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Full Length Research Paper

Evaluating the Fatih project applications in the Turkish educational system according to teachers' viewpoints (Turkey)

Erol Sozen^{1*} and Mücahit Coşkun²

¹Department of Basic Education, Faculty of Education, Düzce University, Turkey.

²Faculty of Letters, Karabük University, Turkey.

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The purpose of this study was to analyze teachers' perspectives on the usage of smart boards and Tablet PCs in the Fatih Project using some variables (gender, branches, school types, educational status etc). The measurement scale of the study was developed and applied with the high school teachers in Düzce. Quantitative research methods were used in the study and screening model was applied. The SPSS 20.0 statistical package program was used to analyze the data. Frequency values, percentages and mean values were used in data analysis; whereas, the One-Way Variance Analysis (ANOVA) and the t-test were used for unconnected sampling. The study samples were 323 teachers chosen haphazardly from amidst teachers from a variety of high schools in Düzce in the 2015-2016 academic year. In general, the teacher viewpoints on the dimensions defined in the measurement tool were observed to be "I am indefinite" or "I am indecisive". In consequence of the analyses, it was identified that there was a remarkable difference in using Tablet PC PCs on behalf of the male participants according to the gender variable. Seeing that the branch variable, there was a significant difference in using Tablet PC PCs dimension in favor of the foreign language branches; and a significant difference was also found out in using Tablet PC PCs dimension on behalf of the skills class branches. According to school type variable, significant differences were detected in the distribution of the Tablet PC PCs in favor of the vocational high schools. No significant difference was observed according to the graduation variable. In average class population variable, on the other hand, a significant difference was determined in favor of the classes with 26 to 30 students and with 31 and over students in the smart board dimension.

Key words: Fatih project, teacher's viewpoints, smart board, tablet PC, Turkey.

INTRODUCTION

The educational institutions and the efficiency and quality of the education they provide have been severally discussed. Each country aims for more successful

education and training activities for its youth for the future. For this reason, each society has to review the money spent on education in its future plans and work on

*Corresponding author. E-mail: erolsozen@duzce.edu.tr.

how to improve its educational systems to become more efficient and productive; and therefore, in the future, one of the significant points that will be emphasized by societies in our permanently evolving and changing world will be the qualification of the literate human labor force, because societies can only develop and change with the increasing number of the educated people who chase any kind of innovation in and who are experts in their fields (Erden and Fidan, 1988). Küçükahmet (1997) stated that the educational process of a person starts when a person is born and continues until death, and added that some parts of the education that continue throughout the lives of individuals are provided either at schools or in classroom environments in a planned and programmed manner and is called "education". The infrastructure and physical equipment of the schools are very important. The education and training activities provided at schools must be planned and programmed, and they must cover the expectations and needs of the society with infrastructure and physical facilities matching the requirements of the modern age (Binbaşıoğlu, 1994).

In order to create an efficient educational environment, it is inevitable to make use of educational tools and equipment (Kazu and Yeşilyurt, 2008). Today, the fast-developing technology has facilitated the lives of people, and it also has additional important functions like collecting, producing and disseminating the information in the field of education. In order for the education to be more qualified, the use of technology in classes is important. The acceptance of technology by teachers is mostly affected by the urge to adapt to external demands or expectations. This shows that teachers prefer to use technology in order to cover the external demands and expectations rather than their efficiencies in classrooms (Baek et al., 2008). Since the 1980s, technology has become the inevitable part of educational environments and has brought with it the debates on the effects of technology on education, and many teachers claimed that technology was efficient for presenting the contents of the education, while others claim that students used technology for fun rather than educational purposes and therefore it was not proper for education (Plumm, 2008). The aim of Fatih Project was to bring a different vision to the Turkish Educational System since 2010, and its general purpose was to provide classrooms with computers and technologies until late 2013, and perform computer technology-assisted education (MoNE, 2011). For this purpose, the components of Fatih Project have been collected under 5 titles, which are hardware-software, e-content, the use of communication technologies, and in-service training of teachers.

It was aimed that the hard-ware-software infrastructure of Fatih Project would be completed within 3 years', between 2010 and 2013; and in the next 2 years, the aim was to perform the evaluation process of the project and monitor the reflections and outcomes of the project in the Turkish Educational System (Alkan et al., 2011).

According to this target, it was aimed to cover the needs of the third education level in the 1st year; the needs of the second education level in the 2nd year, and the needs of the first education level in the 3rd year. In the context of these targets, the pilot applications started in 2011 in certain schools; and by the end of 2011-2012 academic year, the applications were completed in 17 cities in 52 schools 3 of which were primary schools and 50 were high schools. The applications were tested by distributing the Tablet PCs, which was not mentioned before, to students (Bilici, 2011).

There are many studies previously conducted on computers and smart (interactive) boards, which are among technological products used in education (Adıgüzel et al., 2011; Gürol et al., 2012; Dinçer, 2011; Alkan et al., 2011; Harton et al., 2002; Kalem-Fer, 2003; Bağcı, 2013; Ayvaci et al., 2014; Ateş, 2010; Küçüktepe and Baykın, 2014; Merkel, 1984; Yang, 2008; Stoica et al., 2011; Somyürek et al., 2009; Sünkür and Arabacı, 2012; Şad and Özhan, 2012; Senemoğlu, 2010; Yenipalabıyık, 2013). In these studies, the general foci were computer-assisted instruction, which was learnt by students and who improved themselves by using computer programs. In addition, it was claimed in these studies that the teachers should be provided with more in-service trainings.

Purpose of the study

The purpose of this study was to evaluate the teachers' viewpoints on the delivery of Tablet PC to students and the usage of smart boards by teachers at high schools against the backdrop of Fatih Project in 2013-2014 academic year. It is also the aim of the study to determine the viewpoints of the teachers who work at secondary education institutions on the distribution of Tablet PCs to students and on using smart boards. In addition, the significance of the differences between the variables was determined according to gender, branch, school type, educational status, level and average class populations. For this purpose, the following problem definition and sub-problems were taken shape in the study.

Problem statement

Do teachers' viewpoints on Fatih Project, which started in the 2013-2014 academic year in high schools, differ according to the selected variables?

Sub-problems

(1) What are the teachers' perspectives on using interactive whiteboards, which started at high schools as

Table 1. Distribution of the participant teachers according to their genders.

Gender	n	%
Female	141	44
Male	182	56
Total	323	100.0

Table 2. Distribution of the teachers, who participated in the study, according to branches.

Branch	n	%
Physical sciences	94	29
Verbal	126	39
Vocational classes	42	13
Skills	30	9
Foreign language	31	10
Total	323	100.0

in 2013-2014 academic year?

(2) What are the teachers' perspectives on Tablet PC delivery to students, which started in high schools in 2013-2014 academic year?

(3) Do the teachers' perspectives on using interactive whiteboards and Tablet PC delivery, which started at secondary education institutions in 2013-2014 academic year, differ at a actuarially significant level according to gender, branch, school type, educational attainment, level, year and class population variables?

METHODOLOGY

The model, population and sampling of the study, the data collection tools used in it, the data collection process and the analyses of the data are explained subsequently.

Model of the study

This study, which has the purpose of "Evaluating the Teacher Perspectives on the Delivery of Tablet PC PCs and using interactive whiteboards used at secondary education institutions as of 2013-2014 academic year, was conducted with the questionnaire model (Yıldırım and Şimşek, 2013). The Survey Model is based on describing a situation as it is (Karasar, 1994: 77). It is also preferred in social science studies, which are field studies in nature (Borg and Gall, 1971). For this reason, the data were collected by receiving the perspectives of the teachers on the delivery of Tablet PC PCs and using smart boards. For this reason, questionnaire is an important data collection tool to get statistical data. Thence, the quantitative research model was done for in the study, and a convenient scale for the study was prepared and applied to high school teachers. The relevant literature and field review was made for the scale. While the scale was being prepared, both the viewpoints of the high school teachers and the experts were received and made use of. Beforehand the scale was implemented, it was applied to a sample group, and the reliability findings were determined. The reliability findings are explained in detail in the

data collection tool section.

Population and sampling of the study

The study population consisted of the teachers who worked at secondary school institutions in Turkey, and the sampling consisted of 323 high school teachers who worked in the city of Düzce and who were selected randomly from among the study population. The demographic properties of the study group are given in Tables 1, 2, 3, 4, 5, and 6. The teachers incorporated in the study on a voluntary basis. It paved the way for the teachers to fill in the scale of the study and do probable rectification anytime and anywhere they wanted. Since the teachers participated voluntarily in the study, it is expected that the results of the study are more reliable (Kerski, 2000). It might be claimed that the questionnaires that are implemented in an official manner are less reliable than the ones that are filled voluntarily because the teachers who want to improve themselves are bound up with infilling them.

The gender distribution of the teachers who participated in the study is given in Table 1. Within this framework, we can see that 44% of the teachers who participated in the study ($n=141$) were female and 56% ($n=182$) were male. The number of the male teachers who participated in the study is more than the female ones. Nevertheless, the distribution of the gender is poised.

The distribution of the participant teachers with reference to their branches is taped in Table 2. Twenty-nine percent of the teachers, who participated in the study ($n=94$) were from physical sciences field; 39% ($n=126$) were from verbal field, 13% ($n=42$) were from vocational training-education field; 9% ($n=30$) were from skills field; and 10% ($n=31$) were from foreign languages field. The number of the teachers who worked in the verbal field was the highest. This circumstance is appertaining to the general distribution.

The distribution of the participant teachers with reference to their school types is shown in Table 3. Forty-eight percent of the teachers, who participated in the study ($n=156$) were laboring at Anatolian high schools, 17% of the teachers, who participated in the study ($n=55$) were laboring at science and teacher training high schools, 35% of the teachers, who participated in the study ($n=112$) were laboring at vocational high schools. The number of the teachers who were laboring at Anatolian High Schools was more.

This situation has come to light with the reconfiguration of the

Table 3. Distribution of the teachers, who participated in the study, according to school types.

School type	N	%
Anatolian High School	156	48
Science and Teacher Training High School	55	17
Vocational High School	112	35
Total	323	100.0

Table 4. Distribution of the teachers, who participated in the study, according to educational status.

Educational status	N	%
Under graduate	41	13
Science and literature faculty	89	27
Educational faculty	136	42
Post-graduate	57	18
Total	323	100.0

Table 5. Distribution of the teachers, who participated in the study, according to seniority status.

Seniority (Seniority years)	N	%
1-5	39	12
6-10	53	16
11-15	93	29
16-20	63	20
21 and over	75	23
Total	323	100.0

secondary education institutions in Turkey in the recent times. Since plain high schools were made the cut as Anatolian High Schools, this group shows a more level of participation.

The distribution of the participant teachers with reference to their educational status is shown in Table 4. Thirteen percent of the teachers, who participated in the study ($n=41$) were graduated from undergraduate degrees, 27% of the teachers, who participated in the study ($n=89$) were from science-literature faculties, 42% of the teachers, who participated in the study ($n=136$) graduated from educational faculties, and 18% of the teachers, who participated in the study ($n=57$) had post-graduate degrees. The number of the teachers who graduated from educational faculties was more.

The distribution of the participant teachers with regard to their seniority at service is shown in Table 5. Twelve percent of the teachers, who participated in the study ($n=39$), had 1 to 5 years' experience, 16% of the teachers, who participated in the study ($n=53$), had 6 to 10 years' experience, 29% of the teachers, who participated in the study ($n=93$), had 11 to 15 years' seniority, 20% of the teachers, who participated in the study ($n=63$), had 16 to 20 years' seniority, and 23% of the teachers, who participated in the study ($n=75$) had 21 years and above seniority. It might be alleged that the majority of the teachers are experienced in their professions.

The distribution of the participant teachers with reference to the average class populations is shown in Table 6. Eighteen percent of the teachers, who participated in the study ($n=57$) labored in classes with 1 to 25 students, 47% of the teachers, who

participated in the study ($n=152$) labored in classes with 26 to 30 students; 35% of the teachers, who participated in the study ($n=104$) labored in classes with 31 and over students. When the populations of the classes in the schools where the study was carried out were analyzed it was observed that the classes where there were 26 to 30 students which constituted the preponderance. This situation also represents the overall status of the distribution in classes in the country.

Data collection tool

In order to designate the teacher perspectives on Fatih Project which became active as of 2013-2014 academic year in secondary education institutions, a 5-Point Likert scale was enhanced by the author of the study. The scale composed of 17 items and 2 factors. Therewithal, aside from these 2 factors, there are questions on the personal information of the teachers who participated in the study in the first section of the scale. This section is composed of 6 items on demographic variables. This section was formed as personal information, and includes some variables like the gender, branch, school type, educational status (graduation), seniority years and average population of the classes of the teachers. In the 2 dimensions of the scale, the smart board application magnitude consisted of 9 items, and the Tablet PC distribution magnitude consisted of 5 items.

The scale was presented for the expert opinions and evaluations.

Table 6. Distribution of the teachers, who participated in the study, according to the populations of the classes.

Class populations	N	%
1-25	57	18
26-30	152	47
31 and over	114	35
Total	323	100.0

Table 7. The sub-dimensions and item load values formed as a result of the Fatih Project, teachers' viewpoints explanatory factor analysis.

