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Full Length Research Paper

Commenting on effective laboratory teaching in selected preparatory schools, North Shewa Zone, Ethiopia

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The present study assessed the challenges to implement laboratory teaching in selected Preparatory Schools, North Shewa Zone. The result of this study showed that although laboratories for each subjects were present (100%) in all districts, lack of professional skills (50% in biology, 64.5% in chemistry and 61.5% physics), lack of materials (78.6% in biology, 64.7% in chemistry and 65.4% in physics) and lack of chemicals (75%, in biology, 58.8% in chemistry and 46.2% in physics) were the main challenges to implement effective laboratory teaching. The average numbers of students per laboratory session were 46-55, which was very large size to teach in practical session. Students had interest (strong in all subjects) to learn practically, but 75% of biology and chemistry, and 62.5% of physics laboratory activities were not done. The government look forward that the laboratory activities recommended in the text were not well manipulated and laboratory doing was for the sake of doing. Priority must be given for preparatory school laboratory teaching.

Key words: Biology, chemistry, laboratory teaching, physics, preparatory schools.

INTRODUCTION

For more than 100 years, laboratories have been employed for teaching and learning in natural science disciplines (Hofstein and Lunetta, 2004; Lim and Chai, 2008). Laboratory experiences have been found to

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promote problem-solving abilities (Kola, 2013), intellectual development (Renner and Fix, 1979), scientific thinking (Mudulia, 2012), and practical skills (Ogunniyi and Rollnick, 2015).

In American Association for the Development of Science (1993), the National Research Council (2006) defined a core set of seven science learning goals for students and was supported by Trowbridge et al. (2000). Hence, laboratory work should achieve: ‘‘enhancing mastery of subject matter, developing scientific reasoning, understanding the complexity and ambiguity of empirical work, developing practical skills, understanding the nature of science, cultivating interest in science and interest in learning science, and developing teamwork abilities’’ (Idiaghe, 2004; Dare, 2005 Tesfamariam et al., 2014).

Policymakers, scientists, educators, and parents agree that high school graduates must have a working knowledge of science and technology to participate fully in the workplace, understand everyday decisions on matters ranging from health issues to energy resources, and participate as informed citizens in the civic realm (Eilks and Byers, 2010). Science laboratory experiences for middle school and high school students are a fundamental, unique, and critical component for twenty-first century science education (Mudulia, 2012; Thornburg, 2009).

Recently, Ethiopian ministry of education publicized that many of the students who enroll in preparatory and university level must be for natural science fields (Khan and Zafar, 2011)”. Natural science fields like biology, chemistry, physics, mathematics and engineering fields are the main focus. So, the ministry of education directed the 70:30 strategies in natural and social science fields in the university level, respectively (Mamo, 2017).

Natural science fields are supposed to produce those graduates who are excellent in technology if and only if the teaching learning process is encouraged by practical laboratory teaching. Without laboratory teaching there is no quality education in science fields, particularly in biology, chemistry and physics.

In these regards, the current study was used to see the challenges in implementing practical laboratory teaching in selected districts of North Shewa Zone. Challenges were aligned with the possible solutions of laboratory teaching in the area stated earlier. The objective of the present study is to know the challenges to implement laboratory practice in natural science teaching in selected North Shewa Zone Preparatory Schools.

MATERIALS AND METHODS

Description of the study area

The research was conducted at North Shewa Zone districts including Shewarobit, Tarmaber, D/Berhan, Moret ena Jiru, Efrata ena Gidim, and Menz Keya. These districts have preparatory schools for the study to be conducted. The study sites were located in the range of 0 to 185 km from the North Shewa Zone town Debre Berhan in all directions. North Shewa Zone is located in 130 km North of Addis Ababa.

Data collection

The data were collected from biology, chemistry and physics teachers; lab assistants, students and school administrators. Questionnaire and observation were the main data collection tools. From the 6 districts under this study, many questionnaires were collected. The questionnaires were simple, direct and achieved the research objectives. Mixed questionnaire type was applied, that is, closed and open ended questionnaires, of which “yes or no” and “multiple choices” of closed questionnaire were used in most of the cases and few other questions were open ended.

Sample and sampling techniques

In each study site, all teachers (Biology, Chemistry and Physics), school principal, lab assistants and volunteer students from each level (grade 11 and 12), respectively were selected randomly from all districts. Hence, a total of 8 (all male) laboratory technicians, 8 school principals (all male), 28 biology teachers (20 male and 8 female), 17 chemistry students (12 male and 5 female) and 26physics teachers (24 male and 2 female), respectively filled the questionnaire appropriately. Moreover, 104 biology students (55 male and 49 female), 78 chemistry students (41 male and 37 female) and 112 physics (61 male and 51 female) students filled out the questionnaire. In total, 60.1% who were participated to fill out the questionnaire were male and the rest (39.9%) were females. The respondents age ranges from 18 to 40 and the average age of male and female respondents were 26 and 18, respectively.

