2. Hãy nêu các trường hợp xác định một đường thẳng trong mặt phẳng (ghi chú: đã học từ cấp THCS):

TH1: Đường thẳng đi qua hai điểm trong mặt phẳng

TH2: Đường thẳng đi qua một điểm trong mặt phẳng và song song với một đường thẳng khác thuộc mặt phẳng đó

Image 1.

PHIẾU HỌC TẬP SỐ 1

Câu 1. Em hãy đánh dấu đúng, sai và điều chỉnh nếu có vào bảng dưới đây:

	Khẳng định	Đúng	Sai	Chỉnh sửa/bổ sung /ví dụ
A	Đường thẳng là một tia		X	
B	Đường thẳng là một đường kẻ trong mặt phẳng	X		
C	Đường thẳng là một tập hợp điểm trong mặt phẳng		X	
D	Trong mặt phẳng, có nhiều tập hợp điểm trong mặt phẳng khác nhau, tạo thành các hình khác nhau	X		
E	Đường thẳng là một quỹ tích các điểm thỏa mãn một tính chất nào đó		X	

Câu 2. Hãy nêu các trường hợp xác định một đường thẳng trong mặt phẳng (ghi chú: đã học từ cấp THCS):

- Đường thẳng qua hai điểm phân biệt
- Đường thẳng đi qua một điểm và song song với 1 đt/thẳng
- Đường thẳng qua một điểm và vuông góc với 1 đt/thẳng cho trước

Image 2.

PHIẾU HỌC TẬP SỐ 1

Câu 1. Em hãy đánh dấu đúng, sai và điều chỉnh nếu có vào bảng dưới đây:

	Khẳng định	Đúng	Sai	Chỉnh sửa/bổ sung /ví dụ
A	Đường thẳng là một tia		×	Tia chỉ kéo dài về 1 phía
B	Đường thẳng là một đường kẻ trong mặt phẳng	×		
C	Đường thẳng là một tập hợp điểm trong mặt phẳng		×	
D	Trong mặt phẳng, có nhiều tập hợp điểm trong mặt phẳng khác nhau, tạo thành các hình khác nhau		×	
E	Đường thẳng là một quỹ tích các điểm thỏa mãn một tính chất nào đó		×	

Câu 2. Hãy nêu các trường hợp xác định một đường thẳng trong mặt phẳng (ghi chú: đã học từ cấp THCS):

- Đường thẳng qua 2 điểm phân biệt
- Đường thẳng đi qua 1 điểm và song song với 1 đt/1 đường thẳng cho trước

Image 3.

PHIẾU HỌC TẬP SỐ 1

Câu 1. Em hãy đánh dấu đúng, sai và điều chỉnh nếu có vào bảng dưới đây:

	Khẳng định	Đúng	Sai	Chỉnh sửa/bổ sung /ví dụ
A	Đường thẳng là một tia		×	Đường thẳng không có gốc
B	Đường thẳng là một đường kẻ trong mặt phẳng	×		
C	Đường thẳng là một tập hợp điểm trong mặt phẳng		×	
D	Trong mặt phẳng, có nhiều tập hợp điểm trong mặt phẳng khác nhau, tạo thành các hình khác nhau	×		
E	Đường thẳng là một quỹ tích các điểm thỏa mãn một tính chất nào đó		×	

Câu 2. Hãy nêu các trường hợp xác định một đường thẳng trong mặt phẳng (ghi chú: đã học từ cấp THCS):

- Đường thẳng qua hai điểm phân biệt
- Đường thẳng đi qua một điểm và song song với 1 đt/1 đường
- Đường thẳng qua một điểm và vuông góc với 1 đt/1 đường cho trước

Image 4.

+) The majority of pupils (68/79) are able to identify parallel or normal vectors with a given vector, and claim that (reclaim) there are numberous parallel or normal vectors to a given vector. (Figure 5, 6, 7, 8).

+) The majority of pupils (70/79) are able to solve exercise 2 in Handout 2 thanks to exercise 1 as a knowledge preparatory step. It's notable that the pupils come up with 2 correct answers to the question of identifying a normal vector with the

given vector $\vec{n}(A;B)$, namely $\vec{n}1(-B;A)$ and $\vec{n}2(B;-A)$ (Figure 5, 6, 7, 8, 9, 10). Teachers should remind P when they solve the questions that it's possible to employ both ways they have discovered by themselves rather than constantly follow a certain procedure.

PHIẾU HỌC TẬP SỐ 2

Bài 1. Cho véctơ $\vec{u}(-2;3)$ và $\vec{v}(4;8)$. Hãy trả lời các câu hỏi hoặc thực hiện các yêu cầu dưới đây:

1) Hãy xác định hai véctơ song song với $\vec{v}$ và một véctơ vuông góc với $\vec{u}$.

2) Hãy xác định hai véctơ vuông góc với $\vec{u}$ và ba véctơ vuông góc với $\vec{v}$.

3) Có bao nhiêu véctơ song song với $\vec{u}$?

4) Có bao nhiêu véctơ vuông góc với $\vec{v}$?

Bài 2. Cho véctơ $\vec{u}(a;b)$ và $\vec{n}(A;B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

1) song song với $\vec{u}$ ……

2) vuông góc với $\vec{n}$ ……

Bài 3. Em có nhận xét gì về mối quan hệ giữa véctơ $\vec{u}(a;b)$ và đường thẳng d_1; mối quan hệ giữa véctơ $\vec{n}(A;B)$ với đường thẳng d_2 trong hình dưới đây?

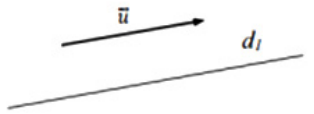


Image 5.

PHIẾU HỌC TẬP SỐ 2

Bài 1. Cho véctơ $\vec{u}(-2;3)$ và $\vec{v}(4;8)$. Hãy trả lời các câu hỏi hoặc thực hiện các yêu cầu dưới đây:

1) Hãy xác định hai véctơ song song với $\vec{v}$ và một véctơ vuông góc với $\vec{u}$.

2) Hãy xác định hai véctơ vuông góc với $\vec{u}$ và ba véctơ vuông góc với $\vec{v}$.

3) Có bao nhiêu véctơ song song với $\vec{u}$?

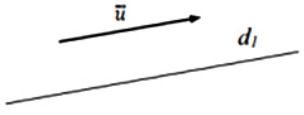
4) Có bao nhiêu véctơ vuông góc với $\vec{v}$?

Bài 2. Cho véctơ $\vec{u}(a;b)$ và $\vec{n}(A;B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

1) song song với $\vec{u}$ ……

2) vuông góc với $\vec{n}$ ……

Bài 3. Em có nhận xét gì về mối quan hệ giữa véctơ $\vec{u}(a;b)$ và đường thẳng d_1; mối quan hệ giữa véctơ $\vec{n}(A;B)$ với đường thẳng d_2 trong hình dưới đây?



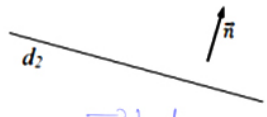


Image 6.

+) Every pupil is able to identify and claim that (exercise 3): $\vec{u}$ // $d1$, $\vec{v}$ // $d2$ (Figure 5, 6, 7, 8). Subsequently, it's advantageous for teachers to instruct P to define direction vectors and normal vectors. Meanwhile, through Exercise 1, 2, the pupils are able to recognise the relationship between a direction vector and a normal vector by themselves. If given either of them, it's possible to identify the other.

PHIẾU HỌC TẬP SỐ 2

Bài 1. Cho véctơ $\vec{u}(-2;3)$ và $\vec{v}(4;8)$. Hãy trả lời các câu hỏi hoặc thực hiện các yêu cầu dưới đây:

1) Hãy xác định hai véctơ song song với $\vec{v}$ và một véctơ vuông góc với $\vec{u}$.

2) Hãy xác định hai véctơ vuông góc với $\vec{u}$ và ba véctơ vuông góc với $\vec{v}$.

3) Có bao nhiêu véctơ song song với $\vec{u}$?

4) Có bao nhiêu véctơ vuông góc với $\vec{v}$?

1. Vecto song song $\vec{v}$ ... $\vec{v_1}(1;2)$; $\vec{v_2}(2;4)$
Vecto vuông góc $\vec{n}$ ... $\vec{n}(3;2)$
2. $\perp$ $\vec{u}$; $\vec{n_1}(6;4)$ ... $\vec{v_2}(9;6)$
$\perp$ $\vec{v}$; $\vec{a_1}(-8;9)$, $\vec{a_2}(-2;1)$; $\vec{a_3}(1;-2)$
3. Có vô số
4. Có vô số

Bài 2. Cho véctơ $\vec{u}(a;b)$ và $\vec{n}(A;B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

1) song song với $\vec{u}$ ... $\vec{u_1}(3a;3b)$

2) vuông góc với $\vec{n}$ ... $\vec{n'}(B;-A)$

Bài 3. Em có nhận xét gì về mối quan hệ giữa véctơ $\vec{u}(a;b)$ và đường thẳng d_1; mối quan hệ giữa véctơ $\vec{n}(A;B)$ với đường thẳng d_2 trong hình dưới đây?

$\vec{u}$ song song d_1 ... $\vec{n}$ vuông góc d_2

Image 7.

PHIẾU HỌC TẬP SỐ 2

Bài 1. Cho véctơ $\vec{u}(-2;3)$ và $\vec{v}(4;8)$. Hãy trả lời các câu hỏi hoặc thực hiện các yêu cầu dưới đây:

1) Hãy xác định hai véctơ song song với $\vec{v}$ và một véctơ vuông góc với $\vec{u}$.

2) Hãy xác định hai véctơ vuông góc với $\vec{u}$ và ba véctơ vuông góc với $\vec{v}$.

3) Có bao nhiêu véctơ song song với $\vec{u}$?

4) Có bao nhiêu véctơ vuông góc với $\vec{v}$?

1. Vecto song song $\vec{v}$ ... $\vec{v_1}(1;2)$; $\vec{v_2}(2,4)$
vecto vuông góc $\vec{u}$ ... $\vec{a}(9,6)$
2. $\perp$ $\vec{u}$; $\vec{n_1}(6;4)$ ... $\vec{n_2}(3,2)$.
$\perp$ $\vec{u}$; $\vec{a_1}(-8,9)$, $\vec{a_2}(-2,1)$; $\vec{a_3}(1,-2)$
3. Có vô số
4. Có vô số

Bài 2. Cho véctơ $\vec{u}(a;b)$ và $\vec{n}(A;B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

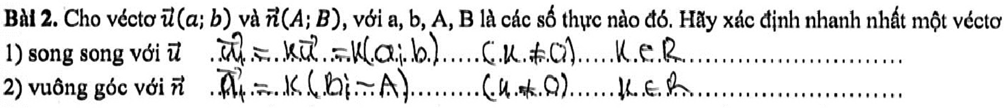
1) song song với $\vec{u}$ ... $\vec{u_1}(6a;6b)$

2) vuông góc với $\vec{n}$ ... $\vec{n'}(-B;A)$

Bài 3. Em có nhận xét gì về mối quan hệ giữa véctơ $\vec{u}(a;b)$ và đường thẳng d_1; mối quan hệ giữa véctơ $\vec{n}(A;B)$ với đường thẳng d_2 trong hình dưới đây?

$\vec{u}$ song song d_1 ... $\vec{n}$ vuông góc d_2

Image 8.

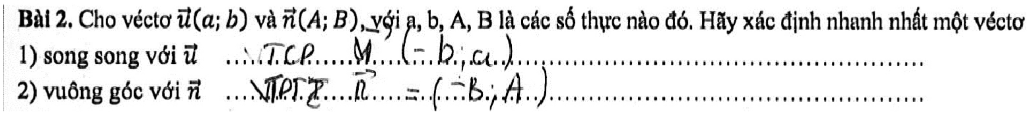


Bài 2. Cho véctơ $\vec{u}(a; b)$ và $\vec{n}(A; B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

1) song song với $\vec{u}$ ... $\vec{u_1} = k\vec{u} = k(a;b)$ ... $(k \neq 0)$ ... $k \in R$ ...

2) vuông góc với $\vec{n}$ ... $\vec{n_1} = k(b; -A)$ ... $(k \neq 0)$ ... $k \in R$ ...

Image 9.



Bài 2. Cho véctơ $\vec{u}(a; b)$ và $\vec{n}(A; B)$, với a, b, A, B là các số thực nào đó. Hãy xác định nhanh nhất một véctơ

1) song song với $\vec{u}$ ... VTCP ... M ... $(-b; a)$ ...

2) vuông góc với $\vec{n}$ ... VTPT ... $\vec{n} = (-B; A)$ ...

Image 10.

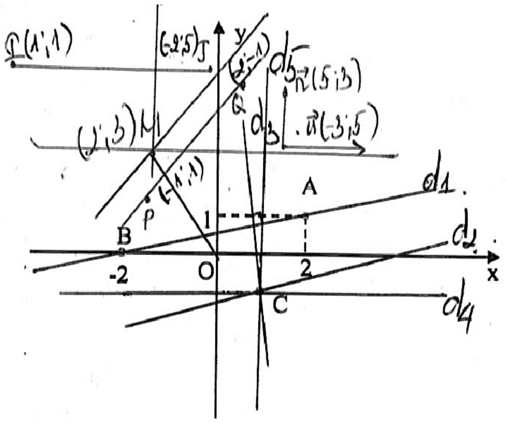


Image 11.