Item numbers	Components	
	Factor 1 Smart Board	Factor 2 Tablet PC
M1	0.907	-
M2	0.887	-
M3	0.885	-
M4	0.878	-
M5	0.855	-
M6	0.854	-
M7	0.795	-
M8	0.769	-
M9	0.755	-
M10	-	0.911
M11	-	0.911
M12	-	0.907
M13	-	0.907
M14	-	0.907
M15	-	0.871
M16	-	0.838
M17	-	0.628

Necessary corrections were made on the scale taking into account the viewpoints and critics of the experts, and it was made proper for the pre-application. Then, this scale was applied to 113 secondary education teachers for reliability analyses. This application was performed as "tete a tete" interviews with the teachers. The items on the content dimension that had low values in the pilot application were removed from the scale. The scale was applied after the reliability studies of the items. If the KMO value in such scales is over 0.60, the scale is seen as being proper for Factor Analysis (Büyüköztürk, 2013). The KMO value of the scale was found as 0.905. This is a value that is convenient for analysis. Into the bargain, the item load values of the scale are viewed in Table 7.

The rate of explaining the total variance by the 5-factor structure is 71.4%. Çokluk et al. (2010) reported that 40 to 60% was the ideal rate in multifactorial structures. The factor load values of 5 factors were not observed to be close to each other and their contributions to the total variance was more than the other factors. After the Vertical Spinning (*Varimax*), the items of the 5-factor structure that overlapped with each other and that had item load values below 0.32 were removed from the scale, and it was given the latest form for application. The numbers given earlier was about the dimensions obtained after the items with low values were removed. After the reliability analysis, the Cronbach Alpha Coefficient of the scale, which consisted of 17 items, was found to be 0.90. As a

result, the scale is reliable. In addition, the range of the points is shown in Table 8 in agreement with the Likert Scale.

Analysis of data

The statistical analyses were produced by using the SPSS 20.0 program in the study. In the analyses of the problem statement and sub-problems, the descriptive statistics method was utilized; the t-test and One-Way Variable Analysis (ANOVA) tests were utilized for irrelevant sampling. The Tukey Test was used for intergroup comparisons. The level of significance was taken as 0.05.

FINDINGS AND DISCUSSION

The frequency values, percentages, arithmetic averages and similar statistical values were used to find out which answers of the teachers given to the questions in the questionnaire were more intense (by using the 5-Point Likert Scale). The Unrelated Sampling t-test was performed in order to determine whether there were

Table 8. Point ranges of the items of the questionnaire with Likert scale.

I do not agree at all	1	1.00-1.80
I do not agree	2	1.81-2.60
I am indecisive	3	2.61-3.40
I agree	4	3.41-4.20
I totally agree	5	4.21-5.00

Table 9. The t-test results of the sub-dimensions of Fatih Project according to gender.

Dimensions	Gender	N	\bar{X}	S	sd	t	p
Smart board	Female	141	3.71	0.85	321	-1.62	0.10
	Male	182	3.87	0.99			
Tablet PC	Female	141	2.03	0.83	321	-2.04	0.04
	Male	182	2.24	0.91			

Table 10. One-Way ANOVA Results of Fatih Project Scale Sub-dimensions according to Branch.

Dimensions	School type	N	\bar{X}	S	sd	F	p	Difference Tukey
Smart board	Physical sciences	94	3.71	0.91	-	3.575	0.007	-
	Verbal	126	3.91	0.87	4			-
	Vocational	42	3.79	0.79	318			2-5
	Skills	30	4.08	0.51	322			4-5
	Foreign language	31	3.36	1.04	-			-
Tablet PC	Physical sciences	94	2.12	0.92	-	2.838	0.025	-
	Verbal	126	2.08	0.98	4			4-1
	Vocational	42	2.03	0.82	318			4-2
	Skills	30	2.68	0.90	322			4-3
	Foreign language	31	2.14	0.89	-			-

significant differences between the teacher viewpoints in terms of two-group variables (like gender). The (ANOVA was used in order to determine whether there were significant differences between the teacher viewpoints in three or more group variables ("the branch, school type, graduation, seniority year, class population"). In case differences were determined, the Tukey Multiple Comparison Test was made in order to determine between which groups the differences were. The significance level was taken as 0.05. The options and their points given in the scale across the sentences are as the following.

The t-test results of the scale are shown in Table 9. When Table 9 is examined it is observed that the teacher viewpoints on smart board do not differ at a significant level according to gender variable [$t(321) = -1.62; p > 0.05$]. In other words, gender does not seem a determinant variable for this dimension. However, a

significant difference is observed between the viewpoints of the teachers on distributing Tablet PCs dimension according to gender variable in favor of the male teachers [$t(321) = -2.04; p < 0.05$]. It may be considered that male teachers adapted themselves more easily to Tablet PC use. In addition, when Table 9 is examined it is observed that the average of the teacher viewpoints on smart board application was determined as "I agree"; and the teacher viewpoints on Tablet PC distribution were determined as "I do not agree". In general, the teachers do not find Tablet PC distribution as a positive development.

The ANOVA results of the Fatih Project scale sub-dimensions according to branches are shown in Table 10. In this context, a significant difference is observed between the teacher viewpoints on smart board application dimension according to branches [$F(4-318) = 3.57; p < 0.05$]. This difference was found to be

Table 11. One-way ANOVA results of the sub-dimensions of Fatih Project according to school type.

Dimensions	School type	N	\bar{x}	S	sd	F	p	Significant difference
Smart board	Anatolian High School	156	3.19	0.81	2	2.62	0.07	-
	Science-Teacher Training High School	55	3.17	0.88	320			
	Vocational High School	112	3.40	0.80	322			
Tablet PC	Anatolian High School	156	1.96	0.98	2	16.826	0.00	-
	Science-Teacher Training High School	55	1.88	0.69	320			
	Vocational High School	112	2.55	0.87	322			

significant in favor of verbal branch and skills branches; and against foreign language branches. It is possible to claim that the use of smart boards bring facilities in terms of documentaries, films, maps and presentations. According to the table, the teacher viewpoints on physical sciences, verbal, vocational classes and in skills fields as "I agree". The teacher viewpoints on foreign language branch were determined as "I am indecisive" on smart board application dimension. When the activities like "Listening" are considered in foreign language field, it is expected that the teacher viewpoints would be more positive.

According to Table 10, a significant difference is observed between the teacher viewpoints on Tablet PC distribution dimension according to branches [$F(4-318)=2.83$; $p<0.05$]. This difference was found in favor of skills branch, and against physical sciences, verbal and vocational classes. Especially the teachers of Skills classes (like music, art, physical education) considered the innovations like smart board and Tablet PC in a more positive manner. According to the table, the teacher viewpoints on Tablet PC distribution dimension are as "I do not agree". In general, the teachers have the viewpoint claiming that the Tablet PC distribution influenced the motivation of the students to classes in a negative manner.

According to Table 11, it is observed that the teacher viewpoints do not differ on smart board according to the school types of the teachers at a significant level [$F(2-320)=2.62$; $p>0.05$]. In addition, the teacher viewpoints on smart board use were determined as "I agree". In general, the teachers consider the smart board use as a beneficial development.

According to Table 11, there is a significant difference between the teacher viewpoints on Tablet PC distribution dimension according to the school type variable [$F(2-320)=16.8$; $p<0.05$]. This difference between the teachers working at vocational and Anatolian High School was found to be in favor of the teachers who worked at vocational high schools; and in favor of the teachers who worked at vocational high schools between the teachers who worked at Science and Teacher Training High School and vocational high schools. According to the

table, the viewpoints of the teachers on Tablet PC distribution dimension were as "I do not agree".

According to Table 12, the teacher viewpoints on using smart boards do not differ at a significant level according to the educational status of the teachers (graduation) [$F(3-319)=1.45$; $p > 0.05$]. In addition, the teacher viewpoints on using smart boards were determined as "I agree".

According to Table 12, the teacher viewpoints on using Tablet PCs do not differ at significant level according to the educational status of the teachers [$F(3-319)= 0.46$; $p > 0.05$]. In addition, the teacher viewpoints on using Tablet PCs were determined as "I do not agree".

According to Table 13, it is observed that the teacher viewpoints on using smart boards do not differ at a significant level according to the Seniority Years [$F(4-318) =1.47$; $p > 0.05$]. In addition, the teacher viewpoints on using smart boards were determined as "I agree".

According to Table 13, it is beheld that the teacher perspectives on using Tablet PCs do not differ at a significant level according to the Seniority Years of the teachers [$F(4-318) =1.44$; $p > 0.05$]. Moreover, the teacher perspectives on using Tablet PCs were identified as "I do not agree".

According to Table 14, there is a significant difference between the teacher viewpoints on using smart boards according to average Class Population variable [$F(2-320)=6.80$; $p<0.05$]. This difference was detected between the teachers who had 1 to 25 students in their classes and those who had 26 to 30 students in their classes in favor of the teachers who had 26 to 30 students. The difference that was detected between the teachers who had 26 to 30 students in their classes and the ones who had 31 and over students was in favor of those who had 31 and over students. A significant difference was also detected between the teachers who had 1 to 25 students and those who had 31 and over students in favor of those who had 31 and over students in their classes. As the Class Population increased, the smart boards were found to be more useful. According to the table, the teacher viewpoints on using smart boards were determined as "I agree".

According to Table 14, it was detected that the teacher

Table 12. One-way ANOVA results of Fatih Project sub-dimension according to educational status.

Dimensions	Educational status	N	\bar{x}	S	sd	F	p
Smart board	Undergraduate	41	4.02	0.11	3	1.458	0.22
	Science-literature	89	3.84	0.10	319		
	Educational faculty	136	3.77	0.07	322		
	Post-graduate	57	3.65	0.74	-		
Tablet PC	Undergraduate	41	2.17	0.15	3	0.046	0.98
	Science-literature	89	2.14	0.10	319		
	Educational faculty	136	2.13	0.08	322		
	Post-graduate	57	2.15	0.11	-		

Table 13. One-way ANOVA results of Fatih Project sub-dimensions according to seniority.

Dimensions	Seniority (Years)	n	\bar{x}	S	Sd	F	p	Difference Tukey
Smart board	1-5	39	3.64	0.94	-	1.47	0.20	-
	6-10	53	3.76	0.81	4			
	11-15	93	3.70	0.88	318			
	16-20	63	3.86	1.00	322			
	21 and over	75	3.98	0.76	-			
Tablet PC	1-5	39	2.17	0.78	-	1.44	0.21	-
	6-10	53	2.16	1.00	4			
	11-15	93	2.11	1.01	318			
	16-20	63	1.96	0.92	322			
	21 and over	75	2.34	0.87	-			

Table 14. One-way ANOVA results of Fatih Project sub-dimensions according to class populations.

Dimensions	Class population (students)	n	\bar{x}	S	sd	F	p	Difference Tukey
Smart board	Between 1 and 25	57	3.44	1.02	2	6.807	0.01	2-1
	Between 26 and 30	152	3.82	0.84	320			3-2
	31 and over	114	3.96	0.81	322			3-1
Tablet PC	Between 1 and 25	57	2.08	0.92	2	2.485	0.08	-
	Between 26 and 30	152	2.06	0.97	320			
	31 and over	114	2.30	.89	322			

viewpoints on using Tablet PCs in classes did not differ at a significant level according to average class population [$F(2-320) = 2.48$; $p > 0.05$]. In addition, the teacher viewpoints on using Tablet PC were determined as "I do not agree."

Conclusion

It is observed that the teacher viewpoints do not differ at a significant level on using smart boards according to

gender variable. Gender is not a determinant variable for this dimension. A significant difference was observed between the teacher viewpoints on Tablet PC distribution dimension in favor of the male teachers. It may be claimed that male teachers adapt more easily to Tablet PC use.

A significant difference was detected between the teacher viewpoints on smart board application according to branches variable in favor of the verbal branches and skills classes and against the foreign language branch. A significant difference was observed between the teacher

viewpoints on Tablet PC distribution according to branches in favor of skills classes, and against the physical sciences, verbal and vocational classes. The teachers of skills classes (music, art, physical education, etc.) approached technological innovation in a more positive manner.

The teacher viewpoints on using smart boards according to school types did not differ at a significant level. A significant difference was detected between the teacher viewpoints on Tablet PC distribution according to the school types in favor of the teachers who worked at vocational high schools, and against the teachers who worked at Anatolian, Science and Teacher Training High Schools.

It was determined that the teacher viewpoints on using Smart board and Tablet PCs did not differ at a significant level according to the educational status of the teachers.

It was observed that the teacher viewpoints did not differ at a significant level on using Smart board and Tablet PC according to Seniority Years variable.

A significant difference was detected between the viewpoints of the teachers who had 1 to 25 students in their classes and those who had 26 to 30 students in their classes on using smart boards according to average Class Population variable in favor of those who had 1 to 25 students in their classes. Significant differences were detected between the teachers who had 26 to 30 students in their classes and who had 31 and over students in their classes in favor of those who had 31 and over students in their classes; and between those who had 1 to 25 students in their classes and those who had 31 and over students in their classes in favor of those who had 31 and over students in their classes. As the class population increases, the smart boards are considered as a more beneficial innovation. It was observed that the teacher viewpoints on Tablet PC distribution did not differ at a significant level according to average class population variable.