Data analysis

Data collected from questionnaire was filled in the excel sheet. Then using an Excel, data were manipulated in the form of figures and tables.

RESULTS AND DISCUSSION

Most of the respondents (students, school principals and lab technicians) accounted that in each district there was only one laboratory room per subject. For example, only one laboratory room was present for biology in Moret and Jiru preparatory school.

Similarly, chemistry and physics subjects were restricted with one laboratory room per preparatory school (Table 1). Although practical laboratory teaching supports the theoretical class room learning (Table 2), all laboratory activities listed in the laboratory manual are not done due to a lot of reasons (Table 3) that is, lack of well skilled man power, lack of materials and chemicals. Moreover, large class sizes were used when teaching practical session (Figure 1). Bayessa (2014) also reported that absence of laboratory chemicals, rooms, apparatuses, technicians and well organized laboratory manuals negatively affected the effective implementation of science education and students’ academic achievement.

Table 1. Number of laboratory rooms in selected preparatory schools of North Shewa Zone.

Subject	Response	1 Room		2 Rooms		3 Rooms		Other	
		Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
Biology	Students	96	92.3	7	6.7	0	0	1	1
	School principals	8	100	0	0	0	0	0	0
	Lab technicians	8	100	0	0	0	0	0	0
Chemistry	Students	63	80.8	10	12.8	0	0	5	8.1
	School principals	8	100	0	0	0	0	0	0
	Lab technicians	8	100	0	0	0	0	0	0
Physics	Students	99	88.4	6	5.3	4	3.6	3	2.7
	School principals	8	100	0	0	0	0	0	0
	Lab technicians	8	100	0	0	0	0	0	0

Table 2. Students' response in teaching methods in laboratory teaching in selected preparatory schools of North Shewa Zone.

Questions	Subject	Yes		No		Other	
		Number	Percentage	Number	Percentage	Number	Percentage
Practical work support theoretical teaching	Biology	95	91.3	8	7.7	1	1
	Chemistry	70	89.7	6	7.7	2	2.6
	Physics	101	90.2	11	9.8	0	0
There is integration between laboratory work and theoretical teaching	Biology	93	89.4	10	9.6	1	1
	Chemistry	69	88.5	4	5.1	5	6.4
	Physics	103	90.2	11	9.8	0	0
There is group work in lab teaching	Biology	92	88.5	12	11.5	0	0
	Chemistry	61	78.2	11	14.1	6	7.7
	Physics	91	81.3	21	18.8	0	0
Lab technicians and teachers support in laboratory session	Biology	95	91.3	8	7.7	1	1
	Chemistry	73	93.6	2	2.6	3	3.8
	Physics	104	92.9	8	7.1	0	0
Lab teaching enhances students' performance	Biology	95	91.3	8	7.7	1	1
	Chemistry	72	92.3	5	6.4	1	1.3
	Physics	103	92	9	8	0	0
All lab activities in the text are done	Biology	53	51	49	47.1	2	1.9
	Chemistry	29	37.2	46	59	3	3.8
	Physics	46	41.1	66	58.9	0	0
There is time of working laboratory teaching outside the school compound	Biology	61	58.7	43	41.3	0	0
	Chemistry	32	41	43	55.1	3	3.8
	Physics	42	37.5	70	62.5	0	0

Students, teachers and laboratory technicians were confident that students have interest in practical laboratory teaching. This is in correspondence with all natural science, that is, biology, chemistry and physics laboratory sessions. In general, students have interest in natural science laboratory learning (Figure 2). However, students perform practical laboratory session very rarely that is, once per month in most of the cases (Figure 3). In

Table 3. Teachers' response in teaching methods in laboratory teaching in selected preparatory schools of North Shewa Zone.

Question	Subject	Yes		No		Not determined	
		Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
Teaching all lab activities	Biology	14	50	14	50	0	0
	Chemistry	9	52.9	8	47.1	0	0
	Physics	14	53.8	12	46.2	0	0
Lab teaching support students	Biology	27	96.4	1	3.6	0	0
	Chemistry	17	100	0	0	0	0
	Physics	26	100	0	0	0	0
Practical teaching improves students' performance	Biology	28	100	0	0	0	0
	Chemistry	17	100	0	0	0	0
	Physics	25	96.2	1	3.8	0	0
Are you skillful to teach practically?	Biology	13	46.4	14	50	1	3.6
	Chemistry	5	29.4	11	64.7	1	5.9
	Physics	10	38.5	16	61.5	0	0
Do you have lab assistant?	Biology	25	89.3	3	10.7	0	0
	Chemistry	10	58.8	7	41.2	0	0
	Physics	13	50	13	50	0	0
Is there job description for lab assistants?	Biology	20	71.4	5	17.9	3	10.7
	Chemistry	16	94.1	0	0	1	5.9
	Physics	11	42.3	3	11.5	12	46.5
Did you take lab training before?	Biology	11	39.3	17	60.7	0	0
	Chemistry	12	70.6	5	29.4	0	0
	Physics	7	26.9	19	73.1	0	0