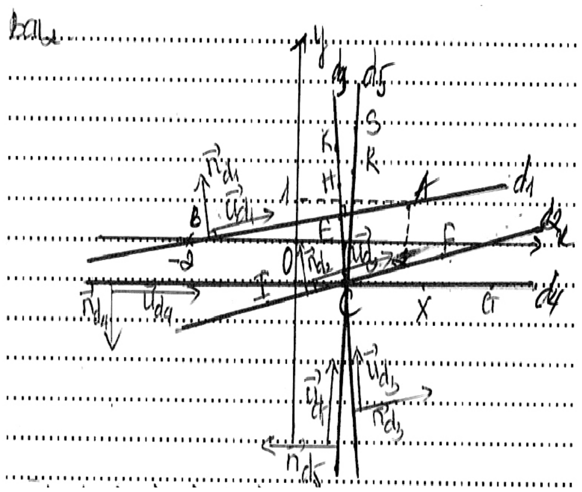
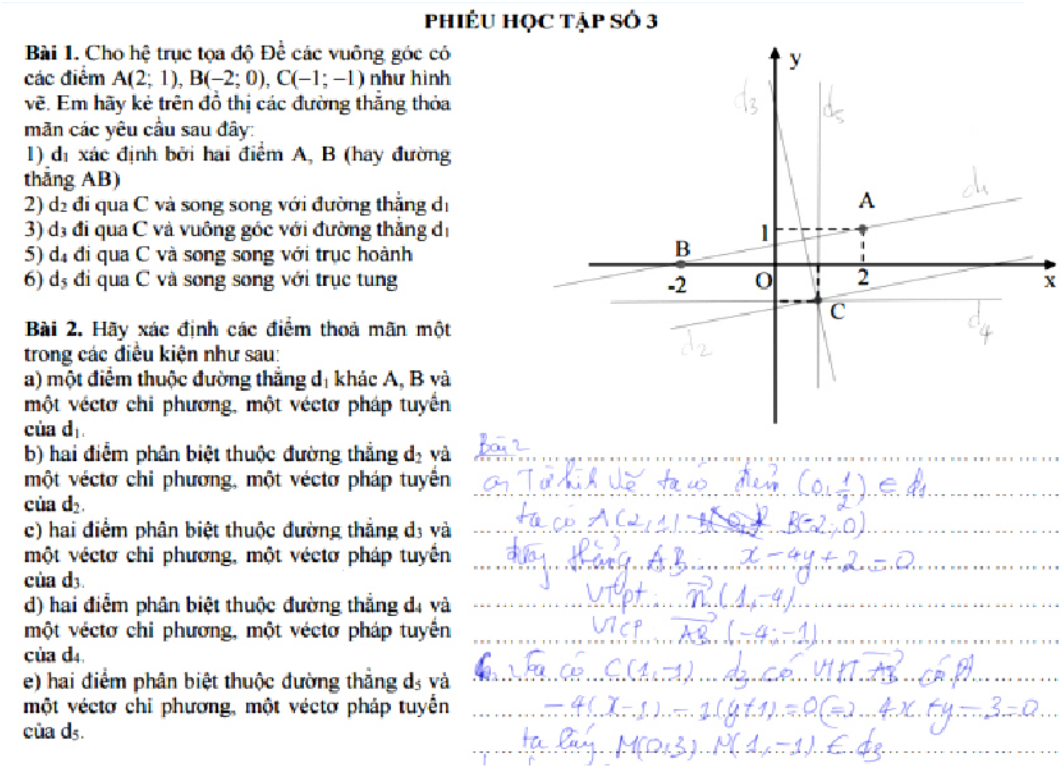


Image 12.



PHIẾU HỌC TẬP SỐ 3

Bài 1. Cho hệ trục tọa độ Đề các vuông góc có các điểm A(2; 1), B(−2; 0), C(−1; −1) như hình vẽ. Em hãy kẻ trên đồ thị các đường thẳng thỏa mãn các yêu cầu sau đây:

1) d_1 xác định bởi hai điểm A, B (hay đường thẳng AB)

2) d_2 đi qua C và song song với đường thẳng d_1

3) d_3 đi qua C và vuông góc với đường thẳng d_1

5) d_4 đi qua C và song song với trục hoành

6) d_5 đi qua C và song song với trục tung

Bài 2. Hãy xác định các điểm thoả mãn một trong các điều kiện như sau:

a) một điểm thuộc đường thẳng d_1 khác A, B và một véctơ chỉ phương, một véctơ pháp tuyến của d_1.

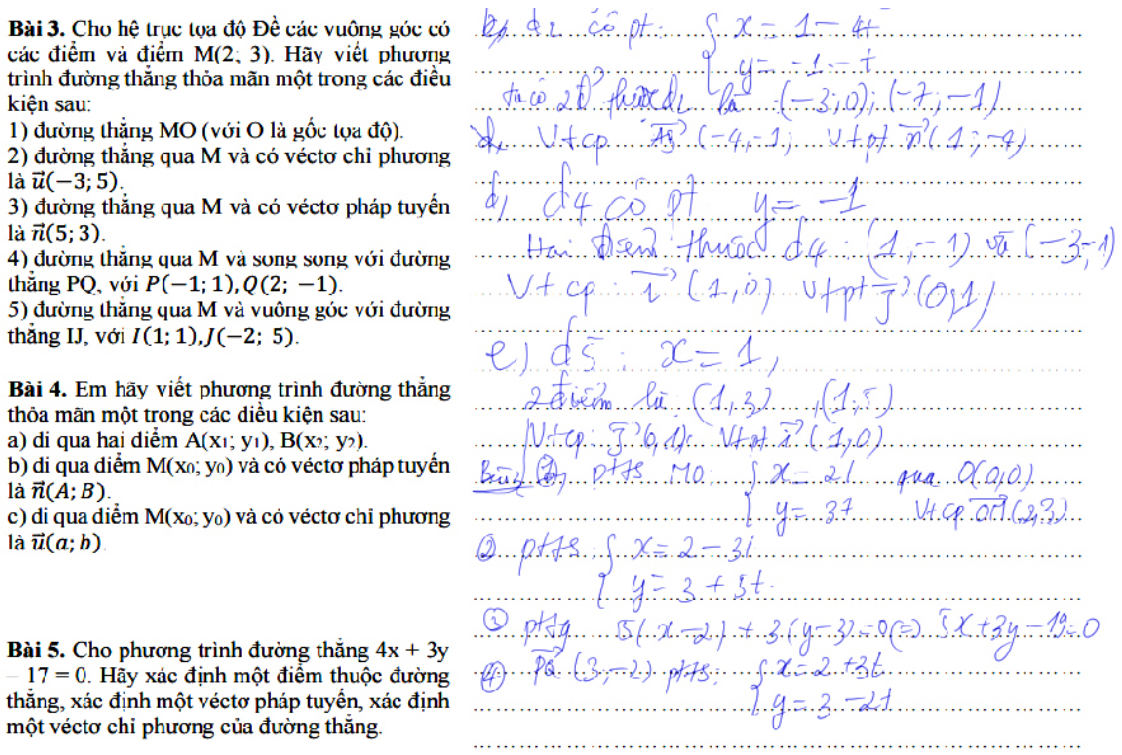
b) hai điểm phân biệt thuộc đường thẳng d_2 và một véctơ chỉ phương, một véctơ pháp tuyến của d_2.

c) hai điểm phân biệt thuộc đường thẳng d_3 và một véctơ chỉ phương, một véctơ pháp tuyến của d_3.

d) hai điểm phân biệt thuộc đường thẳng d_4 và một véctơ chỉ phương, một véctơ pháp tuyến của d_4.

e) hai điểm phân biệt thuộc đường thẳng d_5 và một véctơ chỉ phương, một véctơ pháp tuyến của d_5.

Image 13.



Bài 3. Cho hệ trục tọa độ Đề các vuông góc có các điểm và điểm M(2, 3). Hãy viết phương trình đường thẳng thỏa mãn một trong các điều kiện sau:
1) đường thẳng MO (với O là gốc tọa độ).
2) đường thẳng qua M và có véctơ chỉ phương là $\vec{u}(-3;5)$.
3) đường thẳng qua M và có véctơ pháp tuyến là $\vec{n}(5;3)$.
4) đường thẳng qua M và song song với đường thẳng PQ, với $P(-1;1), Q(2;-1)$.
5) đường thẳng qua M và vuông góc với đường thẳng IJ, với $I(1;1), J(-2;5)$.

Bài 4. Em hãy viết phương trình đường thẳng thỏa mãn một trong các điều kiện sau:
a) đi qua hai điểm $A(x_1; y_1)$, $B(x_2; y_2)$.
b) đi qua điểm $M(x_0; y_0)$ và có véctơ pháp tuyến là $\vec{n}(A;B)$.
c) đi qua điểm $M(x_0; y_0)$ và có véctơ chỉ phương là $\vec{u}(a;b)$.

Bài 5. Cho phương trình đường thẳng $4x + 3y - 17 = 0$. Hãy xác định một điểm thuộc đường thẳng, xác định một véctơ pháp tuyến, xác định một véctơ chỉ phương của đường thẳng.

Image 14.

– Findings from pupils' answers to exercises in Handout 3:

+) Every pupil is able to draw the straight lines required (Exercise 1, Handout 3).

+) In solving Exercise 2: 35/79 pupils use graph to illustrate that point (0; ½) is on straight line. Despite being correct and anticipated by the teachers, this is unwanted.

+) Numberous are unable to answer question b, Exercise 2. There is only 1 pupil able to solve the problem by using his own prior knowledge – the target knowledge of the lesson.

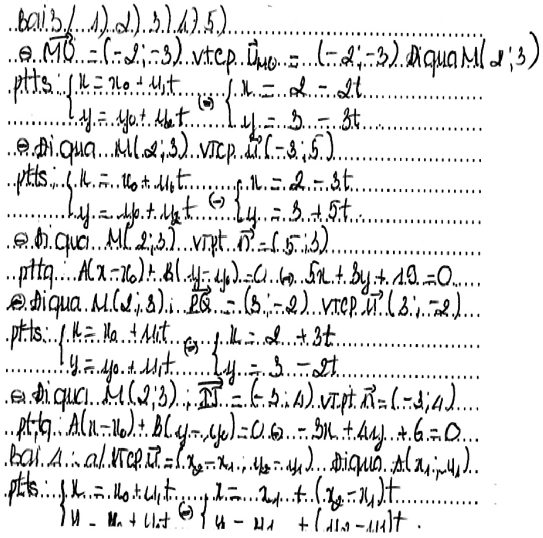


Image 15.

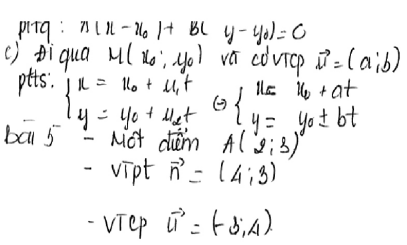


Image 16.

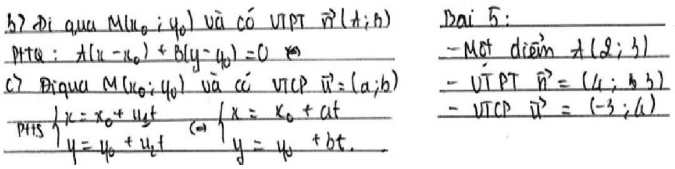


Image 17.

4. Conclusion and Discussion

The paper briefly presents the teaching situations with main learning and teaching activities in the mathematics experimental classroom. These activities are designed with educational purpose in order to provide pupils with pratically useful and efficient knowledge. Teachers are recommended to apply these sample activities into their real teaching practice for different teaching contents. It is evident that some pupils are able to identify, propose, and construct the equations of straight lines in the plane. Thus, applying constructivism in designing and organising learning activities in a math classroom is feasible, which can be the direction for further research.

During the experiment, the researchers were confronted with these two following challenges: first, it is difficult for pupils to apply their knowledge from basic geometry into analytic geometry because of the fact that they are not familiar with the definition of a straight line as "a set of points". Second, pupils lack the ability to convert the given conditions of the problem from points on the straight line to vectors (collinear or normal). The former can only be overcome by changes in the current cirriculum while solving the latter is teachers' responsibility.

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Section 4. Primary General Education

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THE PERFORMANCE OF THE STUDENTS OF PUBLIC PRIMARY SCHOOLS: THE CASE OF THE PROGRAM OF EXCELLENCE IN BASIC EDUCATION IN THE PARANA REGION – BRAZIL

Abstract: Since quality education is a human right, it cannot be considered a neutral or isolated factor. It is constructed through the action of public policies at all levels, with the agents involved, and their personal and social interests. Current paper provides the Excellence Program in Basic Education ((PEEB)), developed by the Centro de Ensino Superior de Maringá (UNICESUMAR) in the state of Paraná, Brazil, and analyzes its impacts on school performance and in the quality of education under different aspects inherent to school management and identified with the teacher, family, organized civil society within the municipal school network. Twenty-five municipalities with 75 government-run schools of basic education are investigated, involving the participation of students from fourth and fifth grades, all educational professionals of the schools, their families and organized civil society. Current exploratory and field research had the direct involvement of the researcher to become familiar with the investigated universe and the retrieval of information that foregrounded data analysis and their interpretation. Research was also quantitative and qualitative due to its aims and the target public. Activities comprised a structured questionnaire, assessment in Portuguese and Mathematics, formation workshops and specific and eventual meetings with school managers, pedagogues, teachers and other officers for the discussion of results that students had on the applications of tests. Formation meetings with families were held and a socio-economic questionnaire was applied to compare parents´ responses with those of their children. Results reveal a lack of a pattern in school management, school units, and hierarchies and even of the family which has ceased to exercise its primary role in children´s development and teaching.