In general, the teacher viewpoints were determined as "I agree" in the smart board dimension, and "I do not agree" in the Tablet PC dimension. Generally, the teachers did not consider Tablet PC distribution as a positive development. The idea that Tablet PC distribution influence students' motivation to classes in a negative manner. In general terms, the teachers consider the use of smart boards as a beneficial development. In addition, a comment may be made claiming that "The teachers have not received adequate in-service training on associating the Tablet PCs and smart boards with the contents of the classes".

RECOMMENDATIONS

The enforcement like using interactive whiteboards and distributing tablet PCs at high schools must be tactful by receiving the line of vision of the high school teachers, students and parents without populist policies. It is

recommended that the learning and teaching processes are organized by receiving the viewpoints of the pedagogues, teachers and instructresses.

The results of the study showed that the viewpoints of the teachers differ on using smart boards and distributing tablet PCs at different school types. This situation shows that the education given at different high school types are not the same. It is recommended that these innovative applications are distributed to students who are at different age groups by considering their school types instead of standard applications.

CONFLICT OF INTERESTS

The authors have not declared any conflicts of interest.

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Full Length Research Paper

The study of validity and reliability of the perceived value scale of prospective teachers in terms of teaching profession

Engin Demir¹, Yusuf Budak^{1*} and Cennet Gologlu Demir²

¹Gazi University, Turkey.

²Science and Art Center, Ministry of National Education, Turkey.

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The aim of this study was to develop "Perceived Value Scale in regard to Teaching Profession of Prospective Teachers ". The validity and reliability analysis of the scale, developed for prospective elementary school teachers, was performed. In order to determine the values of the teaching profession, first of all, the related literature was scanned and an essay about the values related to the profession was written by the elementary school teachers and prospective teachers. In this way, 75 values in regard to teaching profession were determined. The obtained values were asked to be ranked according to their significance by primary school teachers and prospective teachers and a likert scale consisting of 64 items was prepared for 10 values that are most significant. After receiving expert opinions on scale items, 491 prospective teachers were applied and analysis was performed with findings .According to the analysis results, the Kaiser-Meyer Olkin (KMO) sample suitability was found as 0.847. In order to determine the reliability of the scale, Cronbach Alpha internal consistency indexes were calculated. The internal consistency index (Cronbach Alpha) of the scale was found as 0.899. Varimax vertical rotation method was used to determine independent sub factors of the scale. The lower cut-off point of the factor loads is taken as 0.45. It was found that the scale consisting of 8 factors and 40 items, explained 58,674% of the total variance. Findings suggest that the "Perceived Value Scale in regard to Teaching Profession of Prospective Teachers" is a valid and reliable measurement tool that can be used to determine the perceived value of the teaching profession of primary school prospective teachers.

Key words: Professional value, prospective teachers, teaching profession, teacher training.

INTRODUCTION

The concept of value in education systems and understanding has been attracting attention increasingly from history till today. While societies raise their next generation, they try to transfer to them the values which

carry their own society's traces (Bolat, 2016).

The notion of value was first used in 1918 by Znanicki in the social science literature. It is derived from the Latin word "valale" which means "to be worth" or "to be

*Corresponding author. E-mail: edemirakademik@gmail.com. Tel: +905426126087.

strong" (Bilgin, 1995). Despite a lot of emphasis in the past few years, it is difficult to say that there is a common definition that will bring the notion of value to a sufficiently clear point. When the literature is analyzed, it is seen that various disciplines such as psychology, sociology, philosophy and anthropology are involved in a common explanation effort regarding the notion of value.

According to Bacanlı (2002), it is a concept that can be taken into consideration culturally, socially and individually. Slalom Schwartz, who has been studying on notions of values in recent years, (1999) describes the concept of value as "a social actor which usually helps in the selection of behaviors / actions, in the assessment of events and people, in the explanation of behaviors / actions" and ""Desirable goals that serve as principles that guide people in their lives with varying significance"(Ros et al., 1999).

Values are beliefs about ideal behaviors or life goals of individuals and are versatile standards that guide behavior in different ways. They are beliefs that something is desirable (good) or not (bad) (Sağnak, 2004). Esmer (1999) defines the values as abstract thoughts, ideals that determine "good-evil" and "right-wrong". According to Bolay (2007, p.14), values are what people dignify and desire to achieve.

These may be values such as property, wealth, health, as well as spiritual values such as happiness, peace, patriotism love and freedom. Köknel, (2007) defines the notion of value as "an abstract unit of measure that emphasizes the importance of tangible or abstract notions; a word describing the importance of living and non-living beings, events and phenomenon". Values are not abstract notions. Values are our lives (İnam, 2009).

Rokeach (1973) defines values as "permanent beliefs that are favored or opposed to a particular mode of behavior or existence." Values are the basic determinant of behaviors, decisions, group relations, human relations, organizational behavior, superior-subordinate relations, organizational-environmental relations, and many others, as criterion for good and bad. For these reasons, it is necessary to emphasize values and preserve them as they have to be improved (Yılmaz, 2006).

The impact of globalization on societies is increasing rapidly. This affects the values of society in a positive or negative direction. There is a rapid transformation in spiritual, moral and humanitarian values of the societies. New generations should be able to understand this transformation and analyze it in terms of their own values and establish the necessary adjustment mechanisms so that they can be protected from the negative effects of transformation of values.

On the other hand, they should be able to adapt their positive aspects to their own values. The 18th National Education Council gathered on the subject of values education and voiced the significance of value education for our country and suggested that values education should be included in teaching programs. Some of the

decisions taken by the council are (MEB, 2010):

(1) Decision 3. In curriculums, priority should be given to the approaches that will raise awareness by considering national and universal values instead of value transfer in value education.

(2) Decision 31. Teachers should be instructed in value education by emphasizing that value is a preference and that societies consist of people with similar preferences.

(3) Decision 32. All programs that train teachers should include a course on values education and values education should also be included in service trainings of teachers in the system.

The values that prospective teachers have will be transferred to the students and will also affect their relations with their colleagues at the future. It is significant to determine the values, which are crucial notions in terms of the teaching profession and the factors that affect these values and include them in vocational and in service trainings. However, there are few studies studying values for the teaching profession in literature. This research differs from other researches by being the first research in Turkey on professional values of teacher candidates.

The concept of professional values for teaching profession

Professional is a person who chooses a topic as a profession, specializes in this subject, and who has won his life with the knowledge and experience in that area. Being professional requires having some value unique to the profession. Values affect the perceptions of the individual and guide their behavior. The values adopted and acquired by the profession ensure the development of standards. Professional values of teacher candidates need to be determined and standardized. Because if they have these values determined by the teachers, then they can transfer these values to the students.

When the literature is analyzed, it is noteworthy that the values related to work or occupation is considered with the concept of "work values". Work values are generally defined and classified without being specific to any occupation. When the definitions about the concept of the work values are examined in the literature, it is emphasized that the work values are related to the beliefs and attitudes in regard to the occupation.

Among the researchers suggesting this view, Super (1969) defines work values as beliefs or attitudes about the individual's job choice, job learning, or commitment to the job (Liu and Lei, 2012). Any definition of professional value, which includes the value as phenomenon, which was tried to be defined in the introduction, has not been found in the educational sciences literature. However, there are academic studies on values for the teaching

profession (Albayrak, 2015; Şimşek and Erdem, 2016; Tunca, 2012).

Apart from the field of educational sciences, it is seen that Professional Values Scale of Nurses was developed (Göriş et al., 2014; Orak and Alpar, 2012). The studies on values in Turkey in the field of educational sciences are given below: (Albayrak, 2015; Akkiprik, 2007; Aktepe and Yel, 2009; Balcı and Yelken, 2010; Can, 2008; Çengelci, 2010; Çetin, 2016; Doğanay and Sarı, 2004; Devci and Dal, 2007; Demir and Demirhan, 2007; Evin and Kafadar, 2004; Ercan, 2001; Fidan, 2009; Kuş, 2009; Tokdemir, 2007; Tunca, 2012).

Prospective teacher need at least as much knowledge as to gain value and attitude towards the profession. Because research shows that students are influenced by the attitudes and behaviors of the teacher (Çetin, 2006). There are very few studies in the literature investigating values for the teaching profession. It is crucial to determine the perceived values of the prospective teachers, who will provide humanitarian, moral, social, cultural and democratic values in our schools, and identify the necessary studies and measures to be taken within the scope of this determination.

The aim of this study, which is expected to contribute to the teacher training system, is to develop a valid reliable scale aimed at measuring the perceived values of primary school prospective teachers. In this way, the factors that define the professional values of teacher candidates was tried to be determined.

METHODOLOGY

Research model

In this research, which is aimed to develop the "Perceived Value Scale in regard to Teaching Profession of Prospective Teachers", the screening model was used. Screening models are research approaches that aim to describe the past or present situation as it exists. Quantitative and qualitative methods were used together in the collection of research data. Quantitative data were collected with the scale to be developed, while qualitative data were collected with the compositions.

Study group

The universe of the study consists of the elementary education departments of all education faculties in Western Black Sea region. Samples of the study consist of the third and fourth year students of the Kastamonu University Faculty of Education, Elementary School, Mathematics Teaching, School Teaching, Science Teaching and Social Studies Teaching departments, and they were selected by the purposive sampling method. The survey was administered to 491 students.

Composition of data collection tools

A three-part questionnaire was prepared to collect the data. The first part of the questionnaire is composed of "Demographic Characteristics" and the second part is composed of the

prospective teachers' "Value Perceptions Scale for the Teaching Profession of Teacher Candidates", which developed by the researcher.

In order to determine the demographic characteristics, the researcher asked questions to the prospective teachers such as gender, social class, department, income level of the family and the reasons for choosing teaching profession. The collected data has been transferred to the IBM-SPSS 21 packaged software. A content analysis technique was used to analyze the qualitative data. The reason for the use of content analysis is that similar data can be put together in the framework of specific concepts and themes so that it can be regulated (Yıldırım and Şimşek, 2013).

"The Perceived Value Scale of Prospective Teachers In Terms of Teaching Profession" has been prepared taking into account the local and international literature. First of all, 66 value items have been revealed by considering the literature. Then, in terms of the basis for the formation of questionnaires, 40 teachers and 70 students wrote essays, in which "What might be the values of the teaching profession, which guide the teacher when he fulfills his professional duties (educational activities) and determine the character of the teacher? Can you rank these values in terms of concept, teacher behavior or explanation?" open-ended questions were asked.

As a result of analysing the essays, nine values were collected, which is different from the values collected in the literature. These values are: being moral, respecting religious values, being disciplined (authoritarian), empathizing, being trustworthy, being idealistic, being self-confident, being sincere not being prejudiced. As a result, a pool of values consisting of a total of 75 values was created based on the essays and the literature. Afterwards, a total of 337 teachers and students were asked to select the most important 20 values, specific to the teaching profession, from the 75 values collected from the essays and literature. As a consequence, the most significant 20 teaching profession values are listed below:

- (1) Being moral
- (2) Being patriotic
- (3) Empathizing
- (4) Being honest
- (5) Respect to the republic
- (6) Love of profession
- (7) Being understanding
- (8) Respect to National values (Our history, language, religion, independence)
- (9) Being trustworthy
- (10) Being open to learning
- (11) Being patient
- (12) Being open-minded
- (13) Being responsible
- (14) Being sensitive to National symbols (national anthem, flag and national feast)
- (15) Self-confidence
- (16) Respect to human rights and freedom
- (17) Considering individual differences
- (18) Equality and justice
- (19) Value of family
- (20) Value of family

The 10 values having the highest frequency from these are taken into account in the formation of scale items. A total of 64 scale items were prepared for these 10 values. After this step, expert opinions on items were consulted.

FINDINGS

After consulting expert opinions, the questionnaires were passed to the implementation stage so that the last stage of the scale

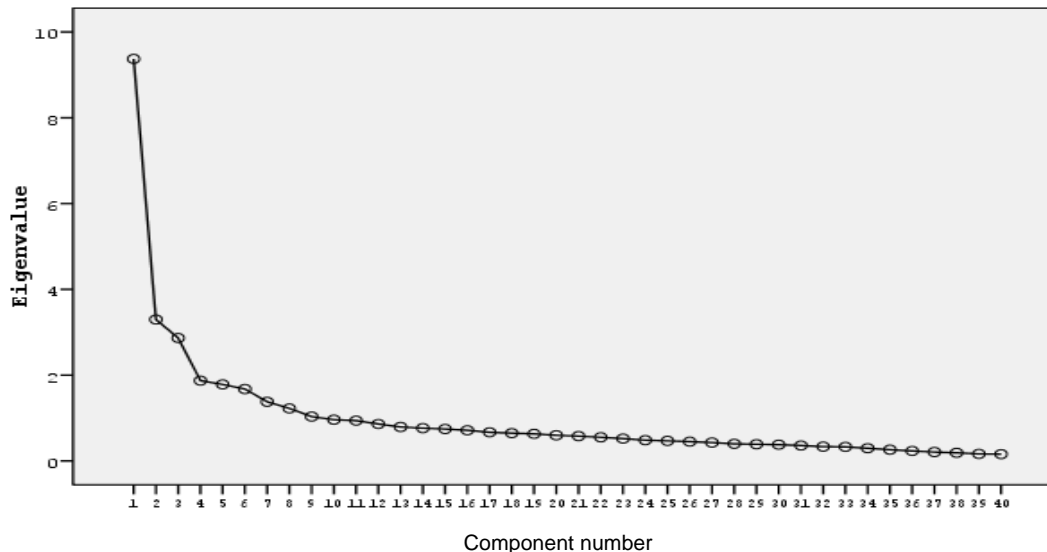


Figure 1. Component number.

development could be analyzed for validity and reliability. A pilot implementation was made to 538 prospective teachers for the development of the "Perceived Value Scale in terms of Teaching Profession".