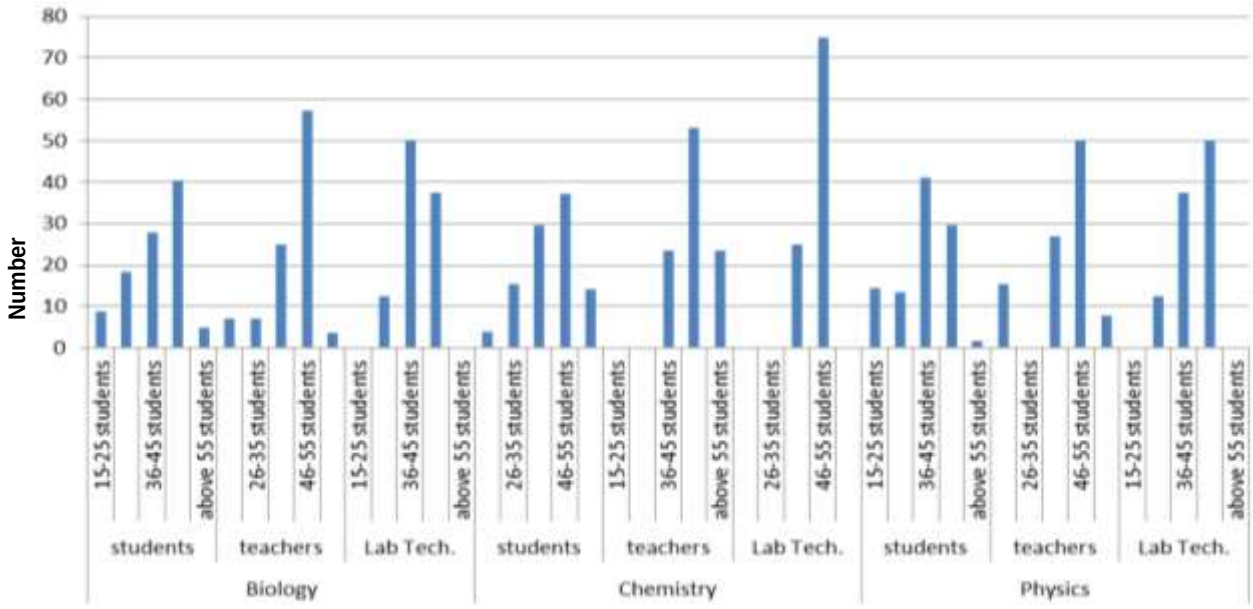

Figure 1. Number of students/laboratory session in selected preparatory schools.

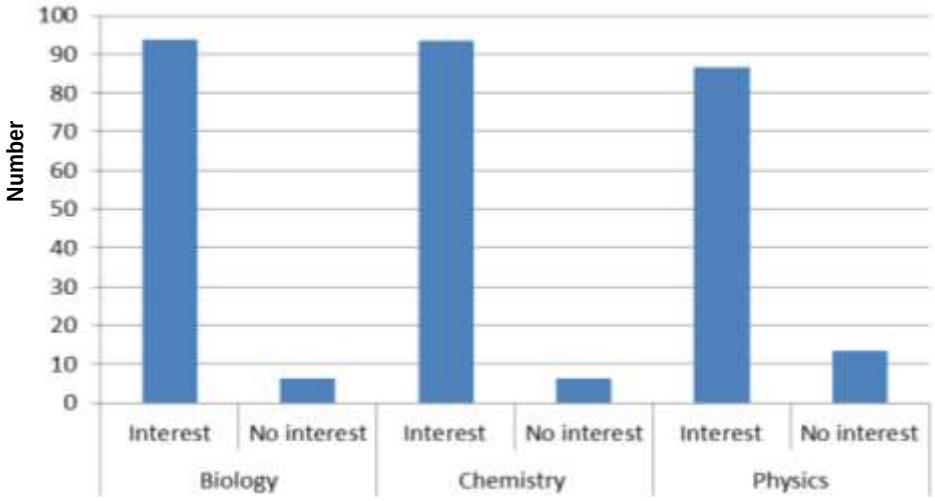

Figure 2. Students interest towards laboratory learning in selected preparatory schools