Keywords: Quality education; School management; Basic education; School performance, Family and education.

1. Introduction

The main interest of this study is to analyze the impacts on school performance and quality of education under the different aspects inherent to school management and, identified with the teacher, family, organized civil society and the student of

the basic education of the municipal public network Demo [1, P. 21], argues that " [...] it is unavoidable to assess without having a scale of contrast. We cannot say if something is higher or lower, it is better or worse, it is more or less, without having a scale that allows ranging".

This way, it is aimed to understand how and the reasons of fragilities, which successful practices and potentialities for improvement of school performance in the municipal school network belonging to the Northwest region of Paraná (Amunpar) and from the Setentrião Paranaense (Amusep) in Brazil.

This approach is associated with the sight of the school as a unit that acts with a cast of actors whose purpose aligns with its purposes and works in synchrony in the pursuit of a quality education. All this effort meets what is stated in the 2009 National Conference of Education Reference document, noting that: " [...] it is central, therefore, not to lose sight of the fact that quality is a historical concept, which is altered in time and space, being linked to the demands and social requirements of a given process" "Mec. [2, P. 30]. In which Machado [3, P. 279] it is emphasized" [...] no educational policy can produce positive results without an organic integration between the different levels of education, particularly between Basic Education and Higher Education". The school is still seen as one of the privileged spaces for learning and improving students' skills and competences. Regarding to teachers and the staff, directive and administrative team, there must be developed processes that are convergent with the wishes and needs of the community, committed to the formation of the critical citizen who will be inserted to the labor market.

It is worth highlighting, as Carnoy et.al. [4], the influence of educational systems and the need for these to fit the actual reality. At the beginning of the school life cycle, the student does it in a gradual way, according to an age evolution and appropriation of knowledge. Simultaneously, the physical and cognitive development happens in a scenario composed by variables that act as counterpoint to the success or failure of the results.

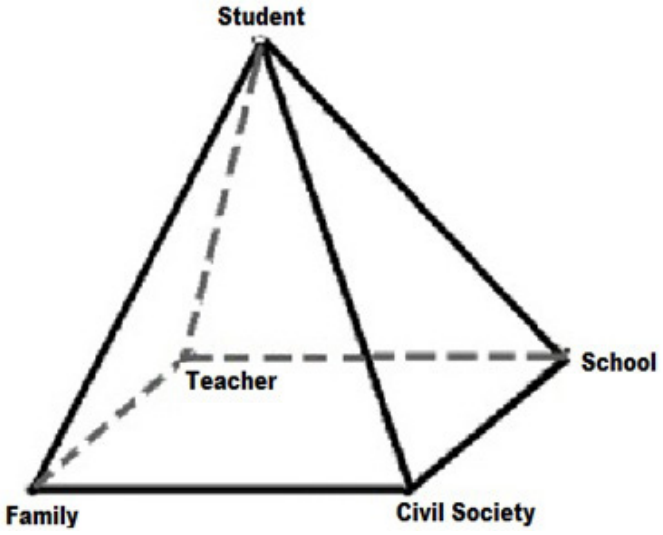

Figure 1. Pyramidal vision of quality education Source: Author 2013

In this study, the relevant variables are the school management, the teacher, the family and the organized civil society because they understand that they subsidize the promotion of quality education and the full development of the student as a citizen. By analogy, this scenario of variables is compared to the structure of a pyramid, represented by (Figure 1), in which the base is consolidated under four fundamental points that interconnect and necessarily depend on each other.

At the top of the pyramid, the focus of all variables is the student who is related to the others and can be compromised if one of them is vulnerable. Consequently, the results of educational processes will have an impact on the quality of the student's education. The performance of each variable takes place in an interrelated way and each of them occupies the role of protagonist following what is in chapter III, section I, art. 205 of the Federal Constitution of the Brazilian Republic Brasil [5].

1.1 The school under the management perspective

According to Luck [6], the school is seen as an institutionalized field where formal learning activities take place. Its curricular proposals, developed on standards based on social and historical, cultural, affective and cognitive aspects are considered. These are formalized through the interactions and relationships of different sectors of society. The effectiveness of the actions, in the school scope, happens by the manager´s leading in addition to the involvement of teachers and other actors.

As an institution, Luck [6], argues that the school needs a command and it does not happen arbitrarily. The professional who occupies the position of school manager needs to know his function and to execute it, being part of it. To be a school manager facing the number of assignments requires the ability to articulate between the needs of daily routine without losing sight of the political and social significance of actions. The performance of the manager cannot be limited only to a department or sector; there is a need to cross limits and involve the internal and external community in order to provoke and promote the interaction between both.

1.2 The teacher

The focus on the teacher variable is not to place him/her in the perspective of single responsible, but as part of the process, so that the he/she is positioned as a professional and recognize the implications of his/her actions with those who have them as guiding in the construction of the knowledge. Following this same thinking, Delors [7], cites the World Conference on Education for All, which highlighted some principles such as learning to know, learning to do, learning to live together and learning to be. According to Delors [7], knowledge is always under construction in the face of the constant evolution of science and technology. Thus, it cannot be claimed to have knowledge or having learned everything.

Involved in this process in which the teacher is the one who leads, using tools and facilitating the construction of knowledge in a reflexive way, that causes paradigm changes in the face of the complexity of the world, it is clear the initial self-commitment to be understood also as Subject under construction. Those who seek to overcome their weaknesses, recognizing the need for constant improvement in the new perspectives and opportunities that society presents.

It also agrees Perrenoud [8], that the solution is not in establishing a standard guide for the possible situations to be found in the school routine. The individual cannot be seen as predictable and linear. Alarção [9], considers that each one has its own list of abilities that, if subsidized by an adequate theoretical and methodological bulge, will learn to use knowledge not only in the classroom, but at any practice.

1.3 The family and its relationship with the school

The relationship established between the family and the school is something that, according to Oliveira et al, [10], deserves attention and needs to be investigated. "The family is considered the first educational agency of the human being, responsible, mainly, for the way in which the subject relates to the world, from his/her position in the social structure". Oliveira et al. [10, P. 100]. In an attempt to highlight and place the commitment of the family with its members, especially with regard to education, reference is made to the Brazilian Civil Code, Brasil [5], which aims to ensure social and individual rights.

Paragraphs I and II of article 1634 of the Brazilian Civil Code establish the obligation of parents to comply with their responsibilities related to education, custody, friendship and the protection of their

children. Good performance of school, overcoming learning difficulties and other situations or needs that may arise in the educational field need to be followed by the family and discussed with the pedagogical team. Routinely, there are several complaints from the school regarding the involvement of the family who have transferred their duties to the teachers. There is misunderstanding between rights and duties.

1.4 Organized civil society and the school

To complete the pyramidal analogy, the last variable is presented – organized civil society. According to Fernandes [11], organized civil society, identified with the Third Sector in the field of Organizational Studies, is composed by the citizens of a population or private groups that come together in different ways counterbalancing the public sphere. Organizations or entities that deal with the lack of services and products that the public sector cannot or does not meet adequately are part of this universe. Such organizations differ from one another according to the focus of their actions, being grounding organizations, intermediaries, institution and care entities.

The articulation of civil society organizations (CSOs) promoted a solid contribution between the State and civil society, favoring the consolidation of its space in the scope of public policies, predicted in the Federal Constitution of 1988, especially articles 199, § 1, 204-subsection I, § 213 and 227 that contemplate the areas of social assistance, health, family, education, child and adolescent and the elderly. These areas are permeated by the various city and state councils that count on the representativeness of the (CSOs) in the formulation and control of the actions and services provided, as stated in article 204-subsection II and paragraph § 227-seventh of the Federal Constitution. The representatives of the (CSOs) are recognized as non-governmental in equal number with the governmental ones that appear in the sphere of the public power.

2.Methodology

This is an exploratory research since it counted on the direct involvement of the researcher to approach to the investigated universe. As for procedures, it is characterized as a field research because it uses different resources such as action-research for data collection Gil [12]. Regarding the approach, this research is classified as quantitative and qualitative considering the proposed objective and the public attended.

As for the means, for this study the following actions were carried out: field surveys with visits in all 75 participating school units to delineate the profile of each one; Application of structured questionnaire to the school manager, teachers, students, family and members of organized civil society to collect information and also delineate the profile; Elaboration and application of the math and Portuguese assessment to evaluate the potentialities and fragility of knowledge; training workshops for the manager, pedagogues, teachers and other actors that compose the staff in a school unit whose subject matter addressed issues related to strategic planning, duties and assignments of each professional, interpersonal relationship, ethics and professional formality; workshops for teachers of mathematics and portuguese that contemplated the difficulties pointed out by them when they answered the questionnaire; training meetings with families and organized civil society; preparation of technical and devolutive reports on the results.

3. Results achieved

Following the analogical perspective of the pyramid that covers the variables: management, teacher, family, organized civil society, student, and the methodological actions shown, it is possible to argue that Excellence Program in Basic Education (PEEB) has already made several progress. With the survey of the profile of the 75 school units in the regions of (Amusep) with 16 participating municipalities and (Amunpar) with nine, it was possible to identify the difference between one school and another in the same municipality. Although the public education policy is the same, the lack of management and planning was evident. In this study 74 directors and 77 pedagogues reported as the most difficult point in conducting their

work, the absence of planning and possible strategies to be implemented throughout the year.

To meet these demands, in 2015 specific workshops were held in the area of management that assisted 23 directors and 46 pedagogues from both areas in order to empower them to their sort of work. In 2016, in addition to the directors and pedagogues, 1,073 professionals from the school units attended, such as the cook, janitor, gatekeeper, secretary, administrative assistant, school bus driver and maintenance team participated. The approached topics were interpersonal relationship, organizational climate and ethics. In 2017, the (PEEB) has already served 273 professionals.

As for the students in the fourth and fifth grade of basic public school education, when they answered the evaluation paper containing 22 questions related to mathematics and 22 questions of portuguese, an instrument elaborated by the (PEEB) coordinators and specialists in the area, it was identified the gaps in learning from each class. The total number of students participating was 6,765, that is, 100% of the fourth and fifth grade classes, aged nine to 11 from all 75 municipal schools. The evaluation happened in consecutive years of 2014 and 2015 between the months of October and November.

The results, following the statistical criteria, pertinent to a quantitative study distributed between Descriptive Analysis and Inferential Analysis, allowed to issue reports by class and turn in descending order by average and, a comparative between the areas, mathematics and portuguese, by school, region and performance in the years 2014 and 2015.

With the report, principals and pedagogues began to have strategic arguments to discuss with teachers the evaluation results achieved by students since they participated in training workshops in mathematics and portuguese in which they dealt with specific subjects pointed by them as difficulty when they answered the Socioeconomic questionnaire.

In the second semester of 2016 up to date, studies on family variables and organized civil society are taking place. The contact with the family happens through formative lectures held in the municipality according to a schedule organized by the (PEEB) coordinators. The meetings usually take place at the school itself, in the evening. Besides being open to the parents of students of fourth and fifth grade, the lecture is open to all family members, from kindergarten up to fifth grade. The subject is about the family's crucial role in the student's performance, highlighting the family and school commitments. In 2016, nine municipalities were attended with 12 lectures reaching an audience of 803 families. In this year's calendar, four municipalities have already been attended with over 219 families. All parents, who attended the lectures, also answered a questionnaire with similar questions as the ones answered by the students. The intention is to cross the information provided by the students with the information provided by their parents in order to understand to what extent the participation of the family and the involvement with the school can reflect on the performance of the student.

When questioned about how many hours, on average, their children study at home, of the 803 families already attended, 604, or 75.2%, do not know how much time their children use at home for studies and homework. This may be related to the professional activity of the parents, since 52.6% have a full time job and 9.7% work part time, characterizing the absence of effective supervision at home. When questioned what year the child who is in the fourth grade was born, 477 that correspond to 59.4% did not know it and, 326 did not remember it, what equals 40.6%. This is relevant information considering that 75.2% of the questionnaires were answered by the mother and 24.8% by the father.

For the work with Rotary, Masonry, municipal councils, commercial, neighborhood, religious, and other associations, 14 municipalities in the (Amusep) region have already been attended, and the issue addressed was the quality of education and what their

contribution is. When analyzing the questionnaires that this group also answered, there was a concern and desire to be more involved with education, but there is a lack of concrete knowledge about public policy and the processes that involve local education, resulting in isolated actions, single, fragile and palliative solutions. The central variable student of the pyramid, when asked about liking the school, presents the percentage of 80.4% that corresponds to 5,438 students who answered that like the school very much. However 16.1%, which equals 1,087 students, said that they like little and only 233, that is, 3.4%, say they do not like the school. This shows a strong relation with it, besides the places of preference with the indication of 37.8% who indicated that the patio being the preferred place, followed by 26.4% who elected the classroom. There is a significant difference between the preference for the patio and the classroom since the other indications were divided between the refectory, library and computer lab.

It is well set here the in-depth reflection on the search for understanding about the student's performance that, even though it does not have satisfactory results, continues to like the school very much. It is still worth investigating what attracts the students to the patio although it happens in a dosed way during break time, and these, for the most, are without maintenance and attractions. The answer may seem obvious, but given the context presented here and the studied variables based on the main objective of the (PEEB), the results achieved have urged the search for local solutions and the best use of the potential of the school professionals. The community came to realize that the school in the neighborhood or city where they live is also their commitment. The (PEEB) every day has improved the way of discussing the themes in the workshops, showing the seriousness of the work and the care with the variables that make up the pyramid that is focused on the quality of education in the region.