However, poorly answered, excessively blanked or some unanswered questionnaires were not analyzed. The data from the remaining 491 questionnaires were analyzed. The criteria given by Tabachnick and Fidell (2007) for factor analysis were taken into account. According to these criteria, 300 people are considered "good", 500 people are "very good" and 1000 people are considered "excellent" for factor analysis. The data collected from the prospective teachers were scored as 1, 2, 3, 4, 5 in the form of "Strongly Disagree", "Disagree Somewhat", "Agree Somewhat", "Agree", "Strongly Agree" and they are transferred to the computer through the SPSS software.

After transferring the data stack to the computer, the factor structure of the scale consisting of 64 items was tried to be determined. The results of the Kaiser-Meyer Olkin (KMO) sample and then the Bartlett's test of sphericity were analysed to determine the suitability of the data for factor analysis. After determining the suitability of the results, the factor structure was determined using the Principal Component Analysis.

When the results of the Bartlett's test of sphericity are examined, it is seen that the results collected are significant ($\chi^2_{(2016)} = 11704,315, p < .01$). The result shows that there is a high correlation between the variables, in other words, the data set is suitable for the analysis of key components (Kalaycı, 2006). In the process of factor analysis, it was decided by the percentage of total variation method, which acknowledges that the number of factors was reached maximum when the contribution to the total variation of each additional factor fell below 5% (Kalaycı, 2006; Dunteman, 1989; from Kalaycı, 2006).

The Cronbach's Alpha index and total correlations of the items were calculated from the data collected from the questionnaire. In this direction, when the total correlations of the items in the scale were evaluated, items 1-3-4-9-10-14-19-24-26-28-36-39-47 and 57, which are below 0.25 and have negative values (Büyüköztürk 2007), removed from the scale. In addition to this, KMO (Kaiser-Meyer-Orkin) sample suitability test and Bartlett's test were performed. The suitability of the Kaiser-Meyer Olkin (KMO) sample

was found as 0.847. Therefore, it is possible to evaluate that the sample size is "very good" in order to perform factor analysis (Hutcheson and Sofroniou, 1999; Field, 2009).

Varimax vertical rotation method was used to determine independent sub factors of the scale. The lower cut-off point of the factor loads is taken as 0.45. In the first analysis, factors of scale were released. In the second analysis, the scale factor number was determined to be eight and reanalyzed.

In this analysis, the factors 6-7-11-29-37-40-48-53-54 and 58, which are below factor load of 0.45, removed from the scale as a result of repeated analyses to obtain the final result. It was determined that the scale of 8 factors and 40 items explained 58.674% of the total variance and the factor loads of the items were found between 0.47 and 0.86.

In addition to this, in order to analyse the collected results altogether, results in regard to analysis of key components, common factor variance, varimax factor loads, eigenvalue, explained factor variance values, Cronbach alpha value for reliability analysis and total item correlation of items in relation to each other and T values for substance distinguish are given in Figure1.

It is thought that the 40 items collected as a result of factor analysis explained the 8 structures of perceived values of prospective teachers in regard to teaching profession;

- (1) Being moral and honest
- (2) Patriotism
- (3) Empathizing
- (4) Respect to the republic
- (5) Love of profession and and being open to learning
- (6) Being understanding
- (7) Being patient
- (8) Respect to National values (History, religion, language, independence)

Cronbach Alpha internal consistency indexes were calculated to determine the reliability of the scale. The internal consistency index (Cronbach Alpha) of the scale was found as .899. The sub factors were found as .71 and above. These findings, According to Kalaycı, (2006, p.405), scale is quite reliable if $0.60 \leq \alpha \leq 0.80$, highly

reliable if $0.80 \leq \alpha \leq 1.00$, thus, the results indicate that the scale is highly reliable.

The item total correlations for each sub-factor, which was determined as eight factors, were found between 0.373 to 0.545 for factor one, factor two for 0.601 to 0.775; 0.385 to 0.648 for factor three, 0.683 to 0.830 for factor four, 0.421 to 0.564 for factor five, 0.446 to 0.720 for factor six, 0.541 to 0.719 for factor seven, 0.507 to 0.668 for factor eight, respectively.

According to Kalaycı (2006), the fact that the item-total correlations are not negative and greater than 0.25, is sufficient to ensure the principle additivity of the scale. Moreover, in the pilot implementation, the answers given by the upper 27% and lower 27% groups to each item were compared with the unrelated t test. The validity and reliability analysis values, collected after the items of the scale were extracted, are given in Table 1.

As a result of the factor analysis of the scale -which will enable the determination of the level of possessing professional values of elementary school teacher candidates- an eight-dimensional structure, which explains 58.67% of the variance and consists of 40 items emerged and its each dimension called: "Being moral and honest, Patriotism, Empathizing, Respect to the Republic, Love of profession and Being Open To Learning, Being Understanding, Being Patient and Respect to National Values (History, Religion, Language, Independence)".

The internal consistency index of the scale was found as 0.89. The obtained factors differ from similar studies (Albayrak, 2015; Aktepe and Yel, 2009; Balcı and Yelken 2010; Çubukçu et al., 2016; Şimşek and Erdem, 2016; Tunca, 2012). The reason of it is the method used to determine the values. Also this research differs from other researches by being the first research in Turkey on professional values of teacher candidates.

RESULTS AND DISCUSSION

In this study, a "five-point Likert-type Perceived Value Scale in terms of the Teaching Profession of Prospective Teachers" was developed to be used to determine the perceived value of prospective teachers in terms of the teaching profession.

At the beginning, the experiment scale consisting of 64 items was applied to 491 primary school prospective teachers and as a result of this analysis, 24 items of scale were extracted and a total of 40 items scale was collected. From the items related to perceived values of prospective teachers in terms of the teaching profession such as "Being moral and honest", "Patriotism", "Empathizing", "Respect to the Republic", "Love of profession and being open to learning", "Being Understanding", "Being Patient", "Respect to National Values (History, religion, language, independence)" reflect eight dimensions.

In the scope of the research, the most important 10 of the 75 professional values determined by literature search and teacher / teacher candidate compositions are seen in the following researches respectively. The value of Being Moral was included in the research as a theme, not as a value (Rokeach, 1973; Lickona, 1991; Güngör, 2000; Köylü, 2016).

"The value of Being Patriotic is mostly seen under national values in studies conducted in Turkey (Ercan, 2001; Evin and Kafadar, 2004; Balcı and Yelken, 2010;

Tunca, 2012). The value of Empathizing was not found in the literature. According to Cooper (2002), teachers who can not empathize cause their motivation to disappear by concentrating all the group, subject and curriculum to a considerable extent neglecting the feelings of the students. The values of Being Honest value is shown in basic and ethical values (Rokeach, 1973; Lickona, 1991; Ketenci, 1997; Schwartz, 2000; Aktepe and Yel, 2009; Balcı and Yelken, 2010; Tunca, 2012; Gibbs and Earley, 1994).

The value of Respect to the Republic is classified under national values (Ercan, 2001; Evin and Kafadar, 2004). The value of Love of profession is classified as a value by researchers working on professional value as a value specific to teaching profession (Çubukçu et al., 2016; Şimşek and Erdem, 2016; Tunca, 2012).

The value of Being Understanding was not found in the field. The value of Respect to National Values is classified under national values (Ercan, 2001; Evin and Kafadar, 2004; Ketenci, 1997). The value of Being Trustworthy; One of the value types collected under the "universal values" in the Apsen Conference is trustworthy (Akin et al., 1995).

The value of being open to learning is determined by Tunca (2012) as a teaching profession value. Among the 10 most important values used in preparing scales, the values of "being moral, empathizing and being understanding" are the values obtained by the researcher with compositions. One of the important results of the research is that these new values are gained in literature. From these values, the value of "Being Moral" was regarded as the most necessary professional value by teacher and teacher candidates taking the first order in the order. However, it is not included in list of national and universal values. Its reason may be explained with the fact that morality concept is perceived differently in our country than western societies

In the study of Şimşek and Erdem (2016), similarly high points were given for values of being patriot, being open for learning and being honest by teacher candidates. Determination of professional value possession statuses of teacher candidates will clear the precautions to be taken for elimination of problems in programs of teacher training. There is no measurement tool to determine professional value levels of teacher candidates in the literature. It may be suggested that the developed scale will have an important contribution in terms of compensating such a requirement.

In the future, the scale may be verified by being applied to a different primary school teacher candidate group, or a similar scale development study may be conducted for secondary school teachers/teacher candidates as well. Studies may be conducted relating to acquirement of obtained values. Performing validity and reliability studies in different uses of the "forms of perception of the teaching profession" scale will help the measurement tools to achieve a more valid and reliable structure. In

Table 1. Validity-reliability analysis values of perceived value scale in terms of teaching profession.

Factors	Common factor variance	Varimax factor loads	Item total correlation	Eigenvalue	Factor explained variance (%)	Cronbach Alpha	t values
Factor 1: Being moral and honest		-		.0.839	7.098	0.712	-
2. He should always address his students with respect	0.619	0.773	0.545	-	-	-	-9.655
5. He should be delicate about students' right of privacy	0.654	0.759	0.485	-	-	-	-7.691
8. He should perform in regard to curriculum	0.702	0.755	0.373	-	-	-	-9.657
23. he should keep his promises	0.678	0.751	0.487	-	-	-	-7.14
25. Even if he is not sick, he can receive report and tell school administration that he is sick	0.647	0.750	0.443	-	-	-	-7.167
27. He can try to fool his students	0.663	0.746	0.487	-	-	-	-6.634
Factor 2: Patriotism		-		2.321	5.802	0.832	-
12. He should use teaching materials and other assets cautiously	0.787	0.844	0.746	-	-	-	-6.901
13. He should use the resources of the school efficiently	0.778	0.850	0.775	-	-	-	-7.01
15. He should use the time of a lesson efficiently	0.665	0.760	0.601	-	-	-	-7.786
Factor 3: Empathising	-	-	-	2.904	7.260	0.756	-
16. He should be able to understand the feelings of students excluded by their friends	0.681	0.747	0.578	-	-	-	-8.326
17. He should be able to understand the feelings of students who behave negatively	0.717	0.793	0.648	-	-	-	-10.898
18. He should be able to read the feelings of his students	0.426	0.518	0.459	-	-	-	-11.703
20. By empathizing himself with him, he should apologize to his student for making mistakes	0.511	0.672	0.487	-	-	-	-8.054
21. He should make feel that he understands the feelings and thoughts of his students.	0.512	0.505	0.548	-	-	-	-10.601
22. He should be able to understand the feelings of the parents, whose child gets low grades	0.314	0.469	0.385	-	-	-	-8.865
Factor 4: Respect to the republic	-	-	-	3.848	9.620	0.910	-
30. He should mention the prominent people who took part in the foundation of the Republic	0.748	0.831	0.778	-	-	-	-10.025
31. He should read books on the founding of the Republic, principles and reforms	0.793	0.859	0.823	-	-	-	-10.957
32. He should be mindful of educating students who absorb values, principles and revolutions that are important in the foundation of the Republic	0.810	0.864	0.830	-	-	-	-9.651
33. He should follow the contemporary and scientific path	0.630	0.732	0.683	-	-	-	-8.781
34. He should participate in foundation / founders of the Republic themed events	0.761	0.830	0.790	-	-	-	-10.717
Factor 5: Love of profession and being open to learning		-		2.279	5.698	0.715	-
35. He should be willing to come to the school	0.619	0.723	0.543	-	-	-	-8.588
38. He should be beneficial to do society by doing his job well.	0.520	0.662	0.507	-	-	-	-7.411

Table 1. Contd.

55. He should follow the advances in science and technology	0.633	0.695	0.564	-	-	-	-8.474
56. He should be open to life-long learning	0.99	0.687	0.421	-	-	-	-7.124
Factor 6: Being understanding	-	-	-	3.489	8.723	0.827	-
41. He should spend more time for inclusive students	0.415	0.595	0.446	-	-	-	-8.946
42. He should support students during their difficult times	0.722	0.800	0.704	-	-	-	-11.531
43. He should try to find out whether the students need support	0.706	0.772	0.720	-	-	-	-7.656
44. He should try to understand the reasons behind the behavioral disorders of the students	0.685	0.737	0.716	-	-	-	-12.865
45. He should cooperate with the parents to get to know / understand the students better	0.535	0.565	0.605	-	-	-	-11.642
46. He should try to find solutions by listening to the problems of the students	0.419	0.568	0.503	-	-	-	-10.585
Factor 7: Being patient	-	-	-	2.608	6.519	0.795	-
49. He should listen to the dreams of young students curiously	0.654	0.713	0.621	-	-	-	-11.064
50. He should be patient with students	0.641	0.565	0.638	-	-	-	-9.734
51. He should be patient to gain students with behavioral disorders	0.739	0.775	0.719	-	-	-	-9.701
52. He should work under difficult conditions patiently	0.572	0.713	0.541	-	-	-	-9.987
Factor 8: Respect to national values (History, religion, language, independence)	-	-	-	3.182	7.955	0.789	-
59. He should speak / write Turkish correctly	0.501	0.595	0.507	-	-	-	-7.124
60. Whatever his branch, he must have national history knowledge and awareness	0.574	0.684	0.568	-	-	-	-7.803
61. He should pay attention to national day and week programs	0.679	0.719	0.668	-	-	-	-10.845
62. He should celebrate the students on religious holidays	0.530	0.660	0.507	-	-	-	-7.787
63. He should definitely see historical places such as Çanakkale Martyrs' Memorial, Anıtkabir, Topkapı Palace	0.556	0.663	0.559	-	-	-	-7.372
64. He should support national arts and sports activities	0.566	0.650	0.591	-	-	-	-8.095

*All "t" values are significant at the level of 0.001. Varimax rotation basic components factor analysis.

addition to this, it may be necessary to reanalyze the validity and reliability before studying with groups other than teachers/teachers candidate.