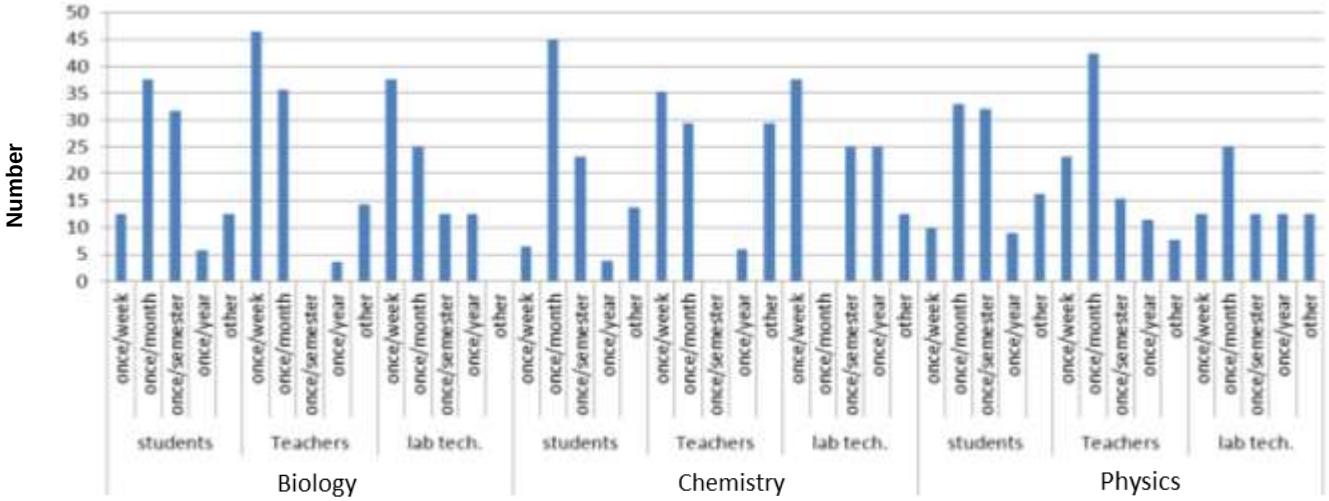

Figure 3. Number of times lab work is doing in selected preparatory schools.

other studies, teaching micro-scale chemistry as a new and efficient method can be a practical solution in the practical education of natural sciences (Ardestani and Badrian, 2014).

In biology and physics laboratories, most of the respondents reported that laboratory technicians assist students sometimes in practical laboratory session; however, laboratory technicians always assist students in chemistry laboratory session (Figure 4). However, laboratory technicians did not attend any laboratory training before (Figure 5). Muleta and Seid (2016) reported that teachers do not use practical activities in teaching science, and thus students do less than 5% of the practical activities on their text books.

Most teachers in the study area respond that all lab materials and chemicals were not available to teach the practical session. Still most of them told that there were materials and chemicals without use and stayed for a long period of time. In addition to lack of materials and chemicals, the materials were not installed properly and chemicals were not used based on the procedures. This was due to lack of well specialized professionals (Table4). Furthermore, the scarcity of materials and chemicals are the main problems of practical teaching in selected preparatory schools (Table 5).

Absence of laboratory chemicals, rooms, apparatuses, technicians and well organized laboratory manuals negatively affected the effective implementation of

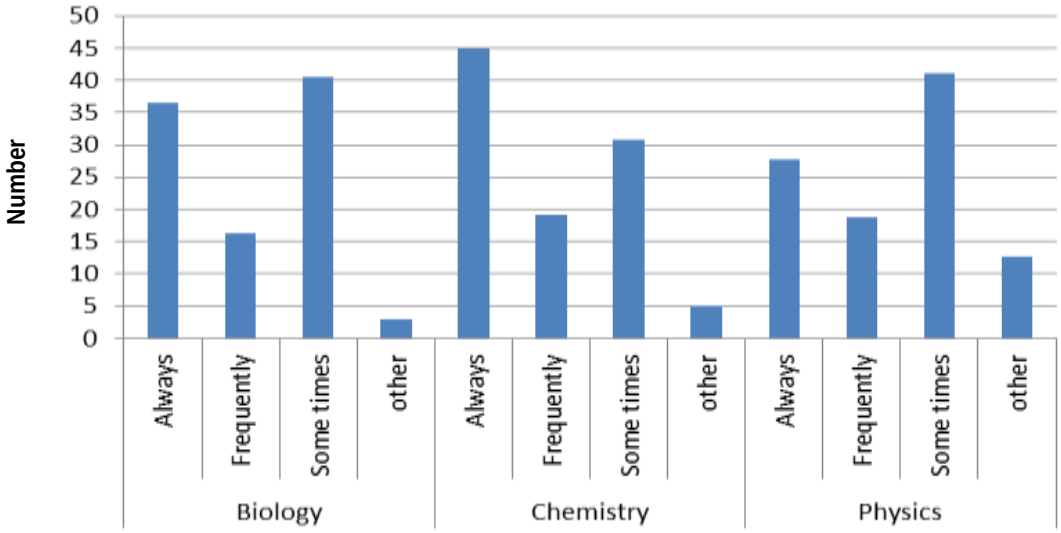

Figure 4. Number of times lab technicians/teachers assist students in practical work.