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Section 5. Education for Adults

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ADULT EDUCATION IN EUROPE AND UKRAINE

Abstract: The article presents a comparative analysis of theoretical approaches to the concept of adult education, as well as the experience of implementing the concept of lifelong education in European countries and Ukraine.

The prospects and suggestions concerning the development of adult education in Ukraine in the process of the integration into the European educational system are outlined.

Keywords: adult education, lifelong education, formal adult education, non-formal adult education, informal adult education.

Considering the recent reforms in the Ukrainian educational field and the adoption of the Law "On Education", the government has initiated the development of the Ukrainian Law "On Adult Education". Therefore, as ever, the study of the issues of adult education in Central and Eastern European countries, their legal regulation; the determination of the principles, forms and methods of the educational process organization and the means of involving a wide range of adults in lifelong education are becoming relevant.

Therefore, the aim of the article is to study and analyze the legal framework in the field of adult education, to compare the principles and peculiarities of the organization of adult education in European countries and in Ukraine.

The Council of Europe has approved lifelong education as one of the main components of the European social model [2]. In Ukraine, as in European countries, people realize their right to lifelong education through formal, non-formal and informal education [4].

Let's compare the theoretical foundations of adult education in Europe and Ukraine. Thus, in the Glossary of the European Higher Educational Area, there is a definition of the term "adult education" – the whole structure of the organized educational process, regardless of its content, level and form (official or another), regardless of whether this process is a continuation or a change of primary education got at school, college or university, as well as during the training, when people considered to be adults in the society they belong to improve their technical or professional qualifications, continue to develop their abilities, to increase knowledge in order to:

– complete formal education level;
– acquire knowledge and skills in a new field;
– update knowledge in a particular field [3].

Unfortunately, in Ukraine there is no definition of adult education in the official legal documents, therefore in our article we rely on terminological dictionaries. Thus, in Ukrainian terminology, adult education is defined as education specially designed for people who are considered to be adults, and aimed at:

– improvement of their educational and professional qualifications, abilities further development;

– improvement or updating knowledge, skills and other competences for the completion of formal education level, in particular in a new field [6].

The essence of the both definitions is quite similar, but in the Glossary of the European Higher Education Area the aim of adult education is revealed broadly, and also covers a broader rank of society.

Recently, in most European countries, there is regulation and correction of the legal framework in the field of adult education. It has been found that changes occurred mainly in two directions. The first is the adoption of new legislative acts (Estonia, Lithuania, Slovakia, Slovenia, Hungary), as well as the development of new strategic program documents at the supranational level. The second direction of reforming is the implementation of changes to adopted or ratified legislative acts, as well as rethinking the main directions and principles of adult education (Denmark, Germany, Norway, Sweden).

Two different approaches can be distinguished at the national level of the regulation of the legislative area of adult education in the European countries. First, this is the approach that is to create legislation based on a holistic approach to the adult education system (the Law of Adult Education in Estonia, the Federal Law on the Promotion of Adult Education Formation in Austria). The other approach supposes legislation based on the regulation of educational practice that is not covered by other laws (the Law on Informal Education in Lithuania, the Law on Liberal Education of Adults in Scandinavia).

As it is noted above, in contrast to European countries, where special laws on adult education have been adopted, there is no such a normative legal act in Ukraine. Therefore, it would be advisable to rely on the Law of Ukraine "On Education". Thus, it states that adult education is aimed at the realization of the right of every adult to lifelong education, taking into account their personal needs, priorities of social development and the economic needs [4].

The components of adult education in Ukraine are:

- postgraduate education (specialization, retraining, traineeship, internship, medical residency);
- vocational training of employees;
- retraining and/or advanced training courses;
- continuous professional development;
- any other components supposed by the legislation, proposed by the subject of the educational activity or independently chosen by a person [4].

A person has the right to free choice of the educational institution, establishment, organization, another subject of the educational activity, types, forms, pace of learning and the educational program within the framework of adult education [4].

In addition, the National Academy of Pedagogical Sciences of Ukraine and the Institute for Pedagogical Education and Adult Education presented the Concept of adult education in Ukraine in 2011. The Concept substantiates the expediency of the development of adult education in Ukraine, outlines the relevant problems of the modern educational area of adults, defines its aim and tasks, proposes directions for the development of Ukrainian adult education in the context of globalization, European integration [5].

The European Employment Strategy [1], agreed on July 22, 2003, has defined the guidelines for the policy of the lifelong education development. These guidelines call on the EU countries to pay attention to the shortage of workforce with appropriate skills and encourage them to pursue comprehensive lifelong education strategies to make citizens master the skills they need in the modern economy. The guidelines determine the need to increase the investment in human resources, especially through adult training by enterprises.

The same guidelines of adult education development are also promoted in Ukraine. In particular, the basic principles of vocational training of employees of enterprises are defined by the Law of Ukraine "On Education". Thus, continuous professional development is defined as a continuous process of training

and improving specialists' professional competences after obtaining higher and/or postgraduate education, which enables a specialist to maintain or improve the standards of the professional activity and extends throughout the period of their professional activity [4]. At the same time, there are also advanced training courses for specialists in order to acquire new competencies within the framework of the professional activity or the field of knowledge.

Both in European countries and in Ukraine, adult education can be divided into three components:

– additional professional education which contributes to the formation of the professional basis of human resources of the modern high-tech economy. Consumers of the services of this part of the lifelong education system are a socially adapted part of the population, who obtain education successively at all its levels.

– education aimed at adaptation and social integration of professionals who are unable to adapt themselves to the rapidly changing social environment. It enables diverse groups of people to adapt to changing living conditions. In addition, this subsystem involves citizens who do not have the access to the formal system of professional education, which creates a risk of desocialization to them.

– education which provides satisfaction of various individual educational needs for citizens, for example, language training, obtaining psychological, cultural and other knowledge, communicative skills and special skills, etc.

All these aspects of education in Europe are provided by a number of educational institutions, in particular universities, adult education institutes, professional institutes, community centers, pedagogical universities, folk schools in Scandinavia, Germany, Austria, Switzerland, private linguistic companies, commercial institutes.

In Ukraine, the network of similar educational institutions is much smaller, and some institutions of secondary and professional education, higher educational institutions, various informal structures (training groups, training and retraining at enterprises, etc.) provide education to adults.

In light of the above, adult education in Ukraine should be defined as a full-fledged educational field with the appropriate focus on the control and quality review, with the assurance of the various educational forms recognition. While developing the draft law «On Adult Education» it is necessary to take into account the key points:

• identification of the models for the assessment and recognition of prior education;

• the connection of national models for the recognition of prior education with the European qualification structure; increasing comparability and transparency;

• creation of criteria and mechanisms for the recognition and validation of non-formal education in educational and professional activities, definition of key skills and competences;

• reduction of significant differences with European countries in the field of key skills and key competences;

• training staff for the lifelong education system in the following directions: teaching; management; scientific and analytical support; the use of the latest technologies; curriculum planning; support (technical, administrative, organizational).

To sum up, adult education in Ukraine requires a substantial adjustment at the legislative level, taking into account the experience of European countries. It is also necessary to expand the network of educational institutions for adults, as well as to popularize the ideas of lifelong education among the Ukrainian population.

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Section 6. Pedagogical Psychology

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PSYCHOLOGICAL CORRECTION OF A PROFESSIONAL BURN-OUT OF A PEDAGOGUE AS A PROCESS OF STREAMLINING OF EDUCATION FIELD OF MODERN SCHOOL

Abstract: Algorithm of psychological support for pedagogues has been provided in the case of professional burn-out as the process of streamlining of education field. Mechanism for the correction of social abnormal behavior as the consequence of professional stress has been described and psychological indication of the reformatting of destructive models of professional activity has been provided. The article highlighted the four periods of burnout history. The first of them – pre-emergence of the scientific term "emotional burnout". During this period, emotional burnout was portrayed in fiction. This article analyses the "Ward No.6" and "Ionich" by Anton Chekhov, and shows that formation process of burnout, its causes and consequences described in these works and it is actually ahead of the scientific approach to the problem for nearly a century.

Keywords: professional burn-out, socially abnormal behavior, action-option, training, stress, competency, psycho-dynamic approach, behavioral correction, classical literature, syndrome manifestations, complications of the syndrome, emotional exhaustion.

Problem of correction of subjective feeling of the personality in the case of professional stress is a pressing applied issue in the work of school psychological service. It was conditioned by the necessity of correction of negative psychological consequences deteriorating professional activity of a teacher: secondary psycho-physiological personality change of "professionally burn-out" pedagogue, inferior productivity of the implementation of educational-training activity by him/her, psychosomatic problem caused by a number of psycho-emotional difficulties in the interaction with trainees, their parents and management of school.

It should be noted that without effective work of pedagogues, it's impossible to ensure quality of the provided education services, full-scale education and training of students, which has a negative impact on the personality of a child, retards his/her all-round mental and social development, decreases the capacity of mental educational work and creates challenges in the development of educational and social competences. Creation of psychologically comfortable education field of school both for trainee and pedagogue himself/herself is considered as an important innovative direction of methodical work of the psychological service at school in the framework of development of a competent graduate [1; 2].

Professional overload, oversaturation of information field of the professional activity of a pedagogue,

territorial mobility of school (inclusive education, individual education models of interaction with children from social and health risk groups), different requirements for technical supply of classroom, necessity of availability of information technologies – all these create solid objective and subjective prerequisites for the teacher to experience stressful situations during the fulfillment of his/her professional duties. It is known that constant experience of stress develops the syndrome of professional burn-out, leading to depletion of personality and emotional-energetic resources of a human being [3; 4].

Psychologists take the view that accumulation of negative emotions, failure to regulate the ratio between personal and work time, lack of knowledge about how to level consequences of psychological and somatic overloads in the case of professional strain, inadequate level of communicative culture, the fear of not being "at the height", professional perfectionism, age factor, harsh competition in the condition of instability of modern social systems – are the main, the most important factors for the formation of different emotional and behavioral exclusions that in their contextual definitions are virtually attributed to the socially abnormal behavior of a specialist as a result of experience of professional stress by him/her [4; 5].

It should be noted that abnormality as a psychological term is frequently used as the definition synonymously more attached to the definition of psycho-physiological norms of adaptation and accommodation of the organism [5]. So, in the context of the definition of reaction to industrial stress and the situation of professional burn-out, it is more expedient to use the definition of *socially abnormal behavior* for the description of deformation of constructive models of professional interactions of pedagogues in the consequence of broad range of different *cognitive* (impairment of memory, productivity of intellectual activity and activeness of attention, effectiveness of analytical and planning functions), *communicative* (decrease of interest and motivation for the fulfilment of professional duties, fall of tolerance, emotional depletion, irritation, formal and reciprocal attitude to others), as well as *psychosomatic* (cardiovascular diseases, metabolic disorder, immune-deficiency and etc.) disorders [5].

In general, we can state that although modern social systems have been strongly evolved in cultural and production terms, universal parameters of social behavior adopted in the social group or any cultural community are also widely spread and are considered as standards for the demonstration of professional conduct. This assertion is of great organizational importance both for regulation of social, private life of people and consolidation of their efforts in the field of effective production relations [2; 3; 6].

Moreover, cultural and social norms carry out uniting and separating functions, while creating views of people about the professional norms of conduct as the system of subjective or collective instructions on the due [7; 8].

Consequently, any deviation of the professional conduct of personality from the standard norms of conduct accepted by the society can be considered by the society itself as substandard, e. g. abnormal.

A priori, we can say that professional *social abnormal behavior* – the condition of proneness of personality to the deformation of personality subjective self-representation norms of human being as the carrier of certain cultural-corporate and moral-mental characteristics of the organization of his/her life, being in the nature of deep deformation of valuable-notional field of people, his/her interest, needs and motives.

We would like to note that G. Sele who, for the first time, introduced the term of "stress" in the medical practice, while developing the problem of adaptive accommodation of organism to the environment (the concept of the general adaptive syndrome) showed that every time when any organism faces new changed conditions it experiences stress [4]. Continuing the logical line in the context of the situation of professional burn-out, we can state that professional stress – is the energetic shock of all

systems of the organism of a specialist in response to the situation of information ambiguity and potential danger.

Consequently, under the normality or abnormality of professional conduct it should be understood how quick and successful a person can establish a homeostasis with the information and professional environment by analogy with biological systems. Defining the behavior as socially abnormal, subjective reaction to professional stress, we characterize it as behavior substantially resisting continuous professional, social, emotional welfare of an individual and/or human community which an individual belongs to [1; 2].