CONFLICT OF INTERESTS

The authors have not declared any conflict of

interests.

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Full Length Research Paper

The effect of teaching methods and learning styles on capabilities of writing essays on elementary school's students in East Jakarta

Wuryani* and Yufiarti

Faculty of Education Science, State University of Jakarta, Indonesia.

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The objective of this research was to discover the effect of teaching methods and learning styles on the student's ability to write essays. This study was conducted in elementary school in East Jakarta. The population of this studies was 3rd-grade elementary school students who study in East Jakarta. Samples were taken with stratified cluster random sampling technique with 32 students as the respondents. Results were analyzed with two ways analysis of variance (ANOVA) and continued with advanced analysis techniques by Tukey test. The results of this study can be described as follows: First, there is an effect between language methods and writing essays capability of elementary school students; Second, there is an interaction effect between teaching methods and learning styles on capability writing essays; Third, the whole language teaching methods only affect elementary school student's writing essays capability with "field independent" learning styles; Fourth, the whole language teaching method does not affect elementary school student's writing essays capability with "field dependent" learning style.

Key words: Teaching methods, learning styles, writing essays capability.

INTRODUCTION

Language learning in the schools is often considered a lesson that is not quite important. This fact caused by the mindset of teachers and parents which regard the clever children can only be reflected by higher value in the exact subjects, such as mathematics.

This mindset resulting in a lack of awareness about the importance of language subject, even there are some people who assume that language subject is not something that should be studied seriously. The efforts to improve the speakability should not be overlooked in

order to improve the student's writing ability. Language subject that can improve the speakability of the students, which furthermore will take effect on student's writing ability, are not considered as an important thing. The result is often encountered on students who have difficulty in expressing and writing their ideas. This problem will continue and persist until they pursue to the higher education, even up to the university.

Indonesian language learning points which contained in Curriculum 2013 as "Basic Competency 3.2" described

*Corresponding author. E-mail: wuryaniUNJ@gmail.com.

Table 1. Writing essay difficulty level of 3rd Grade Students Elementary School State 01Rawamangun East Jakarta.

No. essay component	Writing essay difficulty category		
	High (%)	Medium (%)	Low (%)
Lead	10 (33.33)	15 (50.00)	5 (16.67)
Body	20 (66.66)	5 (16.67)	5 (16.67)
Ending	15 (50.00%)	15 (50.00)	0 (0.00)

as follows: "Understand a simple narrative text activity and play in an environment with the help of a teacher or a friend while using Indonesian language (spoken and written) which can be filled with local vocabulary to strengthen the student's comprehension". In the context of learning, one of the many factors that cause students to have difficulty in writing is unsuitability of the learning strategies applied by the teacher with the student's personality. Generally, teachers will determine the theme or topic essay. Sometimes, these themes were often unknown by the students, as a result, the students will have difficulties in writing the essays.

Several research studies that have been conducted in Indonesia and other country. The American research shows that 2.8% of the elementary school children population have difficulties in learning to read, and in Indonesia, the number reached 51.7% (Semiawan, 2003). Aspects of competence associated with a story expressed in Indonesian language (spoken and written), indicate that writing essay becomes an important part of learning the Indonesian language.

According to the research conducted by Ismail (2003), Indonesian student's writing ability are the lowest among the countries in Asia. The following facts were revealed in elementary school state 01 Rawamangun East Jakarta 2014, about the student's learning results in Indonesian language subjects, which described as shown in Table 1.

As shown in Table 1, it can be conclude that the highest degree of difficulty in essay writing component is to make the content of an essay. Thus, the teacher should make the themes that are still considered abstract by students to be concrete, which can be accomplished through the use of media that facilitate student to understand and comprehend the theme or topic discussed.

Based on the fact mentioned, it is necessary to improve the learning strategies that can help the learner in developing and improving their ability to write essays. Language learning, especially writing, basically focused on guiding the students so they can express their ideas, thoughts, feelings or opinions through essay writing, writing a personal book, summarizing books, making posters, and making a logbook.

Another drawback in language learning is a factor from the teacher who emphasizes the theory more than

practice, by motivating the students to habituate writing their ideas is the first step to inculcate the culture of writing to our young generation.

Language learning particularly covering two main categories which are interrelated like, speaking and writing. Based on these problems, a method of learning is needed that can motivate the students to be creative and active in language learning, especially in writing essays. Important methods of learning to write which should be applied are the "whole language" method. Furthermore, the "whole language" method is combined with the student's learning styles, that are field independent and field dependent style. Both factors become independent variables in this context which affect the ability of students in writing essays.

Based on the background mentioned earlier, this study narrows down the problem on experimental treatments variables which were learning methods that included "whole language method" and free writing method. Other variables are the students' learning styles (field independent and field dependent) as the variable of character attributes. These variables will be linked with the ability of 3rd-grade elementary school children to write essays.

The terminology of "writing" is a creative process that resulted in the creation of non-fiction article. Writing can be done without having to wait for an idea to come. If the inventions phase: finding an idea or topic to be written has been done and the materials are ready, the writing process already can be started (Son, 2010: 15). Furthermore, Dalman (2015: 4) defines the writing process as an activity of delivering the messages (communication) with the use of written language as an instrument or media. Thus, the author can produce the variety of shapes and colors in a creative writing which accordance with the aims and objectives of his writings. According to Emigs (1977) as cited by Boscolo et al. (2007: 76) about writing, which described as the following: "Study of writing as learning models anticipated the emphasis of the cognitive approach to writing to learn the concept. Since the 1980's, studies on the elaborative function of writing mainly focused on two main research lines: the discourse synthesis and writing to learn. In the studies of writing to learn, the thing must be emphasized in the role of writing as a thinking and the learning

instrument, and the researcher's attention is focused on the effect of writing on the comprehension of information learned from oral or written communication at various levels of complexity. In studies of writing from the various sources, the additional focus of the research is on how to elaborate the knowledge and organize it into a new text."

According to Natzir (2010: 24), writing is basically narrated. In storytelling, there are three basic components, namely: heading (lead), contents (body), and closing (ending). Lead or intro are passages which contain an opening that serves as an introduction to the story. The body is the main part of writings that became the content of the story, the core, or the description of an article. Ending or closing as the final part of the article. This section must conclude a good, clear, and precise idea. Ending section should serve as a cover that resolves an idea that was discussed earlier. From a conceptual earlier description, it can be synthesized that, essay writing ability is the result of someone's imagination and creativity through certain paths, there are lead, body, and ending to be written into a story that is complete and easily understood by the others.

Assessment of learning is essentially the process of adding information and capabilities. A teacher is required to master the learning method used so it can provide added value for the students. Furthermore, it is a no less important thing in the value of the learning process which is the optimal learning results (Wijaya, 2008: 101).

One learning model which is still valid and are widely used by teachers is conventional learning models. According to Hamid (2002: 33), the conventional teaching method is teaching methods that commonly used by teachers and often called as traditional methods. Conventional learning has some understanding, according to the experts, Sukandi (2001), defines that the conventional approach method is usually marked by teachers who are more concerned about concepts instead of competence, the goal is only to educate the students with the knowledge (theory), not practice. Most of the time in the learning process, students are listening to the lecturer.

A conventional approach constitutes the learning process that is more dominated by the teachers as "the transferor", while students are more passive as "the recipients". This conventional concept of learning is more based on the behavioristic theory of Skinner. The point of view of Sumarsono (1985) followed by Arifuddin (2013: 136), that language is an important part of the overall behavior of a person so that it becomes the human verbal behavior. The behaviouristic theory explained that the process of learning in children are influenced by many powerful factors, such as impersonation, reward, reinforcement, and the environment are involved in learning process.

According to Ahmadi (2005: 52), when viewed from modes used to delivery of the message and the

implementation of learning, the conventional method is more frequently used "telling method" (giving information), rather than "demonstrating method", and "doing direct performance method" (providing an opportunity to display the live performance). In other words, the teachers often use the lecture or drill method in order to follow the whole material in the curriculum strictly. They assume that the success of the learning program is only seen from the completion of conveying all material in the curriculum. Conventional teaching methods can be categorized as a learning method that is more centered on the teachers, more one-way communication from the teacher to the student, and the learning main goal is students can master all the concepts, not the competence.

On the whole language method, learning a language in school can be seen as a holistic and integrated approach. In the point of view of Goodman (1986), overall it is more meaningful than the portions. Goodman (1986), states that "whole language" method is the language learning which presents the language as a unity, not separately. Experts in the whole language method argue that language is an integral and inalienable, and therefore language learning should be integrated, meaningful, and in the real situations (authentic). For example, learning about the use of punctuation such as commas and so on are taught in relation to the teaching of writing.

According to Daniel and David (2008), the principles for the whole language learning is described by the child grows and learns more readily and children actively engage themselves to learn. In more complex processes such as reading and writing, learners should be facilitated by the teacher. Children need to be supported psychologically. The emergence of the ability to read and write, children trying to imitate the strategy of their parents or teachers.

Learning the whole language is based on observation so that teachers need to provide opportunities and encourage the learners into the learning process so they can learn independently. This process includes: teachers provide guidance to the children, teachers and children learn together to take risks, and make decisions together.

The teacher should introduce a social interaction between children, discuss, share ideas, and work together to solve problems encountered in the study. Teachers provide materials and tests to every child to be able to distinguish which capabilities are not yet optimal and encourage children to discover and criticize their own weaknesses. Furthermore, the assessment combined with the learning process. Teachers have to build and develop this type of behavior and attitudes needed in a child's learning progress (Daniel and David, 2008).

According to Rigg cited by Daniel and David (2008), the shortcomings of the whole language, among others: (1) changes to the class of the whole language would require considerable time, because changes must be made

carefully and slowly in order to produce a class of the whole language desirable, and (2) in the application of the whole language, firstly, the teachers must understand its components so that learning can be done optimally. Some of the advantages of whole language methods, among others are:

- (1) Teaching language skills and language components such as grammar and vocabulary are presented in meaningful integrate and in real situations or authentic.
- (2) In whole language class, students play an active role in the learning process. Teachers do not need to stand in front of the class presenting the material. As a facilitator, the teacher went around the classroom to observe and record student activities. In this case, the teachers to assess students informally, and
- (3) The whole language method is specifically lead to learning the Indonesian language. However, it is also possible to apply it in other subjects learning, for example, the social sciences, because basically every subject interrelated and complementary. Whole language learning method is implemented in integrated Indonesian between reading, listening, writing, and speaking with the use of punctuation that is taught in the teaching of writing in which the classroom environment is furnished with student's writings and facilitated with the libraries.

In the opinion of Charles (1980), learning style factors that need to be considered in the implementation of the whole language method is actually a construction about someone's different way in facing various learning situations and choosing the right strategy. He also explained that learning style is the way used by someone to gain the knowledge.

The characteristics which affect the way of a person's learning style, proposed by Smith cited by Jerold (1990), that learning styles are the characteristic of someone in the way of processing information, feel, and behave in a certain learning situation. According to Nasution (1997: 28), learning style is the way of a person performed consistently in capturing stimulus or information, how to remember, think, and solve the problems.

With various combinations of feeling, imagination, think, and do, lead to the emergence of different learning styles, including: (1) students enthusiasm, the active students who do the activity consciously based on their feelings, (2) imaginative students, the students who does not only rely on intuition, but they also pleased to observe before they act, (3) practical students, the students who are active thinkers and have a willingness to solve the problems, and (4) logical students, who are careful, thorough, logical thinking, and proficient in connecting ideas.

Moran (1996), describes cognition is a mental process to acquire knowledge and understanding of everything in the surrounding environment.

In a person's natural cognitive abilities, ongoing process of information processing to recognize or knowing something. A cognitive aspect includes the process and product of a mind in achieving knowledge which is formed from mental activities like remembering, symbolizing, categorize, solve problems, create, and fantasize. Cognitive development is the development of intellectual function called the process of development of intelligence. Cognitive abilities are related with the ability to think and problem-solving skills. Moreover, cognitive abilities are also closely associated with academic achievement.

According to Pujiningsih (2007: 16), each individual learning activities can be divided into two groups, namely, "global" and "analytical". Individuals who are likely to be global is the individual who receives something more globally and difficult to separate themselves from the circumstances surrounding him and tend to be influenced by the environment.