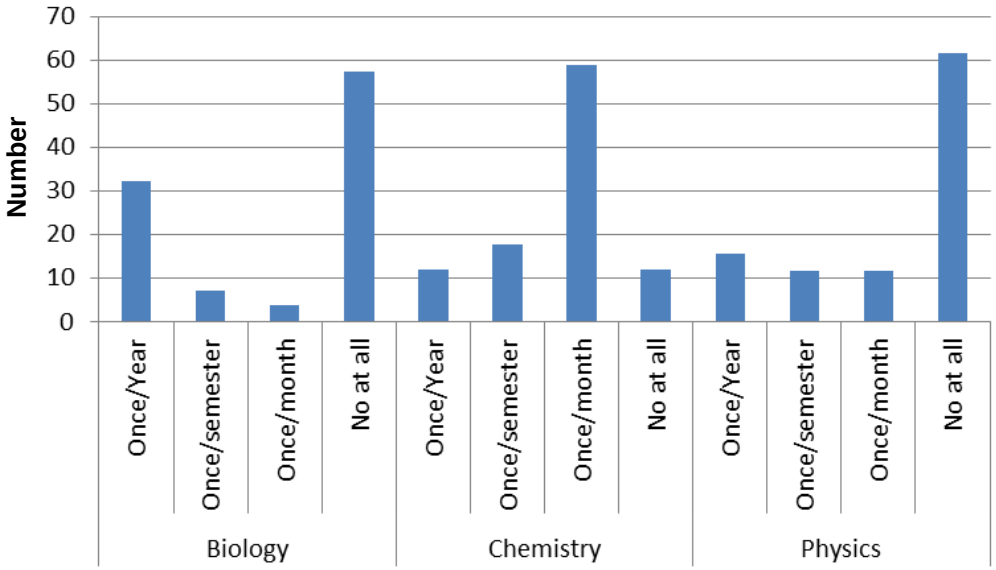

Figure 5. Lab assistants and teachers response on participation of laboratory training before.

science education and students' academic achievement as well (Hunde and Tegegne, 2010; Beyessa, 2014; Caramés et al., 2014; Negassa, 2014).

Conclusion

Laboratory work should achieve mastery of subject matter, developing scientific reasoning, understanding the complexity and ambiguity of empirical work, developing practical skills, understanding the nature of science, cultivating interest in science and interest in learning science and developing teamwork abilities. Well skilled and trained man power, laboratory materials and chemicals in adequate amount enhance the quality of education. This is because practical work develops problem solving skills and a deeper understanding of the concepts and principles in natural science fields. When students do subjects on hands, they understand it and enjoy the learning process since it relates what they have learnt to their real life situations.

The challenges of the modern world require individuals who can apply their theoretical knowledge to solve practical real life problems such as environmental and

Table 4. Teachers' response in laboratory chemicals and materials availability in selected preparatory schools of North Shewa Zone.

Question	Subject	Yes		No		Not determined	
		Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
All lab materials are available	Biology	6	21.4	22	78.6	0	0
	Chemistry	6	35.2	11	64.7	0	0
	Physics	9	34.6	17	65.4	0	0
All lab chemicals are available	Biology	7	25	21	75	0	0
	Chemistry	7	41.2	10	58.8	0	0
	Physics	14	53.8	12	46.2	0	0
Is there lab chemical without use	Biology	16	57.1	12	42.9	0	0
	Chemistry	8	47.1	9	52.9	1	5.9
	Physics	17	65.4	9	34.6	0	0
Is there lab material without use	Biology	12	42.9	15	53.6	0	0
	Chemistry	4	23.5	8	47.1	5	29.4
	Physics	16	61.5	10	38.5	0	0

Table 5. Responses on lab materials and chemicals donation.