In this way, one more side of the definition of abnormality of behavior of manifestation of the professional burn-out situation is unveiled – this is the *behavior, serving to the condition of mental or psychological crisis* of a professional sphere of a human being's activity characterized with physical, social and psychological destruction and being sufficiently sustainable. Supplementing the theoretical research of the professional burn-out problem with the results of experimental works with pedagogues of education institutions, it was possible to achieve the set of diagnostic markers indicating the existence of a pedagogue in the condition of professional burn-out, while using the methods of anonymous pedagogical survey, test procedures and projective graphical tools. In summary, psychological features of the personality, signalizing the necessity to launch preventive and corrective activities for the elimination of symptoms of normality/abnormality of human being's professional behavior, can be following descriptive indicators of his/her assessment, which are attributed to the context of criteria on assessment of the disorder of the cognition in accordance with Alexandrovski. Y.A: [9, C. 23–28]:

• disorder of the mnemic functions and decrease of intellectual productivity, insufficient flexibility and creativity of thinking, weakness of the capability for adequate analysis;

• disorientation of behavior in time and space, its illogically, impairment of the function of constructive perspective goal-setting;

• inconsistency of behavior in serving for actual and important life goals in subjective perceptivity;

• disorder of productive emotional-volitional self-regulation, irritation, compensatory aggression;

• Socio-pathological behavior as the manifestation of the deformation of value-semantic sphere of the personality (Bad habits. Social aggression, collapse of the existing intimate-personal relations, dominance of egoistic, utilitarian-hedonistic needs over humanistic values in the world outlook system of the personality);

• situational conditionality of the behavior;

• "Fuzziness" of the image of future;

• "property" attitude towards others, manipulative models of social interactions;

• destruction of the basic feeling of confidence towards surroundings;

• general decrease in the productivity of professional activity;

• building-up of the feeling of alienation and social isolation.

Considering that symptoms of professional burn-out are of complex polyform character and affect all levels of the organization of the personality, it's thought that psychological help and correction stemming from destructive psychological condition of the personality in the face of experience of professional burn-out should be of systematic and complex character [10; 11].

It's noteworthy to remind that modern psychology considers the personality as psycho-biosocial meta-system, capable of prolonged self-regulation [10; 11]. Therefore, psychological correction of personality manifestation of specialist's professional burn-out should not only be of systematic character, but also affect all spheres of objectification of psychic and can be presented by different events at the level of: emotional, cognitive and behavioral corrective program.

Those arrangements are the integral single system of the psychologist's impact on the personality of a specialist in the condition of crisis professional adaptation amid professional burn-out [8].

«*Formation of positive world outlook*» – this system of arrangements is aimed at teaching the client the rules of building of his/her own positive view of life. The main mechanism for the formation of positive world outlook of a pedagogue is the mechanism of positive meaning making, based on humanist act-option of a human being, as the tool for reformatting of the personality's lifestyle [8; 12].

Psychologist-supervisor addressing the existential of the pedagogue's personality with destructive consequences of professional burn-out helps people to find his/her own place in the world "here and now", to become relevant in it, even if dedicated to development of actual values and meaning, behavioral models, conditioning destructive adaptation to the professional burn-out situation and rather away from social norming constructive templates (V. Frankl, L. Dinsvanqer, M. Khaydegger) [12]. The main prerequisite of success in the correction of socially abnormal behavior of personality in the condition of professional burn-out is the meaningful strive of the personality towards the outer world, for example, other people or deed, through which the actual goal-setting and comprehension of life "here and now" is carried out. It's co It seems that the process should be considered as the firs, but necessary phase of the correctional work, since it builds up the psychological preliminary preparedness of the personality of a client for re-formatting his/her own behavior, which allows keep the personality in the field of mentally creative and operational activeness.

It is possible to approach the understanding of internal psychological mechanisms of the implementation of this option through analyzing the views of B. Bratus about development and possible correction of abnormal personality, set forth in his monograph of the same name [12]. Thus, the definition "mental productivity" introduced by B. Bratus can be considered as the psychological indicator of assessment of the ability of a human being to withstand collisions and preserve himself/herself as a holistic personality. According to B. Bratus, the phenomenon of mental productivity is realized in the process of intensive formation of and the level of consciousness of people in relation with products of surrounding material environment [12].

"Ionich" story also depicts, as said in contemporary terms, "emotional burnout background" of Startsev. Stratsev gets acquainted with "highly cultivated and talented" Chekhov [8, 382] family of the Turkins, visits them, has good time there, listens to books read out by Vera, piano performance by Yekaterina, daughter of Turkins family, sharing jokes and anecdotes, but laughing at insincerity Chekhov [8, P. 383–386]. "But there was a great deal of work in the hospital, and he was unable to find free time" to go to see Turkins family. "In this way more than a year passed in work and solitude" Chekhov [8, 386]. At the end, Ionich starts visiting the family. He falls in love with 18 years old Yekaterina, and lives with pleasant feelings for some time. Only for some time."

Like Gromov, Startsev also refers to town life as "animal life style", he also considers that "life in town is boring". Hence, "Startsev used to visit various households and met many people, but did not become intimate with any one. The inhabitants irritated him by their conversation, their views of life, and even their appearance. Experience taught him by degrees … that as soon as one talked of anything not eatable Chekhov [8, 393] with town people, they would expound a philosophy so stupid and ill-natured that there was nothing else to do but wave one's hand in despair and go away" Chekhov [8, 394].

If Gromov was dividing "mankind into honest men and scoundrels" and Ragin "loved intelligence and honesty", also Startsev thinks in this way and ponders over the future of mankind, but does not have anyone to share it with: "It would be possible to dispense with passports and capital punishment, the liberal citizen would look at him askance and ask him mistrustfully…" Chekhov [8, 394]. According

to Startsev "And everything that was said at the time was uninteresting, unjust, and stupid; he felt irritated and disturbed, but held his tongue…" Chekhov [8, 394]. In his environment, Startsev "was not close to anyone", moving away from people, lived "dull and meaningless" life, "excited and irritated" and gradually find himself isolated from society.

At the end, V.A. Kozin and T.V. Agibalova state in their article that Startev's "temper has changed, too: he has grown ill-humoured and irritable. When he sees his patients he is usually out of temper; he impatiently taps the floor with his stick, and shouts in his disagreeable voice… He is solitary. He leads a dreary life; nothing interests him." Startsev was not going to see Yekaterina whom he one loved Chekhov [8, 398].

So, classic literature allows tracing down formation process of emotional burnout syndrome and its consequences which is subject of recent psychology science. Analysis of the Chekhov's stories show that even though this phenomenon is presented within the certain literary-aesthetic conventionalism framework, its formation process, root causes and consequences are described in details. However, even the name of syndrome did not exist when these stories were written. In other words, V. Kozin and T. Agibalova prove that recitation and literary imagination get ahead of the scientific thoughts. This is really true and facts are known to contemporary science. For example, F. Dostoyevski thinks that, "you may not know but you can feel everything. We unconsciously know more." A. Guliga and philologist S. Nuriyev think that guessing, supposing, predicting, in general art outrun energy and passion Arseniy Guliga [5, 166]; (Nuriyev, 2010, 89). Chekhov also depicted exact description of the phenomenon which would get the name in the field of science after 100 years.

Discussion and conclusion.

Researches on formation, manifestation and complications of emotional burn-out syndrome in socio-economic profession workers, including teachers, shall start from the date of initial studies of this phenomenon, because such approach enable to analyse more deeply the existing different perspectives with regard to essence of the burnout, rational for formation and its essence.

Generally, emotional burnout history can be divided into four phases:

– Pre-emergence period of the term

– Initial empiric research period of burnout

– Initial theoretical generalization and formation period of learning method of this phenomenon

– Contemporary period

This document covers the first phase of the burnout syndrome, i. e. pre-emergence period of the term. This period is characterized by description of different manifestations of the emotional burnout in the literature. The document studies the ways of description of EBS in the literature and make reference to the "Ward No.6" Chekhov [8], "Ionich" (4) stories by Chekhov. V.A. Kozin and T.V. Agibalova rightfully note in their article called "Emotional Burnout Syndrome: formation, theory, prevention and study perspectives" that in late XIX century A. P. Chekhov has described the EBS syndrome faced by the doctors in his stories, even before Kh.

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FUTURE PSYCHOLOGISTS' INDIVIDUAL RESOURCES AS PSYCHOLOGICAL PREDICTORS OF SELF-TRUST

Abstract: The article deals with psychology students' individual resources as psychological predictors of their self-trust. It has been empirically found that the majority of the respondents has an average level of self-trust, which allows them to develop certain value attitudes towards themselves. The analysis has revealed a direct correlation between psychology students' self-trust and individual resources.

Keywords: self-trust, psychological predictor, individual resources, future psychologist.

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ИНДИВИДУАЛЬНЫЕ РЕСУРСЫ КАК ПСИХОЛОГИЧЕСКИЕ ПРЕДИКТОРЫ ДОВЕРИЯ К СЕБЕ У БУДУЩИХ ПСИХОЛОГОВ

Аннотация: Статья посвящена рассмотрению индивидуальных ресурсов в качестве психологических предикторов доверия к себе у будущих психологов. Эмпирически установлено, что для большинства испытуемых свойственен средний уровень доверия к себе, позволяющий им занять определенную ценностную позицию по отношению к самому себе. Анализ выявил прямую корреляционную зависимость между доверием к себе и индивидуальными ресурсами.

Ключевые слова: доверие к себе, психологический предиктор, индивидуальные ресурсы, будущий психолог.

Актуальность. Одним из гипотетических конструктов, адекватно отражающих способность будущего психолога к успешной самореализации в профессии, является доверие к себе, которое традиционно рассматривается как краеугольный камень благополучия и здоровья личности, а также основное условие ее самоорганизации и самодетерминации.

Важно отметить, что до настоящего времени нет однозначного представления о психологических предикторах доверия к себе у субъекта конкретной профессиональной деятельности. Скорее всего, что речь должна идти о совокупности внутренних ресурсов человека, которые могут в большей или меньшей степени влиять на процесс накопления личностного и социального капитала.

Поэтому, актуальность проблемы изучения процесса воздействия субъекта на свое функционирование, обеспечивающее эффективную гармоничную жизнедеятельность, реализацию

внутренних потенций и достижение жизненных целей не вызывает сомнений.

Термин «предиктор» (от английского глагола predict — прогнозировать, предсказывать) может быть определен в широком и узком смысле. В широком смысле — это та исходная характеристика индивида и его окружения, по которой можно с большим или меньшим основанием предсказывать другую (целевую) характеристику того же индивида. В узком смысле понятие «предиктор» приобретает дополнительные ограничения, связанные с количественным выражением и оценкой статистической достоверности прогноза. В регрессионном анализе, который наиболее часто используется как метод построения прогноза, предикторами называются такие независимые переменные, изменения которых приводят к вариации других зависимых переменных-откликов.

По характеру прогнозируемых эффектов можно выделить четыре основных вида предикторов: межуровневые (в структуре индивидуальности), онтогенетические, профессиональные и клинические.

Выделение индивидуальных ресурсов личности в качестве психологических предикторов представляет собой первый вариант прогнозирования одних свойств/параметров индивидуальности на основе других.

Прицельный анализ семантической нагрузки понятия «индивидуальные ресурсы» показал, что оно является сложным конструктом, который включает совокупность ценностей, запасов и возможностей личности, которые сознательно используются ею в процессе разрешения различных проблем.

Анализ зарубежной и отечественной литературы показывает [1; 3; 4], что в качестве индивидуальных ресурсов выделяются: когнитивные способности как средства переработки информации, личностные черты и особенности, эмоциональные и волевые возможности субъекта, как субсистемы контроля поведения. Отдельно рассматривают как ресурс особую жизненную диспозицию человека — «hardiness» или жизнестойкость [3].

В каждый момент времени человек обладает индивидуальным набором ресурсов. Когда условия, предъявляемые человеку той или иной ситуацией, выходят за пределы актуального ресурса субъекта, активизируется его потенциальный ресурс. Ресурсы специфичны, т. е. предназначены для удовлетворения определенного круга потребностей, однако обладают свойством взаимозаменяемости и взаимодополняемости.

Цель нашего исследования состояла в эмпирическом изучении индивидуальных ресурсов развития «доверия к себе» у будущего психолога.

Методы и организация исследования. В работе использован рефлексивный опросник уровня доверия к себе А. Б. Купрейченко [2]. Испытуемому предлагалось оценить меру доверия к себе в наиболее значимых сферах жизнедеятельности. Мера доверия к себе оценивалась исходя их трех уровней: высокого (полностью доверяю); среднего (частично доверяю) и низкого (не доверяю). Для изучения индивидуальных ресурсов личности (самоэффективности, настойчивости, внутренний локус контроля, совладание и адаптация) использовался тест «Жизнеспособность взрослого человека» (А. В. Махнач) [3]. В исследовании принимали участие студенты-психологи Государственного высшего учебного заведения «Университет менеджмента образования», общей численностью 70 человек.

Результаты и их обсуждение. Замысел эмпирического исследования предполагал: 1) выявление меры доверия к себе у будущих психологов; 2) изучение индивидуальных ресурсов испытуемых; 3) выявление значимых связей между изучаемыми феноменами.

Обобщенная картина процентного распределения уровней доверия к себе у будущих психологов в различных жизнезначимых сферах представлена в табл. 1.

Таблица 1. – Особенности проявления доверия к себе у будущих психологов в жизнезначимых сферах

Жизнезначимые сферы	Уровни доверия к себе		
	Низкий	Средний	Высокий
Учебная деятельность	10,0	51,4	38,6
Интеллектуальная деятельность	7,1	60,0	32,9
Решение бытовых проблем	40,0	55,7	4,3
Построение взаимоотношений с близкими людьми	17,1	58,5	24,4
Построение взаимоотношений в семье	12,8	60,0	27,2
Взаимодействие с противоположным полом	15,7	70,0	14,3
Проведение и организация досуга	17,1	72,5	10,4

Из, результатов, представленных в (табл. 1.) видно, что лишь у трети будущих психологов зафиксирован высокий уровень доверия к себе в таких жизнезначимых сферах: как учебная (38,6%), интеллектуальная (32,9%), в сфере взаимоотношений с близкими людьми (24,4%) и в семье (27,2%). Следовательно, лишь треть испытуемых имеет достаточно высокое мнение о своих способностях и возможностях. Для них характерно самостоятельное определение меры значимости своего поступка, своей активности для общества. При этом, мера значимости зависит и определяется самоценностью личности.