Individuals who behave like this are called field dependent. While analytic individual is individuals who are likely to observe an object separated from the background picture, as well as being able to distinguish and separate the objects from the surrounding context. They looked around at the surrounding in more analytical ways. Individuals who behave like this are called independent field style. Learning styles are typical ways that are used by the individual in building or forming his beliefs and attitudes about the surrounding world, also the ways the process and reacting to an incoming or received information.

METHODOLOGY

This research was conducted at Elementary School State 14 Morning and Elementary School State Gedong 03, East Jakarta. Research activities were held at the school at the second semester in the academic year 2015/2016, from November to December 2015.

This research uses the experimental method. The manipulation of variables applied is learning styles (field independent and field dependent) as attributes variable and "whole language" as the design of learning methods. Instruments used were data collectors, consisting of 32 items essay writing ability test (valid with a reliability coefficient of 0.91) and learning style instrument which is a raw instrument.

The target population in this study are elementary school students in Jakarta. Affordable population includes elementary school students who take their study in Elementary School State 14 Morning and Elementary School State, Gedong 03, East Jakarta. Sampling technique using stratified cluster random sampling, sample quotas are set by the 27% of upper and lower group in order to obtain 32 students as the sample. The principle described by Kelley in Nur (1996: 35), claims that the distribution between upper and lower group with 27% will have a more sensitive and stable index of discrimination as the outcome. Data analysis technique used is a two-way ANOVA and a further test performed is multiple comparison with Tukey's test.

Table 2. Recapitulation of essay writing ability scores on various learning methods and learning styles.

Number	group data	Descriptive statistics values					
		Mean	Modus	Median	Upper limit	Lower limit	Range
1	A1	81.37	83	83	73	87	14
2	A2	77.37	73	77	73	87	14
3	A1B1	85.37	87	86	83	87	4
4	A2B1	77.75	73	77	73	83	10
5	A1B2	75.50	77	76	73	78	2
-	A2B2	5.50	77	76	73	78	5

RESULTS

Descriptive study

Description of the research data is based on the measurement of the variables according to the group contained in the research design, among others:

- (1) Score of the ability to write the essay with the whole language method (A1),
- (2) Scores of the ability to write the essay with the conventional method (A2),
- (3) Scores of the ability to write the essay with the whole language method on field independent learning styles students (A1B1),
- (4) Scores of the ability to write the essay with the conventional method on field independent learning styles students (A2B1),
- (5) Scores of the ability to write the essay with the whole language method of field dependent learning styles students (A1B2), and
- (6) Scores of ability to write the essay with the conventional method of field dependent learning styles students (A2B2).

A summary of the data description of each group of the study sample was measured, and can be specified as shown in Table 2.

As shown in Table 2, the results of the ability to write essays measurement through written tests, can be concluded that the highest average score of the ability to write essays on the experimental results are in the treatment group with whole language learning methods on field independent learning styles students (A1B1) which its value is equal to 88.37. On the other hand, the lowest average score of the ability to write essays on the experimental results is in the group with whole language learning methods on field dependent learning styles students (A1B2) which are equal to 75.50.

Hypothesis

The requirements that must be fulfilled in hypothesis

testing is data have to be normally distributed and has a homogeneous variance. Therefore, firstly we must test the normality with SPSS 16.0 for Windows that gives the following results as shown in Table 3.

The test results show that the entire values of Sig. are greater than 0.05. It means we accept H_0 at $\alpha = 0.05$ and it can be concluded that the population is normally distributed.

In terms of test homogeneity of variance, the result of Levene Statistics calculations which has been performed can be summarized as shown in Table 4.

From the test results, which obtained the Levene Statistics Sig., the value in the amount of $0.059 > 0.05$, it means we can accept H_0 at a significance level of 0.05, and prove that variance of the population is homogeneous.

With the fulfillment of the requirements of the aforementioned test, further analysis can be performed. The results of hypothesis testing in this study can be summarized as follows in Table 5. From the summary of the test results in Table 5, can be interpreted as the following.

The first hypothesis test results "essay writing skills in children who received the whole language method are higher than the conventional methods", we obtain the value of $F = 5.81 > F(0.95)(1.28) = 4.17$, then H_0 is rejected at $\alpha = 0.05$, which mean the first hypothesis is tested and proven significantly.

The result of the second hypothesis, that the average ability to write the essay on the students who were given with whole language methods (mean = 81.56) was higher than in the conventional method (mean = 77.37). With the significant influence which is proven of the interaction mentioned, then the magnitude of essay writing skills must be considered other factor. The other factor that should be calculated is learning styles. Multiple comparison tests, in this case, the Tukey test was conducted to determine the learning styles which delivers the highest positive impact on the elementary school student's essays writing skills.

The test results of the third hypothesis, "the essay writing ability on the independent field learning style student's that gets the whole language method is higher

Table 3. Data normality test summary using Kolmogorov-Smirnov formula one sample.

S/N	Sample	Sig. Values	α values	Information
1	A ₁	0.318	0.05	Sig. Value > 0.05, then Ho accepted, so the data are normally distributed.
2	A ₂	0.419	0.05	
3	A ₁ B ₁	0.423	0.05	
4	A ₂ B ₁	0.906	0.05	
5	A ₁ B ₂	0.588	0.05	
6	A ₂ B ₂	0.591	0.05	

Table 4. The results of homogeneity of variance test using Levene Statistics' calculation.

Dependent variable: Essay writing ability			
F	df1	df2	Sig.
2.785	3	28	0.059

^aDesign: Intercept + X₁ + X₂ + X₁ × X₂

Table 5. Summary of results of Two-Way ANOVA test.

Source variance	df	SS	ANS	F _{ount}	S _{table}	
					$\alpha=0.05$	$\alpha=0.01$
average	1	199238.28	199238.28	-	-	-
Learning methods (A)	1	75.03	75.03	5.81*	4.17	7.56
Learning style (B)	1	225.78	225.78	17.49	-	-
Int. An × B	1	166.53	166.53	12.90**	4.17	77.56
Errors	28	361.37	12.90	-	-	-
Total	32	200067	-	-	-	-
Total correction	31	828.71	-	-	-	-

Keterangan: db: Degrees of freedom; SS: sum of squares; ANS: Average Number of Squares; Int.: interaction; *)Significant ($\alpha=0.05$); **)Very significant ($\alpha=0.01$).

than the conventional methods" showing the Post Hoc Tukey test calculations results is $Q_{call} = 24.41^{**} > Q(0.95)(1,14) = 4.60^{**}$, Ho is rejected at $\alpha = 0.05$, which mean the hypothesis is proven significantly, and elementary school student's average score of essay writing skills with independent field learning style given with the whole language method (mean = 85.37) was higher than the conventional method (mean = 77.75).

The result of the fourth hypothesis: "the ability to write the essay on the independent field learning style students given the whole language method is lower than the conventional methods" showing the Post Hoc Tukey test calculations $Q_{call} = 0.55^* < Q(0.95)(1,14) = 4.60$, then Ho is rejected at $\alpha = 0.05$ which mean the hypothesis proven significantly, and the average score of essay writing of field dependent learning style elementary students given with the whole language method (mean =

75.50) is lower than the conventional method (mean = 77.00).

DISCUSSION

The hypothesis testing produces significant test results, it adds to the empirical evidence that it is true; there is significant effect between teaching methods and learning styles in the student's ability to write essays.

First, empirical facts support that the whole language method causes the essay writing ability of elementary school students to be higher than the free writing method. The context of the whole language method is actually a form of holistic and integrated approach to language learning. This approach is the application of Goodman point of view which state that "the whole is more

meaningful than the parts". It becomes the reference that corresponding to the characteristics of elementary school students who have the integrative thinking ability, the use of language learning methods with the whole language is very suitable to apply. Language learning which is based on the holistic view (whole language) will treat language as an integral (holistic), basically, the whole language is the philosophical views or beliefs about learning and how to make children learn optimally.

In this context, the whole language can be seen as a method in teaching and learning languages. As a method, the whole language is based on a number of multidisciplinary assumptions such as psycholinguistics, sociolinguistics, the psychology of child development, language learning theory, and pedagogy. Starting from the whole language method and its assumptions, then many concepts of language teaching are developed integrated in accordance with the curriculum, language across the curriculum, and the presentation of language learning material in the thematic units.

Goodman stated the whole language is the language learning that presents the language as a whole, not separately. In the whole language method, language is considered as an integral (whole) that can not be separated, so the learning of language skills presented in full is significantly in real situations (authentic). Learning about the use of punctuation such as commas and so on are taught as it relation to the writing learning process.

The integrated approach suggested that the Indonesian language teaching is based on the insight of the whole language, the Indonesian language learning integrated the learning activity such as: between reading, listening, writing, and speaking.

Second is learning style factor. Each individual has a specific characteristic, which is not owned by another individual. This is in accordance with the opinion of Davies (1973), that learning style is the pattern of behavior of a person in their learning process where they can feel comfortable, appropriate, and steady. According to Borich, some characteristics of students with field independent learning styles are: (1) focus on the details of the learning material, (2) focus on the facts and principles, (3) rarely conduct a physical contact with the teacher, (4) interactions with the teacher are limited to the tasks and looking for non-social compliments, (5) prefer to work alone, (6) love the competition, and (7) can organize them.

This opinion is in line with the opinion of Gagne, that the characteristics of students who have independent fields learning styles tend to pay more attention to the parts and components in a pattern and also more oriented to task completion rather than lively social relationship. Students who belong to this group are easier to analyze a problem and rearrange the parts and more diligent in finding their own solutions, but less sensitive to the issues that contain social complications.

The characteristics of people who have field learning style tended to see a pattern as a whole and often oriented to the social relationships. Students who belong to this group, can gain general impression quickly and easy to remember information associated with social relationships, but it is difficult to process the subject matter which is not structured and more sensitive to a negative criticism. According to Charles, that person who have a dependent field learning style:

- (1) requires the strong support of another person around them,
- (2) tend to be nervy and anxious, and
- (3) difficult to take the initiative and work alone, tend to be obedient, especially to people who are in the authority positions.

In this study, factor which became a determinant factor is students learning style which is conclusive whether the learning method will have the effect on the elementary school student's writing essays ability. Whole language learning methods can improve the student's ability to write essays when given to the students with field independent learning style. Characteristics of learning styles independent field relevant to the nature of the whole language method that emphasizes learning activities to students should include a complete element. In contrast to the field dependent learning style, learning method which is more relevant is free writing method.

This method emphasizes the guidance of students by the teachers during learning and teaching process. The characteristics of students who depend on others e.g. teachers in learning will be facilitated through the conventional methods. Generally, the results of this study are also in accordance with previous studies conducted by Widiyanto et al. (2012: 1) using the classroom action research techniques conducted in three cycles with 4th-grade students in Elementary School State 2 Kalibeji as the subject. The study proves that the application of whole language method can improve reading comprehension skills of the 4th-grade students of Elementary School State 2 Kalibeji.

Conclusion

Based on the hypothesis testing and discussion of the research results can be concluded as follows:

- (1) There is an effect between the learning method which used and student's essay writing skills. The use of whole language method in language learning improves the essay writing ability of the students higher than the conventional methods.
- (2) There is an interaction effect between the teaching methods used and learning styles towards the student's

ability to write essays. There is an interaction effect between teaching methods and learning styles in the ability to write essays. Learning styles determine certain types of learning methods that suitable in order to improve the student's ability to write essays.

(3) Students with independent field learning styles, the whole language method have a positive impact on the student's ability to write the essay giving the whole language method to students with field independent learning style improve the students writing ability is higher than the conventional methods.

(4) Students with field dependent learning styles, the whole language method does not affect the ability to write essays significantly. The use of conventional methods on students with field dependent learning styles cause students essay writing ability to be higher than the whole language method.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

The strategies of using a special kind of number patterns in different stages of education

Joanna Jureczko

Cardinal Stefan Wyszyński University, Warsaw, Poland.

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Patterns and generalization are one of the most fundamental aspects of mathematics, which makes recent decades, mathematical tasks which include patterns, whether they are numerical or graphical, are mostly used, for example researching generalization. The aim of this paper is to investigate how a special kind of task concerning well-known palindromes can diversify the process of generalization in three different age groups of students. More precisely, the paper includes the analysis of solutions of one task concerning counting of numbers of palindromes by middle school, high school and university students with the special attention for finding similarities and differences among advance of process of generalization and using methods of solving in researched groups. The researched groups chosen randomly from two distant part of Poland, were consisted of 44 middle school students, 102 high school students and 51 university students (including 42 pre-service teachers). All students solved the same task in limited time without any assistance of teachers. The research was carried out between 2013 and 2015.

Key words: Strategies, patterns, palindromes, mathematics.

INTRODUCTION

Learning mathematics in the whole world is liable to constant reforms. Following the Program for International Student Assessment (PISA) and experts who analyzed the obtained results, one has to accept the need for a change in the students' attitude towards learning mathematics and developing a habit of observation, conducting experiments, establishing findings without assistance, and gaining information.

According to (Krygowska, 1981), we can identify at least several mathematical activities: perception and use of analogy, deduction, the reduction of problems, the assimilation and transformation of data, schematization,

discovering regularities, and generalization.