Questions	Response	Subject	Government		Non-governmental bodies		Both		Others	
			Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)
From where you get lab materials	Teachers	Biology	10	35.7	1	3.6	15	53.6	2	7.1
	Lab Tech.	Biology	2	25	0	0	6	75	0	0
	Teachers	Chemistry	9	53	0	0	3	17.6	5	29.4
	Lab Tech.	Chemistry	4	50	0	0	3	37.5	0	0
	Teachers	Physics	13	50	0	0	12	46.2	1	3.8
	Lab Tech.	Physics	7	87.5	0	0	1	12.5	0	0
From where you get lab chemicals	Teachers	Biology	12	42.9	0	0	14	50	4	18.8
	Lab Tech.	Biology	3	37.5	0	0	5	62.5	0	0
	Teachers	Chemistry	13	76.5	0	0	1	5.9	3	17.6
	Lab Tech.	Chemistry	2	25	6	75	0	0	0	0
	Teachers	Physics	13	50	0	0	12	46.2	1	3.8
	Lab Tech.	Physics	7	87.5	0	0	1	12.5	0	0

economic challenges. Hence, practical work prepares students for adult life since it fosters the theory they have learned. However, laboratory facilities (materials and chemicals) and professional were insufficient to do well with quality education in the case of the present study. A lot of challenges were raised by students, teachers, laboratory technicians and school principal on the topic of laboratory teaching. Authors appreciate the start, but challenges must be look forwarded for all the government officials and stakeholders. University teacher would like to design curriculum (at Bachelor level) of laboratory teaching for Biology, Chemistry and Physics students who will be laboratory technician in preparatory schools.

Researchers are aware that graduating well skilled man power, that is, laboratory technician should be given priority to develop awareness, skill and knowledge on school students. Thus, the study share is to train students in laboratory technician field of study and open the market for the needy schools all over the country. The materials and chemicals scarcity must put under consideration all stakeholders including researchers of the present study. This study fits with the country policy that science and technology is the main tool for development.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

American Association for the Development of Science (1993). Benchmarks for scientific literacy. Oxford University Press, New York.

Ardestani MS, Badrian A (2014). The necessity of micro-scale chemistry laboratory. J. Lab. Chem. Educ. 2:25-27.

Beyessa F (2014). Major factors that affect grade 10 Students' academic achievement in science education at Ilu Ababora General Secondary of Oromia Regional State, Ethiopia. ILSHS 32:118-134.

Caramés MTF, Prieto C, Santos MJ (2014). Pedagogical innovations to enhance student learning in physics labs. TEEM' 14 proceedings of the second international conference on technological ecosystems for enhancing multi-culturality, Salamanca, Spain, pp. 95-100.

Dare AL (2005). 'Indicators of quality'. A paper presented at the national consultative workshop on educational quality implementation in low income countries, Ghana.

Eilks I, Byers B (2010). The need for innovative methods of teaching and learning chemistry in higher education – reflections from a project of the European Chemistry Thematic Network. Chem. Educ. Res. Pract. 11:233-240.

Hofstein A, Lunetta V (2004). The laboratory in science education: Foundation for the twenty-first century. Sci. Educ. 88:28-54.

Hunde AB, Tegegne KM (2010). Qualitative exploration on the application of student-centered learning in Mathematics and Natural Sciences: The case of selected General Secondary Schools in Jimma, Ethiopia. Ethiop. J. Educ. Sci. 6:41-58.

Idiaghe JE (2004). Relationship between Educational Facilities, Teachers' Qualifications, School Location and Academic Performance in Secondary Schools in the Delta State. PhD Thesis. Delta State University, Abraka, Nigeria.

Kola AJ (2013). Importance of science education to national development and problems militating against its development. AERJ 1:225-229.

Khan M, Zafar I (2011). Effects of inquiry laboratory method on the development of scientific skills through the teaching of Biology in Pakistan. pp. 169-178.

Lim CP, Chai CS (2008). Teachers' pedagogical beliefs and their planning and conduct of computer-mediated classroom lessons. Brit. J. Educ. Technol. 39:807-828.

Mamo DK (2017). Implementation of the 70:30 Students Placement Policy in Government Preparatory Schools of Addis Ababa City. A Thesis Submitted to Department of Educational Planning and Management, Addis Ababa University in Partial Fulfillment of the Requirements of the Degree of Masters of Art in Educational Planning and Management, Addis Ababa, Ethiopia.

Mudulia AM (2012). The relationship between availability of teaching/learning resources and performance in secondary school science subjects in Eldoret Municipality, Kenya. JETERAPS 3:530-536.

Muleta T, Seid M (2016). Factors affecting implementation of practical activities in science education in some selected secondary and preparatory schools of Afar region. AJCE 6:123-142.

National Research Council (2006). America's lab report: Investigations in high school science. In: S. R. Singer, M. L. Hilton, and H. A. Schweingruber (Eds.), Committee on high school science laboratories: Role and vision. Board on Science Education, Center for Education. Division of Behavioral and Social Sciences and Education, The National Academies Press, Washington, D.C.

Negassa O (2014). Ethiopian students' achievement challenges in science education: Implications to policy formulation. AJCE 4:2-18.

Ogunniyi MB, Rollnick M (2015). Pre-service science teacher education in Africa: Prospects and challenges. JSTE 26:65-79.