Средний уровень доверия к себе зафиксирован у большинства испытуемых: в учебной (51,4%), интеллектуальной (60%) сфере, в налаживании отношений с близкими людьми (58,5%), противоположным полом (70,0%). Полученные результаты, позволяют прийти к выводу, что доверие к себе отражая внутреннюю позицию личности, объединяет ее эмоциональные, когнитивные и поведенческие реакции [5].

Низкий уровень стремления к обретению целостности, которая, в свою очередь, позволяет гармонизировать отношения к миру, себе и другим зафиксирована у незначительной части испытуемых (17,1%). У них наблюдается низкий уровень доверия в значимых сферах жизнедеятельности таких, как: умение строить взаимоотношения с близкими людьми и в семье. Недоверие к себе, чаще всего, связывается с чувством страха и опасности, осознания рисков при межличностном взаимодействии, боязни негативных оценок со стороны окружающих, что свидетельствует о присутствии напряженности и настороженности в контактах с партнерами по общению. Примечательно, что 2/5 испытуемых не доверяет себе в решении бытовых проблем, что на наш взгляд, является результатом процесса социализации и может быть обозначен как феномен «выученной беспомощности». Неэффективность собственных усилий в решении бытовых проблем у значительной части испытуемых, свидетельствует либо о их неготовности к преодолению, либо о делегировании инициатив по разрешению различных бытовых проблем значимым близким.

Результаты эмпирического исследования позволили выявить, что для большинства испытуемых свойственен средний уровень доверия к себе, полярные уровни доверия представлены в малой степени.

Исследование внутренних ресурсов личности в качестве психологических предикторов доверия к себе, является одним из важнейших направлений в современной психологии.

Дальнейшее исследование предполагало выявление значимых связей между доверием к себе и индивидуальными ресурсами. Результаты корреляционного анализа представлены на (рис. 1).

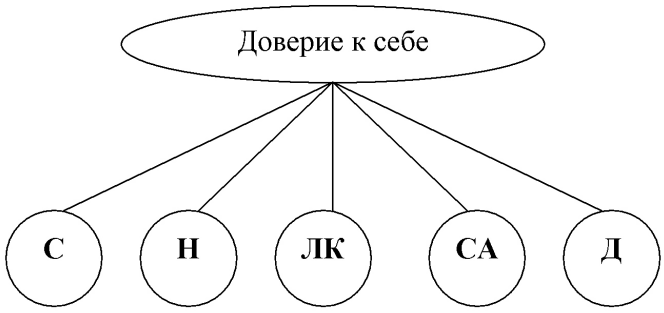

Рисунок 1. Положительные корреляционные связи доверия к себе с индивидуальными ресурсами личности

Примечание: С – само эффективность; Н – настойчивость; ЛК – локус контроля; СА – совладание и адаптация; Д – духовность.

Анализ полученных данных с использованием теста А. В. Махнач показал, что индивидуальные ресурсы правомерно могут рассматриваться в качестве предикторов доверия к себе у будущих психологов. Между доверием к себе и индивидуальными ресурсами существует пять положительных корреляций. Выявлено, что между доверием к себе и самоэффективностью (С) существует положительная корреляционная связь ($r = 0{,}533$; $P < 0{,}01$), свидетельствующая о том, что ценностное отношение к себе зависит от понимания своих возможностей, восприятия собственной эффективности для осуществления контроля над стрессом, способности личности быстро выйти из состояния неудачи, опыта в преодолении препятствий посредством настойчивых усилий.

Вполне логичной выглядит обнаруженная положительная корреляционная связь между доверием к себе и настойчивостью (Н) ($r = 0{,}633$; $P < 0{,}01$), так как это свидетельствует о влиянии таких личностных черт, как упорство, живучесть, самодисциплина на способность будущего психолога «выходить за пределы себя».

Результаты корреляционного анализа позволяют рассматривать в качестве предиктора доверия к себе внутренний локус контроля ($r = 0{,}798$; $P < 0{,}01$), который показывает насколько будущий психолог верит, что он – является автором всего и ответственен за все случившееся в своей жизни.

Кроме этого в результате корреляционного анализа зафиксирована положительная связь доверия к себе у испытуемых со стратегиями управления потребностями в неблагоприятных условиях и процессом приспособления к изменяющимся или неблагоприятным обстоятельствам. (СА) ($r = 0{,}447$; $P < 0{,}01$). Совладание и адаптация имеют решающее значение для развития доверия к себе, так как позволяют личности не только регулировать свою целенаправленную деятельность, но и использовать положительные эмоции для возврата в исходное уверенное состояние.

Следует отметить существование положительной корреляционной связи между доверием к себе и духовностью будущих психологов ($r = 0{,}848$; $P < 0{,}01$), что, безусловно, свидетельствует о влиянии гармоничного ощущения мира и себя в этом мире на меру ценностного отношения к себе.

Выводы. Результаты корреляционного анализа свидетельствуют в пользу того, что в качестве психологических предикторов доверия к себе выступают такие индивидуальные ресурсы, как: самоэффективность, настойчивость, внутренний локус контроля, совладание и адаптация, а также духовность. Полученные в исследовании результаты могут способствовать прояснению психологической детерминации доверия к себе в одном

из важнейших периодов профессиональной социализации личности – профессиональной подготовки.

Настоящее исследование указывает на необходимость изучения индивидуальных ресурсов личности с позиций синергетического подхода, при котором их взаимодействие между собой аккумулируется и формирует суммарный эффект, который повышает сумму каждого ресурса по отдельности.

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Section 7. Family and Living Psychology

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CONTENT OF PSYCHOLOGICAL SPACE IN THE YOUTHFUL AGE

Abstract: of special feature the formation of psychological space at the youthful age, the influence of shielding mechanisms on the boundaries of psychological space, specific character is the functioning of the nonadaptive mechanisms of psychological protection, individual psychological qualities influencing the psychological space.

Keywords: psychological space, youthful age, psychological shielding mechanisms, the content of the boundaries of psychological space, individual psychological qualities.

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СОДЕРЖАНИЕ ПСИХОЛОГИЧЕСКОГО ПРОСТРАНСТВА В ЮНОШЕСКОМ ВОЗРАСТЕ

Аннотация: особенности формировании психологического пространства в юношеском возрасте, влияние защитных механизмов на границы психологического пространства, специфика функционирование неадаптивных механизмов психологической защиты, индивидуально- психологические качества влияющие на психологическое пространство.

Ключевые слова: психологическое пространство, юношеский возраст, психологические защитные механизмы, содержание границ психологического пространства, индивидуально-психологические качества.

Современный социум диктует индивиду постоянно вступать во взаимодействие с окружающим миром и осуществлять взаимный обмен информацией, подвергается всяческим воздействиям внешней информационно наполненной и стрессогенной социальной среды, что обуславливает возникновение у него потребности в психологическом комфорте и личной автономии, достигаемой путём сохранности границ психологического пространства [1; 2].

В связи с этим актуальным становится вопрос рассмотрения феномена целостности психологического пространства личности. Таким образом, объектом нашего исследования являются особенности психологического пространства в юношеском возрасте, а предметом — особенности влияния механизмов психологической защиты личности на формирование психологического пространства в юношеском возрасте. В качестве предположений выступает следующий тезис: индивидуально-психологические механизмы защиты личности имеют определенное влияние на формирование психологического пространства личности в юношеском возрасте, а именно функционирование неадаптивных механизмов психологической защиты повышает уязвимость границ психологического пространства, обуславливая формирование индивидуально-психологических качеств, характерных для депривированной личности.

Для реализации цели эмпирического исследования нами были использованы следующие методы: анализ и обобщение литературы по проблеме исследования; психодиагностическое тестирование при помощи следующих методик: опросник «Индекс жизненного стиля» (LSI) Х. Келлермана-Р. Плутчика (диагностика индивидуально-психологических механизмов защиты личности.); самоактуализационный тест (САТ) Э. Шострома, в адаптации Ю. Е. Алешиной, Л. Я. Гозман, М. В. Загика и М. В. Кроз; методика диагностики социально-психологической адаптации (СПА) К. Роджерса, Р. Даймонда; диагностика индивидуальных копинг-стратегий Э. Хайма (диагностика психологического пространства личности); математико-статистические методы обработки эмпирических данных с помощью пакета Statistica 7.0. с использованием множественного регрессионного анализа. Исследование проводилось при участии студентов 2х и 3х курсов Смоленского Государственного университета. В исследовании приняло участие 148 человек (30% – юноши и 70% – девушки).

Для более подробного анализа полученных данных нами был использован программный пакет Statistica 7.0. и применен множественный регрессионный анализ, изучающий взаимосвязи зависимой и нескольких независимых переменных. В ходе применения множественного регрессионного анализа были получены следующие значимые результаты исследования: индивидуально-психологические механизмы защиты личности влияют на формирование таких составляющих психологического пространства, как ориентация во времени, характеризующая компетентность человека во времени, способность рассматривать его в единстве прошлого, настоящего и будущего; ценностный блок, включающий в себя ценностные ориентации и гибкость поведения, характеризующая особенности реализации данных ценностей в поведении; самоуважение, проявляющееся в способности ценить свои достоинства, положительные качества характера и уважать себя за них; выраженность познавательных потребностей, определяющих стремление к приобретению знаний об окружающем мире; креативность, характеризующаяся в творческом отношении к действительности [4; 5].

Также механизмы психологической защиты личности связаны с такими характеристиками личности, как эскапизм, проявляющийся в стремлении личности уйти от действительности в мир иллюзий и фантазий; дезадаптивность, заключающаяся в частичной или полной утрате человеком способности приспосабливаться к условиям социальной среды; внешний локус-контроль, характеризующийся пассивностью в решении жизненных задач, ожидании поддержки извне; непринятие себя в естестве своих проявлений и непринятие других, склонность к конфликтному поведению. Наряду с этим нами были зарегистрированы связи механизмов психологической защиты личности с такими стратегиями совладания, как проблемный анализ, направленный на анализ возникших трудностей и поиск способов выхода из них; установка собственной ценности, определяющая нали-

чие веры в собственные ресурсы в преодолении трудных ситуаций, повышение самооценки и самоконтроля; конструктивная активность, характеризующаяся стремлением к временному отходу от решения проблем с помощью погружения в любимое дело, путешествия, исполнения своих заветных желаний; диссимуляция, проявляющаяся в сознательном сокрытии и подавлении своих чувств и эмоций; религиозность, определяющая поведение, направленное на оценку трудностей, придание особого смысла их преодолению, вера в Бога и стойкость в вере при столкновении со сложными проблемами; альтруизм, характеризующий поиск поддержки в ближайшем социальном окружении и предложением ее близким в преодолении трудностей; обращение, заключающееся в поиске помощи для выхода из сложных ситуаций у значимых людей.

Также нам удалось проследить влияние каждого конкретного индивидуально-психологического механизма защиты личности на составляющие психологического пространства личности: при меньшей выраженности такого психологического механизма защиты личности как проекция приобретают развитие следующие индивидуально-психологические качества: ориентация во времени, адаптивность, опора на себя, гибкость поведения, спонтанность, позитивный взгляд на природу человека, принятие других, синергичность, контактность. Напротив, чем большую выраженность имеет проекция, тем большее развитие приобретают такие качества, как, непринятие других, эскапизм, дезадаптивность и преобладание диссимуляции и агрессивности как стратегий совладания; при меньшей выраженности регрессии как психологического механизма защиты личности получают развитие следующие индивидуально-психологические качества: адаптивность, опора на себя, приверженность ценностным ориентациям, самоуважение, контактность, принятие агрессии, как природного свойства человека, внутренний локус-контроль. Наряду с этим преобладают такие копинг-механизмы, как сохранение самообладания, проблемный анализ, конструктивная активность. В противоположность этому, большая напряженность регрессии как защитного механизма способствует развитию дезадаптивности, преобладанию внешнего локус-контроля, а также такого копинг-механизма как установка собственной ценности, являющегося следствием проявления эгоцентричности; при меньшей выраженности защитного механизма вытеснение большее развитие приобретают познавательные потребности личности.

Доминирующими стратегиями совладания при этом являются игнорирование, эмоциональная разрядка, проблемный анализ. Однако при большей выраженности вытеснения развитие приобретают такие индивидуально-психологические качества личности, как непринятие себя, непринятие других, эскапизм, и такие копинг-механизмы, как религиозность, подавление эмоций, активное избегание, отступление; при меньшей напряженности такого механизма защиты личности, как отрицание, наибольшее развитие приобретают такие характеристики личности, как гибкость поведения, сензитивность, синергичность, при этом ведущими стратегиями совладания являются религиозность, установка собственной ценности, компенсация, конструктивная активность; меньшая выраженность такого механизма защиты личности, как замещение предполагает развитие таких характеристик личности, как ориентация во времени, креативность. Ведущими копинг-стратегиями при этом являются диссимуляция, отступление, придача смысла, альтруизм. Напротив, при большей выраженности замещения преобладающими являются копинги проблемный анализ и обращение; чем меньшую напряженность имеет защитный механизм реактивное образование, тем большее развитие приобретают такие характеристики личности, как креативность, высокая выраженность познавательных потребностей, принятие себя, доминирование. Преобладающими копинг-стратегиями при этом являются игнорирование,

диссимуляция. При большей выраженности реактивного образования ведущими копинг-стратегиями являются сохранение самообладания, самообвинение; при меньшей выраженности защитного механизма компенсация развитие приобретают познавательные потребности личности, преобладают копинги смирение, придача смысла, альтруизм. При большей выраженности компенсации ведущим копинг-механизмом является проблемный анализ; при меньшей выраженности защитного механизма интеллектуализация большее развитие приобретает ведомость, как характеристика личности. Преобладающими копингами при этом являются сохранение самообладания, религиозность, обращение. Чем большую напряженность имеет интеллектуализация, тем большую выраженность приобретают такие копинг-стратегии, как проблемный анализ, придача смысла, установка собственной ценности.