Generalization can be recognized as a characteristic of mathematical thinking. This process is useful to extend notions (the class of notions), that is by defining a more generalized notion, which one can obtain by indicating a "super notion", weakening the defining conditions, generalizing the relation connected with the notion, using the mathematical induction principle, or unifying particular cases (Tocki, 2006).

Tocki (2006) further writes that the process of generalization can be considered in two aspects. On the one hand, it is to find a common (constant) property of

E-mail: jjureczko@uksw.edu.pl.

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objects or relations; and on the other hand, to specify a particular property in the examined object and to create a class of all objects which have this property. Generalizations on theorems by weakening the assumptions, strengthening the thesis, introducing parameters, or unifying or changing the proof, can be performed (Tocki, 2006).

The need for teaching such an activity was raised in (Krygowska, 1977). Undoubtedly, the crucial basis in the process of generalization which is the proper choice of tasks, consists of not just choosing stereotypical ones for which the student already knows the algorithm of solving it but ones for which the student is forced to find their own way of solving the task by using acquired knowledge.

Transitioning from stereotypical tasks to open problems was attempted in (Wittmann, 1972), (see also (Krygowska, 1977)). Wittmann's research is concerned with students' observations when solving open problems in which they can be assisted by their teacher. By performing an analysis of the students' work, he concluded that this way of thinking as well as the students' imagination is lifted up to a "higher level of energy" (Krygowska, 1977).

The consequence of such a procedure was the possibility of "extending" the problem posted in the task. One of the forms of extending the problem, as Krygowska writes, is the specification or the generalization of previously learnt theorems. Specification, as defined by Krygowska, is formulating particular cases of a given theorem, and generalization is formulating a theorem for which the special case is a given theorem. If we do not know whether the theorem is true or false, specification can help us decide on the question.

One of multiple task type is a task which includes patterns as the main objects described in the text of the task. Relating patterns in geometry, algebra, and measurements undoubtedly help students in understanding many of the connections among different mathematical topics.

As emphasized in Hale (1981) and Hargreaves et al. (1998), recognizing, describing, or extending patterns has considerable value in the introduction to formal algebra. This statement is based on many investigations. For example, Schoenfeld and Arcavi, (1988) indicate that "by asking students to observe and summarize them [patterns] verbally and we may help make the transition from arithmetic to algebra". Furthermore, Tanisli and Ozdas, (2009) emphasize that pattern activities are important parts in the introduction of algebra, especially for young people.

Guerrero and Rivera, (2002) states that pattern are a kind of rule among the elements of a series of mathematical objects which are constructed. Moreover, according to Burns (2000), a pattern is the key concept for understanding and observing mathematical relationships (Tanisli and Ozdas, 2009). Other examples can be found in Tanisli and Ozdas, (2009).

Working with patterns in geometry usually leads to the generalization of a sequence of numbers. It is significantly easier for the students when the patterns (or some of its initial steps) are included in the text of the task.

As was shown in (Jureczko, 2014), high school students can also generalize patterns (which led to some sequences of numbers), which are partially described verbally in the task, with some initial steps given as auxiliary sketches. The task, which in that research concerned the so-called steric numbers, was very important. In order to solve it, the students were required to provide a general rule dependent on two variables. Although the task was solvable for high school students, younger students might have found it to be too difficult.

In Jureczko, (2016), the author investigated a group of more than 100 people divided into three groups: middle school students, high school students, and university students. But this research differed from Jureczko, (2014a), because the students were given a task concerning operations with cubes without any auxiliary sketches of the situation described verbally in the tasks.

Despite this, a number of students made such sketches of the cube in their solutions, which undoubtedly helped them solve (though partially) the task. What is worth noticing is that, although all of the researched students had sufficient mathematical knowledge for solving the task. The number of proper and full solutions was small and increased proportionally to the age of the researched groups (that is the smallest amount of proper solutions (or even some parts of the task) was among middle school students; while almost all university students provided full solutions for the task, even though not all of them gave a comprehensive explanation of how they reached the solution).

According to Hargreaves et al. (1998), some of the research regarding children working with patterns (students aged 11 to 15) shows that it is more difficult for them to explain patterns than to continue them and a significant number of pupils performed the generalization of the pattern by using only partial information from the previous steps (This also occurred in the research analyzed in (Jureczko, 2016)).

The process of generalization of patterns may be useful in other more advanced aspects of mathematics. As shown in Jureczko, (2014) and Jureczko, (2015), generalization in the presence of IT aspects, such as graphic display calculators or equivalently mathematical computer software, can be used as an alternative and, most likely, more intuitive introduction to calculus (It is worth emphasizing that the topics concerning calculus belong to "higher planes of abstraction" which are not achieved by all young people in high school).

Obviously, the mathematical and analytical explanations of such objects as the limits of functions (especially when simple algebraic calculations lead to symbolic representations) or its derivatives can

Table 1. The text of the task given to all research participants.

Task: A palindrome is a sequence of figures or letters which is the same when read from left to the right and vice versa, for example ANNA, 12321.

In this task, we will only consider palindromes which are composed of digits.

Answer the following questions and explain how you arrived at your conclusion:

a) How many palindromes can be composed out of one, two, three, four digits?

b) How about six digits?

c) How about n digits?

Formulate and explain the statements.

Is there a common divisor for all palindromes of n length, for which n is given?

Formulate your own questions concerning palindromes.

undoubtedly help students in understanding the sense of the mathematical operations they have to do when solving a particular problem using calculus.

Another way of working with numbers, which is called pattern generalization, was investigated in (Bojarska-Sokołowska, 2014), where the author described the analysis of research regarding children aged 8-9. The task concerned platonic solids, for which the students were asked to calculate the edges, vertices, and faces, as well as deduce the relation among these numbers. It was most likely the first time the children had contact with variables, but the best results were obtained by using concrete numbers for each of the mathematical objects.

Another direction of research in the topic of pattern generalization is studies regarding pre-service and in-service teachers. For example, Zazkis and Liljedah, (2002) presented research regarding pre-service elementary school teachers, whose task was to continue a pattern of numbers arranged in a kind of matrix. The participants were also asked to provide the rule for generalizing the numbers occurring in the pattern (that is they had to predict the appearance of a particular number in the matrix). As shown, the continuation of the pattern turned out to be easier than performing the generalization.

Furthermore, the participants lacked synchronization between the demonstration of algebraic thinking and the ability to use algebraic notation. There was a gap between the ability to express generality verbally and the ability to employ algebraic notation. This research showed that the gap does not disappear, although in Jureczko, (2016), the problem did not occur among university students who were studying mathematical sciences. Other examples of research regarding teachers' attendance can be found for example in the study of Chua and Hoyles, (2009) and Rivera and Becker (2007).

Many authors (i. e. Hargreaves et al., (1998) carried out research using tasks which led to the generalization of a sequence of numbers and usually provide consecutive numbers in the given sequences (which Rivera defines

as near generalization, as opposed to the general pattern, which Rivera calls for generalization).

The author of this paper does not know of any researchers who would touch the problem of other number patterns. This led the author to decide to investigate how students work with other number patterns, for example palindromes consisting of numbers of a different length. The author in this paper posed the following research questions:

- (1) What kinds of methods were used in order to obtain generalization?
- (2) How does the process of generalization look like depending on the age of participants?
- (3) What kind of common characterizations occur in each age group? What kinds of characteristics differ in these groups?
- (4) Are the tasks concerning generalization interesting for the students?

Data collection and analysis

The goal of the research was to investigate how students of three different age-groups (middle school, high school and university) interpreted and solved the following task (Table 1).

197 participants took part in the research, divided into three age groups: 44 middle school students, 102 high school students, and 51 university students studying mathematical sciences (including 42 pre-service mathematics teachers). Students came from two distant parts of Poland (East-North and middle) between years 2013 and 2015.

All of the students were given the same 45-minute limit to solve the task during the lesson or lecture. The students were not assisted by any coordinating teacher. The coordinating teachers were not allowed to provide any hints or disturb the students when solving the task. The research was carried out on several groups.

Table 1 presents division of participants divided by age

Table 2. The spread of number of students related to the degree of advance of the solution of the task.

Variable	Middle school	High school		University		
	1st year	1st year	2nd year	1st year	2nd year	3rd year
Lack of solution	29	75	9	3	5	-
Partial solution	15	19	-	-	4	-
Full proper solution	-	-	-	6	-	33

group: middle school, 13-15 years old; high school, 16 to 19 years old; university, 20 to 22 years old (2nd and 3rd year) and the degree to which the task was solved (lack of solution, partial solution, full proper solution) (Tab 2).

As presented in Table 2, the students were divided into three age groups. Hence the analysis also being divided into these three groups.

Students of middle school (year 13 to 15)

Students from this group mainly base their solution on writing down all possible palindromes, which is why almost of them gave the proper number of palindromes composed of one and two digits. It is worth noticing that although they had taken into account the palindrome "0", they erased the palindrome "00" without providing any explanation.

This method proved not to be efficient in further cases, which is why the answers for further questions were provided only by nine of the fifteen students who touched upon the problem. The students, encouraged by the lack of difficulty in the previous cases, attempted to write down the palindromes composed of three digits but mainly in the form of perhaps "111", "222", etc. in which all digits are the same. It was probably due to the influence of the previous steps.

Two of the students, making use of this observation, answered that there are only nine three-digit palindromes. One of the students continued this process, giving the same answer for four- and six-digit palindromes. However these students did not generalize this matter for n-digit palindromes, answering that there was an infinite number of such palindromes.

Five other students tried to write down the other three- and four-digit palindromes, and two of them answered that there are 100 three-digit palindromes, but for longer ones they concluded that there are "infinitely many of them" or "a lot of them". Two students' solutions are worth special attention.

Figure 1 presents a part of a student's work showing their reasoning as regards calculating the number of palindromes of different types. The student, despite proper observation regarding number of one- and two-digit palindromes, as well as proper observation of the structure of further cases of palindromes, did not resolve the number of the longer ones.

In contrast to the previous case, the next participant (Figure 2) provided an algorithm with which one can

calculate the number for further cases of palindromes by writing "10 for each number in the front". This means that the student builds consecutive palindromes by inserting a digit as the front. However, it is worth noting that by writing "10", the student did not take into consideration palindromes starting with "0".

In this group, no student provided any generalization of n-digit palindromes, though some of the students were willing to continue working on this task by asking the questions: "How many eight-digit palindromes are there?" "How many 10-digit palindromes are there?", "Is there a palindrome that consists of 3 digits, for which the sum of digits equals x?" "Are palindromes odd or even?" No student answered the question on the existence of a common divisor for all of the palindromes.

High school students (1st grade)

In this group of students, six only provided the proper number of palindromes for the cases in part a) of the task. There are some differences depending on whether they had taken the existence "0" in a palindrome into account or not. Three of the students provided the number of palindromes, which were unfortunately incorrect (that is, one-digit – 10, two-digit – 100, three-digit – 100, four-digit – 1000).

Four other students used the same method of calculating the number of palindromes as observed among the middle school students by writing down all of the cases, but none of the students concluded any results. In one other student's work, the student noticed that the number of palindromes from each previous step can be multiplied by 10 in order to obtain the result. This student reached the result by using observation, which is shown in scan (Figure 3).

Another type of solution also appeared in the aforementioned student's work. The student used the matrix in Table 3 when calculating the amount of three- and four-digit palindromes:


Hence they deduced that there are $10 \times 9 = 900$ palindromes.

In this group of students, there were two trials of generalization in the forms

$$10^{n-2} * 9, n \geq 2$$

$$9 * 10^{\frac{n}{2}-1}$$

a) Jednocyfrowe: od 0 do 9
 dwucyfrowe: 11, 22, 33, 44, 55, 66, 77, 88, 99
 trzycyfrowe: 111, 222, 333, 444, 555, 666, 777, 888,
 999, 121, 212 (to wystarczy do zrobienia palindromu)
 czterocyfrowe: 4444, 1221, 1122 (pozostawa i lewicowa liczba taka sama)
 maie by? jch dzie

b) 
 takich liczb będzie bardzo dużo, patrz na to jak można je stworzyć

c) 92244229
 Niechcąc wiele liczb, mamy tutaj nieograniczone możliwości tworzenia palindromów

- | |
|---|
| <p>(1) one-digit from 0 to 9
 two-digit 11, 22, 33, 44, 55, 66, 77, 88, 99
 three-digit 111, 222, 333, 444, 555, 666, 777, 888,
 999, 121, 212 (the first and the third are the same number, with a different one in the middle) (this is enough to make palindromes)</p> |
| <p>four-digits: 4444, 1221 (the first and the last digit is the same), the two middle digits are the same but in a different form than the first and the last digits. There may be a lot of those</p> |
| <p>(2) (example of a palindrome – the explanations are the same as in the previous case) there will be a lot of such numbers seeing as how they can be constructed</p> |
| <p>(3) 92244229 infinitely many such numbers, there are unlimited possibilities of creating palindromes here</p> |

Figure 1. Student's work (trans. by JJ).

but without any explanation or division of n into odd or even, aside the first pattern case resulting from the improper observation that there are 10 one-digit palindromes, 9 – two-digit, 90 – three digit, $10 \cdot 10 \cdot 9$ four-digit, due to there being 10 times more palindromes in consecutive cases. The student continued her calculations by concluding that there are $10 \cdot 10 \cdot 10 \cdot 10 \cdot 9 = 90000$ six-digit palindromes.