Tesfamariam G, Lykknes A, Kvittingen L (2014). Small-scale chemistry for a hands-on approach to chemistry practical work in secondary schools: Experiences from Ethiopia. AJCE 4:48-94.

Thornburg D (2009). Hands and Minds: Why Engineering is the Glue Holding STEM Together. Thornburg Center for Space Exploration. From http://www.tcse-k12.org/pages/hands.pdf (Retrieved on 10 September 2014).

Trowbridge LW, Bybee RW, Powell JC (2000). Teaching Secondary School Science. Upper Saddle River, NJ: Merrill/ Prentice Hall.

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Pedagogical development level of pre-service primary school teachers for science teaching

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In this study, the pedagogical development level of pre-service primary school teachers for science teaching was examined. The participants of the study consist of 135 pre-service teachers from Primary School Teaching Department in Faculty of Education at Pamukkale University. After removing the invalid forms, a total of 128 pre-service teachers participated in the study. Data were collected with "Pre-service Teachers' Pedagogical Development Scale" developed by Hudson and Ginns and adapted by Hacıömeroğlu and Şahin-Taşkın. For data analysis, standard deviation, mean, t-test, one way ANOVA were used. Results showed that the pre-service teachers "totally agreed" they have science teaching skills in general. They "totally agreed" also with the dimensions (theory, development of children, planning, and practice) of the scale. There was no statistical difference between the pedagogical development levels of the pre-service teachers according to their gender. However, they differ according to the type of high school that they graduated from; other types of high schools (Anatolian Teacher Training High School and Science High School) perceived themselves more efficient than students from Anatolian High Schools in terms of theory and planning dimensions.

Key words: Pedagogical development, science teaching, pre-service primary school teacher.

INTRODUCTION

Human beings have been excited in exploring the world since they were created. They have put in much effort in understanding and learning the world. They have survived by adapting to what they have learned since ancient times. Indeed, humans survive by learning through their observations and experiences.

There are various types of learning today. For instance, Morgan (1995: 77) defined learning as continuous changes in behavior with experiences and repetition. On the other hand, Bower and Hilgard (1981: 21) handled learning as behavioral changing process and discriminated that learning from behavioral changes resulted from effects such as tiredness and medicine. Behaviorist approach considers learning as observable behavior changes while cognitive approach emphasizes meaning making process in learning. What the behaviorists call changing behavior is, in fact, the expression of learning which occurs in cognition. Meanwhile, learning and teaching concepts have changed due to constructivist theory. Wheatley (1991, cited in Yurdakul, 2005) indicated that learning in constructivism is a meaning making process and meaning is constructed

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not through direct instruction but by the learner himself. An individual reconstructs and interprets knowledge based on his experiences and pre-learnings. Thus learning to learn becomes important in this approach. In behaviorist approach, knowledge is transferred to the learner by an expert or a teacher. Nevertheless, in constructivism, the teacher is a guide for the learners to organize their learnings by providing a suitable environment.

What we adopt as a theory for learning affects the role of the teacher also. In behaviorist approach, the teacher is the one who transfers knowledge and is at the center of the instruction. On the other hand, in constructivism, the teacher has the role of a guide. In other words, the teacher creates suitable learning and teaching environments for the students to construct their meanings (Açıkgöz, 1996).

In Turkey, schools' curricula have been revised according to constructivist approach in 2004. The content knowledge, instructional methods, teacher and students roles were all identified based on constructivism. As Demirel (2008: 22) defines, the teacher is open-minded and innovative, considers individual differences, provides appropriate learning experiences and is the learner himself. Teacher training institutions also revised their curricula considering the constructivist approach. Brooks and Brooks (1993) emphasized that a teacher as a learner supports the autonomy of the students, encourages students' curiosity and interests, and provides environments for them to assimilate, classify and relate. In this sense, the pedagogical knowledge of a teacher becomes important. As Uşak (2005) indicated also, the purpose of the pedagogical knowledge of a teacher is to organize his knowledge based on the level and skills of his students. Pedagogical knowledge is the combination of the student, classroom, and curriculum in terms of students' level and abilities (Gudmundsdottir, 1990). As a result of rapid technological and scientific developments, curricula are revised today. Mostly in the fields of science and technology, these rapid developments lead to the increasing importance of engineering. Especially Science, Technology, Engineering, and Mathematics (STEM) has become so popular in the sense that engineering is a suitable platform for science and technology education (STEM Report, 2015). As for the learning outcomes of science courses at school, science and engineering practices were added in order to train an individual who can produce and use technological practices.