Исходя из результатов регрессионного анализа, можно сделать вывод о том, что такие индивидуально-психологические механизмы защиты личности, как проекция, регрессия и вытеснение, являясь наиболее деструктивными среди механизмов защиты, способны отрицательно влиять на формирование психологических качеств личности, описывающих структуру психологического пространства, тем самым повышая уязвимость его границ по отношению к внедрениям извне.

Таким образом, можно констатировать следующие положения самостоятельного эмпирического исследования: индивидуально-психологические механизмы защиты личности влияют на формирование таких составляющих психологического пространства, как ориентация во времени, ценностный блок, включающий в себя ценностные ориентации и гибкость поведения, самоуважение, выраженность познавательных потребностей, креативность; механизмы психологической защиты личности влияют на формирование таких характеристик личности, как эскапизм, дезадаптивность, внешний локус-контроль, непринятие себя в естестве своих проявлений и непринятие других, склонность к конфликтному поведению; было зарегистрировано влияние механизмов психологической защиты личности на функционирование таких стратегий совладания, как проблемный анализ, установка собственной ценности, конструктивная активность, диссимуляция, религиозность, альтруизм, обращение; такие индивидуально-психологические механизмы защиты личности, как проекция, регрессия и вытеснение, являясь наиболее деструктивными среди механизмов защиты, способны отрицательно влиять на формирование психологических качеств личности, описывающих структуру психологического пространства, тем самым повышая уязвимость его границ по отношению к внедрениям извне.

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Section 8. Work Psychology

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TIME AS THE RESOURCE OF ORGANIZATION OF SUBJECT'S ACTIVITIES

Abstract: The article is devoted to a reflexive analysis of the main directions of the study of the phenomenon of time in psychology, which is positioned as the most important component of human orientation in the world.

Keywords: time, resource, subject, organization, activity, timeliness, efficiency.

Introduction. The problem of time is complex and multifaceted since a person cannot exist outside the time factor, its distribution, planning, and structuring. This problem has become especially topical in recent times in connection with the acceleration of the pace of public life, the growth of the amount of information that comes to a person, and the need to flexibly react to changes in the surrounding world. The shortage of not only free time but also the time necessary for productive activities has already become habitual for discussion and scientific research. Along with the problem of time deficit, there is also its surplus, inability to dispose it effectively with the benefit for personal development.

The aim of the work was to try to discover the value significance of time as the most important resource for optimizing the activity of a subject.

The results of the theoretical search and their discussion

In psychological science, the problem of time is considered in a number of directions: 1) the reflection of the objective time by the consciousness (Yu. M. Zabrodin, F. E. Ivanov, P. Fress); 2) the process dynamic characteristics of the psyche itself,

associated with underlying rhythms of biological, organic, neurophysiological processes (N. M. Bekhtereva, N. N. Bragina, T. A. Dobrokhotova); 3) the ability of the psyche to regulate the time of movements, operations, actions and activities (L. M. Grimak, D. T. Elkin, D. N. Uznadze); 4) the personal organization of the life and activity time, the spatiotemporal composition of the construction of human value attitudes with the world (K. A. Abulkhanova, T. N. Berezina, A. A. Kronik, G. V. Lozhkin, T. M. Titarenko) [1; 4; 7; 8; 9].

Nevertheless, it should be noted that these approaches are in fact little related to each other. This gap is most likely determined by the fact that the first two directions were assigned to the area in which the objective temporal organization of the psyche itself was investigated, and the latter ones – to the field of study of subjective psychological time (the subjective reflection of time). In addition, these approaches are also isolated from the study of problems of personal time – the time of personality development, motivation, the dynamics of the conscious and unconscious (J. Piaget, K. Levin, H. Tomé). Studies dealing with problems of personal time, primarily the dynamic concept of the personality of Z. Freud, have been left out of the study of a specific life path, its specific temporal, biographical, event characteristics (B. G. Ananiev, A. F. Bondarenko, Sh. Buler). An attempt to bridge the gap between the study of the objective (physical, socio-cultural, historical) and subjective (psychological) time was made by K. A. Abulkhanova and T. N. Berezina who proposed a different concept of time research [2]. The connecting link between them is a person with his temporal organization, correlating his subjective time with self-realization in life and activity. But if we take into account that the number of these times is great (physical, sociocultural, historical, psychological), then the tasks of such coordination are extremely complicated, and it is realized through self-regulation. The authors of this concept represent the conceptual system, for the first time explicating the concept of «temporary abilities of the individual», which ensure the productivity of time use, orientation in time, the ability to distribute it when the time of occurrence of an event is uncertain, when its strict determination is not available.

Unlike many approaches that emphasized the subjectivity of psychological time, the concept of personal time management assumes the ontological nature of its organization by a person either in activity or in life as a whole.

Such a broad context of posing the problem of personal time management (the temporal characteristics of the psyche, the personality itself, the life path) and the progressive character of the theoretical and empirical research make it possible to prove the thesis about the presence, firstly, of the specifics of human time in general and its difference from the time of physical processes. Secondly, it becomes possible to develop an objective approach to the study of the given time because of the evidence of its specific organization. Thirdly, it opens the possibility to differentiate the different mechanisms of the temporal organization at different levels of the psyche and to represent the personality as a subject that integrates these levels in a unique way, including its temporal type in the social and cultural time continuum, organizing the time of his life and activity. When studying the activity, psychologists use such characteristics as consistency, simultaneity, pace, rhythm, speed, event, etc., which allow us to correlate time with other processes in the surrounding world, but they do not disclose the correlation of biological, psychological, social and cultural time.

Personality as a subject of time management acts as the epicenter of the past, present, and future, that is, it has the property of relating these times to itself and constructing certain compositions from them [3]. In psychology, this property is interpreted as a temporary synthesis, which assumes a special way of linking three-time units of the past, present, and future [9; 12]. The concept of time synthesis allows us to consider the time reflected in the image

of the world of professionals, the coordinates of individual experience, to analyze professional activity through temporal-rhythmic characteristics. Temporary syntheses have a wide range of manifestations in various professions, not only in content but also in filling the present, the past, and the future. For some professions, the present is rendered into the future and is quickly filled with new content. In particularly dynamic modes of activity of a psychologist, a doctor and a pilot there may be situations when the possibility of a return to the past disappears.

It is important to note that the physical, biological and mental processes have their time, independent of a person, that is, they represent some kind of objective organization which should be taken into account by a person. Numerous discrepancies between these different «clocks», going at different speeds, at a different tempo, rhythm, have to be eliminated and coordinated by a person in order to «keep up» with the objective time, first of all, the time of activity as the basic form and way of the social life [11]. This ability is called timeliness, in a particular form sensitivity, that is, the optimal coincidence of the characteristics of the stages of development with its conditions. Timeliness allows resolving contradictions between biological, mental and social time, as well as between different temporal existences. In a simpler expression, timeliness is the coincidence of the maximum of activity with conditions (adequacy of activity to these conditions). Neither premature activity, nor maximum activity, manifested post-factum, will not give the desired result. Timeliness is the moment when the authenticity of self-expression is achieved due to its completeness and freedom. There are criteria for timeliness in a career, education, choice of profession, acquisition of social status (for example, if a person has worked most of the time as an employee, it is unlikely that he will prove himself if he becomes a manager later). A successful timely professional start gives the effect of acceleration, further progress in the sense of minimizing personal efforts. Rather accidental or purposeful hit of a person at the right time and to the right place gives him the potential ability to turn around [7]. Timeliness ensures the ascending character of the life line.

The fundamental untimeliness, infatuation with the process, ups and downs of successes and failures, rejection to accept life seriously, passion for impromptu and unexpectedness not only cause a loss of time but also lead to the destruction of the time horizon. The untimeliness forms life disruptions, which require starting all over again in order to make up for lost time.

It is important to note that the society itself changes the status of the subject over time. And the postulation of such "universal" time frames, in which the person falls into, can lead to a lot of psychological problems. K. A. Abulkhanova notes that "social time, when it makes its demands on a person, clearly indicates what period he must meet in order not to lag behind socially… It can act as both a "driving force for the development of the subject of time and its brake, a stress factor" [2].

It should be understood that each person has his own idea of speed, a kind of "individual step" that measures the course of experience of individual time and experience. Actually, the subjective image of human speed is a rigid psychological constant, which almost does not change during life. In what way is it expressed? In the case of "hurrying people", it is expressed in fussiness, impatience, constant sense of time trouble, in the haste of speech-motor reactions, complaints about an acute shortage of time. It is difficult for them to establish social interactions. "Hurrying" people in their personal time is more often directed to the future. Talking about "slow" people, it reveals itself in slowness, deliberation, torpid responses, delayed signal maintenance, neglect of others' time, and non-constructive attitude to one's own and everyone's time. The temporal focus of "slow" ones is often aimed at the present and the past. The future vector is poorly represented in activity.

These are extreme poles, reflecting ideas about speed, and between them, there is a time type, which B. Tsukanov once called "precise". Such professionals are characterized by the consistency of subjective and objective speeds in the space-time continuum, the skillful organization of the time frames of their activities, strict implementation of deadlines, respect for the time of others in social interactions.

Under certain conditions, time as an objective category can act as a factor of mental tension and thereby influence the nature of the activity and its characteristics. These are the cases when the task has strict time limits for implementation. Emotional tension due to a lack of time can disorganize thinking processes, but at the same time, it can also have a certain mobilizing effect. In times of shortage of time, a person is able to solve some problems more effectively. It seems potentially heuristic that not only a professional predetermines the temporary organization of one's own activity, but time itself as an objective reality is capable of regulating the activity of the individual.

After analyzing a number of professions, L. Aaronson and P. Meredith singled out five typical time regimes in which a person works. The first, the most well-known regime is the time deficit, when it is obviously insufficient to carry out activities; the second one is the limit, when a person needs to work especially hard to fulfill a certain amount of work on time; the third one is the optimal (normal) regime, which in different professions is regulated by the peculiarities of labor organization and human capabilities; the fourth one is indefinite, when the person himself must determine the term of completion of activity (in creative professions it is not customary to plan the period of the scientific discovery or completion of work on the book); the fifth one is an excess of time, when it is known to be more than necessary to obtain a product [2, P. 61].

To determine the time regime, which consists in assessing the reserve to perform a certain task, experience and a certain level of professionalism of the subject of activity are essential. Only in this case, a person can accurately assess and compare his actions and time. At the same time, the organization of activities, even in a time-related regime that is the same from the point of view of objective factors, can also be different for different people [1].

A serious problem, which worries modern leaders, is the tendency of employees to permanently postpone important business or events for later. In psychology, a special term for this phenomenon is used – procrastination. For the sake of justice, it should be pointed out that it is of English origin and in literal translation means delay and postponement. For the first time in the scientific revolution, it was introduced by the English psychologist Noah Milgram [10]. In his work "Procrastination – a disease of modernity", the scientist described the mechanisms of launching this process, the main features, as well as recommendations aimed at its elimination. Procrastination, in his opinion, is not laziness and not the wrong planning of the day or shirking from the work process, but rather resistance to the performance of work or what a person would not like to see in his life.

Actually, the Romans wrote about such a problem as people's desire not to deal with unpleasant matters, but the escalation of this phenomenon began in the late eighties of the last century due to the growth of the bureaucracy and the emergence of a large number of office personnel who can afford to imitate activities.

Procrastination has three components: counterproductiveness (discussing the appropriateness of doing work), useless actions (doing absolutely unimportant and not urgent matters) and postponing (work is postponed until all the terms have expired).

A brief analysis of the main types of procrastination is presented in paper [10]: 1) daily (everyday), i. e. postponing household chores that must be performed regularly; 2) procrastination in decision-making (including minor ones); 3) neurotic, i. e. postponing vital decisions, such as choosing a profession or creating a family; 4) compulsive, in

which a person combines two types of procrastination – behavioral and in decision-making; 5) academic, i. e. postponing the implementation of study assignments, preparation for exams.

In general, procrastination is a consequence of the accumulation of two unpleasant feelings – anxiety and repressed aggression. A person experiences anxiety and postpones business, while his anxiety and aggression grow (time presses), and he, fighting these feelings, fills time with useless deeds.

L. Yu. Kublickene empirically obtained the types of personal organization of activities that characterize the individual features of time management. The first type, "optimal", is determined by the fact that in all given time modes a person acts successfully. The second type, "deficient", means that any temporary situation is reduced by a person to a deficit situation, and he successfully operates in it, allocating support affairs and immediately proceeding to action, while mobilizing. The third type, "calm", is characterized by the fact that its representatives have problems with a given deadline and with deficient regimes. When time is not specified and in a situation when the amount of time is bigger than it is required, they act successfully. For the fourth type, "executive", it is typical to have a successful action in all time modes, except for the mode of unspecified time. Uncertainty, the absence of time restrictions on them are extremely disorganizing. The fifth type, "alarming", is determined by success in situations with an optimally specified term, a good organization of activity in excess of time, temporary uncertainty, and failure in a temporary deficit. The sixth type, "nonoptimal", can be defined as a low level of development of self-regulation activity in time. Representatives of this group do not act successfully in any of the temporary situations, they need constant help and supervision since they are not able to work independently [5].