The second generalizing pattern was not supplemented by any explanation. Similarly to middle school students, no answer was provided concerning the existence of a common divisor. Nonetheless, the following questions

were given in order to continue the task:

- (1) "How many four-letter palindromes do you know?"
- (2) "Are palindromes irrational?"
- (3) "Is there a number of digits for which the number of palindromes will be infinite?"
- (4) "How many seven-digit palindromes are there?", "Are there 15-digit palindromes that consist of non-decreasing digits?"

The 2nd grade high school high school did not introduce anything new to the research, which is why this part of

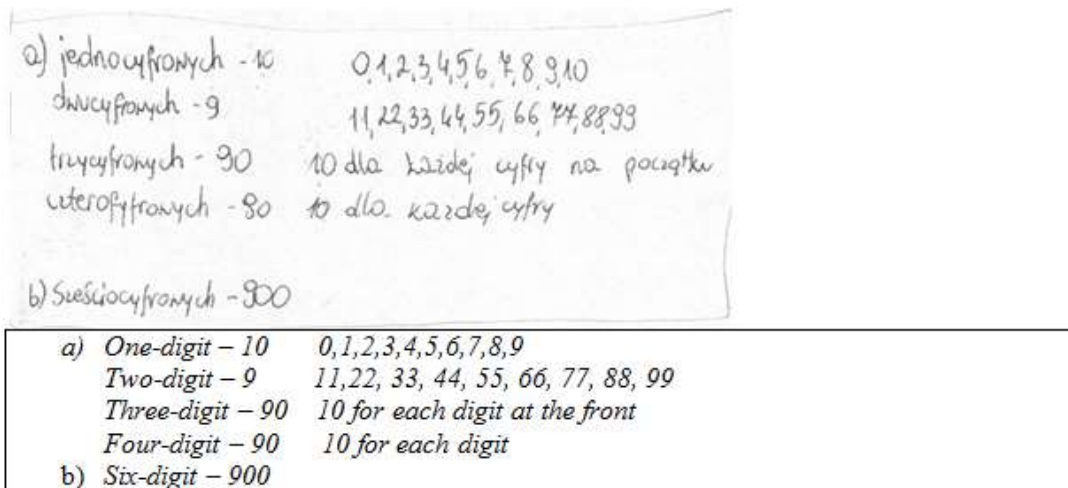


Figure 2. Student's work (trans. by JJ).

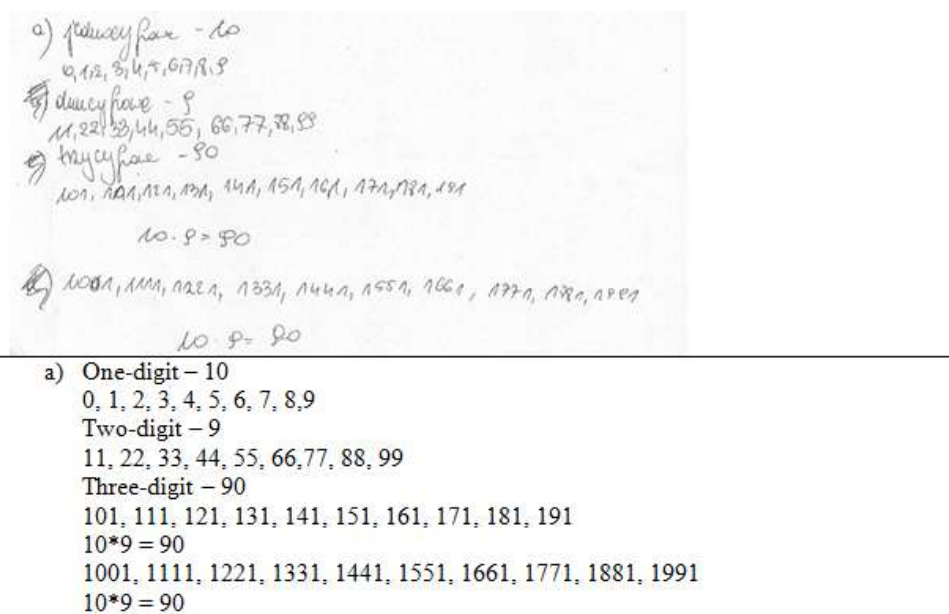


Figure 3. Student's work (trans. by JJ).

Table 3. Diagram of student's work.

101	202	303	404	505	606	707	808	909
111	...							
121								
131								
141								
151								
161								
171								
181								
191								

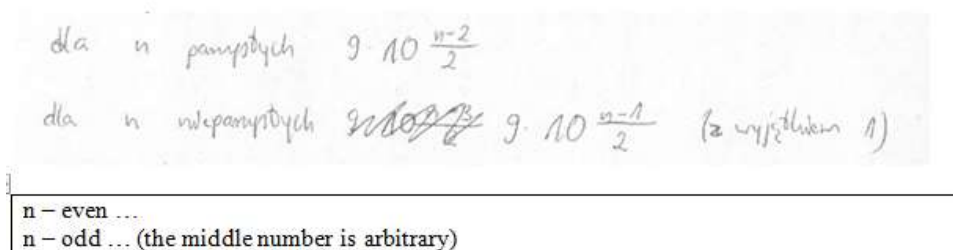


Figure 4. Student’s work (trans. by JJ).

the analysis will be omitted.

University (1st year)

Three of the participants used the same method as the middle school and high school students of writing down all of the possibilities of one- and two-digit palindromes, but no generalization occurred.

Three other students described verbally how one can calculate the number of palindromes of particular types, but only two students’ reasoning resulted in the number of palindromes due to pattern generalizing. Unfortunately, both of them are incorrect (Figures 4 and 5).

Unfortunately, the generalizing pattern, although constructed well for $n=3$ and 6 , was incorrect for $n=4$. As one can observe in Figure 5, the students (consciously or not) used variations with repetition by taking into account the fact that the digit which cannot be in the first position in the palindrome is “0”.

University students (2nd year - pre-service teachers)

In this group, only one person performed generalization, but the pattern was incorrect, which is why this case was not analyzed here.

University students (3rd year - pre-service teachers)

28 out of 33 students performed the generalization of the problem posted in the task. The solution presented in this group can be divided into three types.

Type 1: Four students used an algorithm similar to a few of the high school students by writing down the possibilities of the arrangements of digits in the palindromes and setting them in a matrix (as was shown in Tab. 3). This way, they calculated the number of palindromes to the ones four-digit.

For six-digit palindromes, they changed the algorithm, as they observed that the previous result has to be

multiplied by 10. Such reasoning led them to the generalizing pattern in the form of

$$9 * 10^k \text{ where } k \text{ is } \left\lceil \frac{n+1}{2} \right\rceil \text{ (the whole number from } \frac{n+1}{2} \text{)}$$

Type 2: Eight of the students did not provide any explanation for how they reached the generalizing pattern, but they provided a pattern similar to the previous ones or as a hybrid function for n -odd and n -even separately. Some of the students took into account palindromes starting with a “0”, defining the generalizing pattern as a power of 10, depending on n .

Type 3: This group was the most numerous - 16 students. These students used variations with repetition in their reasoning. Four of them, despite proper reasoning, provided incorrect generalizing patterns. Eleven students used the pattern for the variations with repetition in their reasoning, following the process as can be seen in (Figure 6) providing the pattern either for n -odd and n - even separately, or using the notation

$$9 * 10^{\lceil (n-2)/2 \rceil} \text{ where } \lceil \] \text{ means upper approximation of } \frac{n-2}{2}$$

It is worth emphasizing the following solution (Pic.7), in which a student partially wrote down the particular cases of palindromes and partially used the rule for the variations with repetition. Three other students formulated a theorem concerning the number of palindromes, in the proof of which they used the mathematical induction principle. The theorem is in the form of:

Theorem: If n is natural and different from 0 and 1, we can calculate the number of n -digit palindromes using the rule $9 * 10^{\lceil (n-2)/2 \rceil}$, but for $n=1$ the number of palindromes is equal to the number of all digits.

DISCUSSION

As was indicated in the Introduction, the goal of the

Odp: a) jednocyfrowych - 10 (bo: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9)
 dwucyfrowych - 9 (bo: 1, 2, 3, 4, 5, 6, 7, 8, 9)
 trzycyfrowych - $9 \cdot 10 = 90$
 czterocyfrowych - 90
 na 1 miejscu
 3 możliwości,
 na 2 miejscu
 10 możliwości,
 na 3 miejscu
 9 możliwości → więc się należy 1 i 2, bo to na 3 miejscu jest
 taka sama) ale 1
 b) sześciocyfrowych - $9 \cdot 10 \cdot 10 = 900$
 c) trzycyfrowe - $9 \cdot 10 \Rightarrow 3 \rightarrow 3-2$
 sześciocyfrowe - $9 \cdot 10^2 \Rightarrow 6 \rightarrow 6-4 = 2(3-1)$
 n-cyfrowych: ~~.....~~
 $9 \cdot 10^{\frac{n}{3}}$

a) One-digit - 10 (because 0, 1, 2, 3, ...)

Two-digit - (because 1, 2, 3, ...)

Three-digit $9 \cdot 10 = 90$ (9 possibilities for the first position, 10 possibilities for the 2nd position, 9 possibilities for the 3rd position - the numbers [positions] 1 and 2 are important, since the 3rd one is the same as the 1st [one])

b) Six-digit - $9 \cdot 10 \cdot 10 = 900$

c) Three-digit - $9 \cdot 10 \dots$

Six-digit $9 \cdot 10^{(n/3)}$

n-digits

Figure 5. Student's work (trans. by JJ).

a) 10
 9
~~.....~~
 $9 \cdot 10 = 90$
 $9 \cdot 10 = 90$
 b) $9 \cdot 10 \cdot 10 = 900$
 c) n - parzyste
 $(\frac{n}{2}) - 1$
 $9 \cdot 10^{(\frac{n}{2}-1)}$
 $9 \cdot 10^{(\frac{n-1}{2})}$ n - nieparzyste

a), b) need not translated
 c) ... n-parzyste (trans. n-even)

 ... n-nieparzyste (trans. n-odd)

Figure 6. Student's work (trans. by JJ).



Figure 7. Student's work (trans. by JJ)

research was to find answer of the following questions:

- (1) What kinds of methods were used in order to obtain generalization?
- (2) How does the process of generalization look like depending on the age of participants?
- (3) What kind of common characterizations occur in each age group? What kinds of characteristics differ in these groups?
- (4) Are the tasks concerning generalization interesting for the students?

The process of the generalization of the problem posted in the task is also increasingly proportional to the age of participants. In contrary to the research analyzed by in (Jureczko, 2016), in this task the author provided examples of palindromes in the text of the task, which turned out to be very helpful in the process of formulating the generalization. Generalization on middle school level is limited only to simple observations that palindromes may be constructed by adding the first (and simultaneously last) digit and that there are 10 possibilities.

The students in this group could not provide the general pattern describing the number of palindromes depending on n -length palindromes. Very few students provided the proper number of palindromes of the length

of at least 3. However, they usually summarized that there are a lot of, or an infinite number of, palindromes longer than 2.

It is worth noticing that the students, while trying to provide the number of palindromes, wrote down all possible examples, but the method did not prove to be sufficient enough to generalize the problem posted in the task.

This method (consisting of writing down examples of palindromes) was present also among a small group of high school students. While these students did not provide any generalizing patterns, other students provided their attempts of generalization by using alternative methods.

In the researched group of high school students, two other methods occurred: the second one made use of (probably unconsciously) variations with repetition (by observing the general scheme of the palindrome as a system of boxes with digits in each of them), and the third method included entering all possible examples of palindromes (of the length 3) into a matrix, as shown in Figure 7 (the number of palindromes was obtained by multiplying the number of rows by the number of columns in the matrix). The second method especially led to some generalizations (by providing a simplifying pattern).

It is worth emphasizing that although among middle school students, the attempts of generalization were

described verbally. Here, in the group of high school students, the first attempts at explaining generalization algebraically were made.

A fully formed process of generalization can be observed among university students (the only participants to reach this conclusion in the research) who used variations with repetition which led them to generalizing patterns (The two other methods mentioned above also occurred, but in the case of very few students).

Conclusions

The first conclusion that can be observed is that the number of attempts at creating solutions and the number of proper solutions increases proportionally to the age of the participants, but the willingness to continue the task (propositions for the two last questions in the task) is present only among middle and high school students.

Also, proportional to the age of the participants is the manner of the process of generalization: from writing down examples and verbal description (characteristic of middle school students) to using advanced combinatorial methods and providing the generalizing pattern algebraically (university students).

The next conclusion is that alongside age, intuition regarding imagination mathematical objects increases (without writing down explicit) for arbitrary natural numbers (such as the length of palindromes): from writing down examples (middle school students) to creating some schemes regarding palindromes (that is as a matrix or as a box) without writing down particular examples (especially university students, but also some high school students).

The research also showed that it is not true that the scheme of reasoning is adequate to mathematical knowledge, because while the notion of variations with repetition is not taught in middle school; some students used this method unconsciously.

Consequently, university students were not willing to continue the task in the form of posing additional questions concerning palindromes, as opposed to the younger participants. One can deduce that the university students touched upon more interesting problems during their studies or perhaps were not certain of their generalizations.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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