Activity in many ways depends on time, it can be unlimited in time or motivated by a time deficit, or time constraints. On this basis, time can be considered one of the sources of activity.

Motivation is also the driving force of activity, which involves the contradiction between an undesirable present and a desirable future. To characterize the motivation and its functioning in time, it is important to note the time scales and the duration of its action. The broader the temporal sphere of motivation, the richer and more thoroughly the psychological content of the past, present and future is integrated into it.

Expanding the temporal perspective of motivations from everyday needs to life goals and ideals is the evidence of a developed time perspective. Effective construction of a particular activity depends on the individual ability to regulate the time, which is regarded as an operational distribution of efforts at the moment with the aim of preserving mental reserves.

The peculiarities of the temporary organization of activities depend, on the one hand, on the degree of formation of personal abilities to self-organize, self-distribute, and on the other hand – on the objective temporal characteristics of the organism, the type of nervous system affecting the accuracy of time perception.

It is important to note that in the psychological literature individual psychic processes, states and properties are more often considered than the interrelationships of these phenomena. This is due to temporal and spatial uncertainty, localization, mobility of states and mobility of their shifts. However, in recent years, theoretical provisions on holistic concepts of the psyche, on nonequilibrium mental states, and on integrative mental processes have been developed.

One of such integrative processes is goal-setting, i. e. the ability to separate real and ideal goals in time, readiness to solve the problems that arise stage-by-stage, and to design them in a long-term perspective. The tactic of goal-setting, as one of the highest personal aspirations, is described in detail in the papers of B. V. Zeigarnik. Between real and ideal goals, a greater or lesser discrepancy may be established. The

ability to timely develop real and ideal goals in a particular activity is an indispensable tool for adapting to changing environmental conditions and a means of protection against failure. This largely determines the self-realization of the professional, the stability and productivity of his activities. On the contrary, merging, undifferentiation of real and ideal goals can lead to serious conflicts.

We can ask what role is played by the goal-setting for the individual. In the goal-setting, not only certain projective features of the personality are manifested, but also that it has a need to have a perspective. Social narrowing of living conditions of many people, crises, radical or abrupt changes deprive this personal need. That is, life is limited to the present – today's ("here and now") and thereby personal and semantic and time and space narrow.

On the one hand, the value of the present has always been emphasized ("Don't put off until tomorrow what you can do today"), it contains the foundations of the future. On the other hand, the presence of the future had not only the meaning to prolong life, but also to improve it. The projection of the future always contains the meaning of an open possibility of improvement. The perspective acts as a function of increasing the individual's life potential. Interpretation of life, as well as its construction, has a prolonged character, in each period something develops unsuccessfully/successfully; something is achieved, something is lost. In general, this once again proves that time can be added and multiplied, divided and lost.

While forming the goal, an important role is played by the anticipation, which allows, in order of anticipatory reflection, to present plans and patterns of behavior, including possible time limits. The mention of anticipation in our reasoning is not accidental because the task to be in time is solved due to this component. But not just that. In order that the human psyche is not reactive, a forecast is needed. Then the person will act actively and independently, instead of on a principle "stimulus-reaction".

When analyzing the mechanisms of self-regulation of activities, special attention should be paid to the temporal structure of activity as an integral entity. Under the conscious self-regulation of time is meant a system-organized process of the person's inner psychic activity, consisting in the reflection of temporary goals, conditions, and actions controlled by consciousness. In the structure of conscious self-regulation of time, several levels can be distinguished: reflexive, when an understanding of the value of time in life, awareness of the necessity of ordering time is realized; operational, which includes the use of techniques for organizing activities in different time conditions; motivational, which involves the use of strong-willed efforts to perform work in tight time intervals and planning with time uncertainty.

Conclusions

Thus, time in psychology is regarded as the most important component of human orientation in the world, allowing to study all the diversity of human-time relationships, the temporal organization of its communication and activities. Most scientists who investigate this problem proceed from the fact that perception and understanding of time is a universal human experience, and its development is associated with an adequate reflection of man's time and potential opportunities for the development of adequate temporary perceptions and views. Planning and use of temporary resources are associated with strategies for «anticipating» the real chronological time, or otherwise the strategy of its active transformation. In order to keep up, you need to be a bit ahead. Another strategy, "lag", involves a passive redistribution of time, which is not used to develop a professional.

The study of the organization of activities, taking into account the space-time resource, rational and effective use of it by the subject, can and should be considered by scientists as a criterion for its productivity.

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Section 9. School Education

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LINES OF RUSSIAN POET-STORYTELLERS ON PHYSICS LESSONS

Abstract: the article discusses the possibility of using in teaching physics as a school discipline, works of great Russian poets such as Pushkin, Krylov and others. The authors propose to use the well-known lines of the poet-storytellers to implement different didactic purposes of the lesson.

Keywords: school discipline, physics, didactic purpose of the lesson, tales in verse, physics exercises.

Among school disciplines, physics holds the special place in terms of forming the school pupils' scientific worldview. As an academic discipline, it constitutes the main content of the naturalistic world view. According to pupils and many teachers, literature, art, and poetry should fully give place to the exact experiment, strict evidence, formulas and calculations on physics lessons. Few would dispute this but we should admit the fact that the incompatibility of this school discipline and its liberal 'fellow-travelers' is erroneous. The use of fiction works in teaching such school disciplines as physics allows facilitating material digestion by pupils to a great extent, its memorization and repeating, and it makes these very lessons more interesting and emotional.

The fiction works may pursue various didactic purposes on physics lessons:

– creation of a problem-based situation;

– explanation of new material;

– consolidatione of studied material;

– generalization and repeating of learned material;

– monitoring of knowledge digestion and forming of pupils' skills, etc.

Let us consider the variants of implementing some didactic purposes in the course of physics lessons with the help of lines written by famous national poets: A. S. Pushkin, I. A. Krylov, P. P. Yershov.

With the purpose to create a problem-based situation on the lesson, a teacher may use a fragment from the fairy tale 'The little humpbacked horse' by

P. P. Yershov:

Brighter, brighter shone the light,
Swifter, swifter was their flight
Till they halted where it lay-
There, the field was bright as day,
Lit by wondrous brilliant rays-
Cold and smokeless in their blaze! [1, 26].

Which physical phenomenon is described in the plot? Explain its nature.

When studying the notion of 'force' as a vector value, a teacher may offer to pupils a problem-based task on the basis of a fable by I. A. Krylov 'Swan, Pike and Crawfish':

Once Crawfish, Swan and Pike
Set out to pull a loaded cart,
And all together settled in the traces;
They pulled with all their might, but still the cart refused to budge!
The load it seemed was not too much for them:
Yet Crawfish scrambled backwards,
Swan strained up skywards, Pike pulled toward the sea.

Who's guilty here and who is right is not for us to say –

But anyway the cart's still there today [3].

At which direction of the fable members' drag force and at which values of this force will the cart be 'still there today'?

If the literary writing fragment contains a description of a physical phenomenon, it is reasonable to start its studying with reading this plot. For example, when reading the poem 'The Little Humpbacked Horse' by P. P. Yershov:

Evening shadows fell apace,
And the Sun had run his race;
Tinged the heavens with the blaze
Of his slowly dying rays [1, 104].

Why are the heavens tinged 'with the blaze'?

In order to activate pupils' educational activity when studying new material or its consolidation, it is also possible to use exercises based on these authors' plots:

And his horse flew like the wind,
Leaving miles and leagues behind–
Twenty thousand leagues, ere night,
Covered in a single flight [1, 80].

Evaluate the Little Humpbacked Horse's speed of movement and find out how many times he could turn round the globe 'ere night'?

All the sturgeons flocked around
And, without a single sound,
Raised the little jewel box
Stuck fast in the mud and rocks [1, 104].

Evaluate the sturgeons' lifting force if the box volume was 0.1 m^3

Near the cauldrons, in a row,
Sat the servants, high and low-
Princes, dukes, and lords and pages,
Cooks and coachmen, fools and sages–
Sat and whispered with a smile
And discussed Ivan, the while
Logs were fed on to the fire
So that it should not expire [1, 115].

How much dry birch wood must be burned in order to heat the water cauldron with the volume of 200 l from 20 °C to the boiling temperature?

One can also offer pupils a task based on the plot of the fable 'The Crow and the Fox' by I. A. Krylov:

… Hearing the praise the fox employed,
Her breath stopped in her gizzard,
And, being dizzy with delight,
She loudly crowed with all her might.
The cheese fell out, of course [2].

How long was cheese falling if the height of the tree the crow was sitting on is 6 m?

It is possible to apply different tasks widely on the basis of fictional works while questioning pupils:

Soon the sky grew overcast,
Colder, colder blew the blast,
So they called a bivouac
So as not to lose the track [1, 25].

Why did the blast blow colder by night?

"What a wonder-Oh, I say",
Mused Ivan aloud, as they

Rode the cloudy meadows blue-
"Though our country's pretty, too",
But compared with this blue sky,
It's not worth a button-why,
Our old Earth down there is so
Black and muddy, as you know;
Here, the soil is bright and blue,
And how brilliant it is, too! [1, 85]

Why is the soil 'bright and blue' in the skies?

'But the youngest of the three
Murmured: "If he married me–
I would give our tsar an heir
Handsome, brave, beyond compare".
At these words their chamber door
Gently creaked– and lo, before
These three maidens' very eyes
Stood their tsar, to their surprise [4, 606]

Why has the door creaked? How to "remove" this creaking sound? How to explain that each door has its own "special voice"?

"O, you wanton waves so blue –
Free to come and go are you,
Dashing when and where you please,
Wearing rocks away with ease –
You, who flood the mountains high,
You, who ships raise to the sky –
Hear my prayer, o waves, and spare us–
Safely onto dry land bear us" [4, 609].

What do we call a wave? What waves occur in nature? Which type of waves does the sea wave belong to?

As the practice shows, the use of fictional texts on lessons, as a rule, establishes the good 'feedback', and the pupils express the wish not only to listen but to share their thoughts and experiences. May pupils reread the literature works familiar to them since childhood, and try to compose on their basis tasks not only on physics but on other school disciplines, for example, mathematics.

Of course, the use of fictional texts does not substitute the conventional approaches of educational work but supplements them, helping in physics digestion, giving big opportunities for educational work.

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Contents

Section 1. Other aspects of Psychotechnology **3**

Sovetkina Elena, Verplanken Bas, Weiss Marjorie
INSIGHTS FOR A 'SLOW EPIDEMIC' OF HPV-RELATED OROPHARYNGEAL CANCER: CHARACTERISTICS OF ENGAGEMENT IN ORAL SEX BEHAVIOUR AMONGST YOUNG PEOPLE IN BRITAIN 3

Section 2. Information Technology and Education **14**

Evangelos Koutsoumpidis, Vasileios Komianos, Konstantinos Oikonomou
EVALUATION OF VIRTUAL AGENTS' EFFECTIVENESS IN HISTORY CLASS 14

Section 3. Public education **30**

Do Thi Trinh, Tran Viet Cuong
SOME METHODS TO DEVELOP MATHEMATICS TEACHING COMPETENCE FOR STUDENTS AT PEDAGOGICAL INSTITUTIONS IN VIETNAM 30

Trung Nguyen Tien, Anh Hoang Ngoc
CONSTRUCTIVIST TEACHING IN VIETNAM MATHEMATICS CLASSES: A CASE STUDY OF TEACHING EQUATIONS OF STRAIGHT LINES IN THE PLANE (GEOMETRY GRADE 10TH- HIGH SCHOOL, VIETNAM) 41

Section 4. Primary General Education **53**

Tania Corredato Periotto
THE PERFORMANCE OF THE STUDENTS OF PUBLIC PRIMARY SCHOOLS: THE CASE OF THE PROGRAM OF EXCELLENCE IN BASIC EDUCATION IN THE PARANA REGION – BRAZIL 53

Section 5. Education for Adults **59**

Boiarska-Khomenko Anna Volodymyrivna
ADULT EDUCATION IN EUROPE AND UKRAINE 59

Section 6. Pedagogical Psychology **63**

Vafa Naghiyeva Geyser
PSYCHOLOGICAL CORRECTION OF A PROFESSIONAL BURN-OUT OF A PEDAGOGUE AS A PROCESS OF STREAMLINING OF EDUCATION FIELD OF MODERN SCHOOL 63

Shevchenko Svetlana Viktorovna
FUTURE PSYCHOLOGISTS' INDIVIDUAL RESOURCES AS PSYCHOLOGICAL PREDICTORS OF SELF-TRUST 69

Section 7. Family and Living Psychology **74**

Kapirenkova Oxana Nikolaevnas
CONTENT OF PSYCHOLOGICAL SPACE IN THE YOUTHFUL AGE 74

Section 8. Work Psychology **79**
Kolosov Andriy Borisovich, Volianiuk Nataliia Yurievna,
Lozhkin Georgii Vladimirovich
TIME AS THE RESOURCE OF ORGANIZATION OF SUBJECT'S ACTIVITIES 79
Section 9. School Education **86**
Zhuravlyova Nadezhda Stepanovna, Yermakova Yelena Vladimirovna,
Mamontova Tatiana Sergeyevna
LINES OF RUSSIAN POET-STORYTELLERS ON PHYSICS LESSONS 86