Primary school years are especially important to train individuals to become responsible for their own learnings. In this sense, having pedagogical knowledge is significantly important for a primary school teacher. In related literature, there is a lack of research assessing pedagogical knowledge. Çiltaş and Akıllı (2011) identified the pedagogical efficiencies of teachers; Öztürk and Horzum (2011) investigated the technological dimension of teachers' pedagogical knowledge, and lastly, Hacıömeroğlu and Şahin-Taşkın (2012) adopted a scale on pedagogical knowledge in Turkish. In this research, pedagogical development level of pre-service primary school teachers for science teaching was examined and three research questions were asked for this purpose:

Research Questıons

(1) What is the level of pre-service primary school teachers' pedagogical development in science teaching?
(2) Is there any significant difference between the pre-service teachers' pedagogical development level of science teaching and their gender?
(3) Is there any significant difference between the pre-service teachers' pedagogical development of science teaching and their high school type?

METHODOLOGY

Screening model was used for the study. Screening models are research approaches which aim to describe past phenomenon as it is today. The respective phenomenon is identified in its situation and as it is. In screening models, a sample is chosen from the study group or the researcher reaches whole study group in order to make generalizations (Karasar, 2007: 77).

Sample

The sample of the study consists of 135 pre-service primary school teachers from Faculty of Education at Pamukkale University. After removing the invalid forms, the study was carried out with 128 pre-service teachers. Demographics of the teachers are displayed in Table 1.

Data collection tool

Data were collected with "Pre-service Teachers' Pedagogical Development Scale" developed by Hudson and Ginns (2007) and adapted by Hacıömeroğlu and Şahin-Taşkın (2012). The scale has two parts. The first part consists of personal information, and the second part consists of items related to pedagogical development. A total of 25 items are rated from "Totally disagree" to "Totally agree". The scale is of the five-point likert type. The inter-reliability coefficient of the scale was calculated as 0.919. The scale was translated into Turkish, and three experts from English Language Teaching Department and two experts from Curriculum and Instruction Department evaluated the scale for its scope validity. It has four factors named theory, development of children, planning, and practice; its Cronbach alpha is 0.706, 0.781, 0.795 and 0.820 respectively.

Data analysis

In order to compute the pedagogical development inclination of pre-service teachers for science teaching course, total arithmetic mean scores and standard deviations, and minimum, maximum and total scores reported from the scale were calculated. While determining the median, it was supposed that the results from the scale had a homogeneous distribution. The dimensions of the 25-item pedagogical development scale are the theory (6 items),

Table 1. Demographics of pre-service primary school teachers.

Variables	f	%
Gender		
Female	85	66,4
Male	43	33,6
Total	128	100
High school type		
General high school	60	46,9
Anatolian high school	43	33,6
Others	25	19,5
Total	128	100

Table 2. Kolmogorov-Smirnov test results.

Test	Theory	Development of Children	Planning	Practice
Kolmogorov-Smirnov	1.52	2.03	0.997	2.00
p	0.019	0.011	0.273	0.011

Table 3. Pre-service teachers' pedagogical development scale.

Variables	N	X	Sd	Min	Max.	Xort	Response
Total	128	95.04	10.24	70	117	3.80	Totally agree
Theory	128	22.21	2.82	14	29	3.70	Totally agree
Development of the children	128	19.26	2.45	12	23	3.85	Totally agree
Planning	128	26.53	3.29	19	32	3.79	Totally agree
Practice	128	27.03	3.41	19	34	3.86	Totally agree

development of children (5 items), planning (7 items) and practice (7 items). The minimum score gained from the scale is 25, the median score is 91.6 and the maximum score is 125. Independent samples t-test was used to compare the mean scores and the variables. Standard deviation, arithmetic mean scores, t-test, one way ANOVA were used for data analysis. The significant value was accepted as 0.05.

Data collection

Data were collected in the spring term of 2016-2017 academic years. The scale was independently completed by the volunteer participants reminding them not to indicate their name on the scale. Data were collected by the researcher herself.

FINDINGS

The findings of the study were presented based on the research questions. In order to comment on the responses of the pre-service teachers to the scale, the scores intervals were used. This value was "the result of dividing the difference between maximum value and the minimum value in the measurement results to the group number" (Kan, 2009: 407). So the response intervals of the pre-service teachers were obtained as totally agree (3.21 – 4.00), agree (2.41-3.20), neutral (1.61-2.40), disagree (0.81-1.61), and totally disagree (0.00-0.80). If the sample size is above 35, the Kolmogorov-Smirnov test is the one used for normality (McKillup, 2012). Kolmogorov-Smirnov test was used to determine the normal distribution criteria. As displayed in Table 2, the data were normally distributed.

Findings of the first research question

The first research question of the study was "What level is the pre-service primary school teachers' pedagogical development of science teaching?" Table 3 shows the pedagogical development levels of the pre-service teachers. The minimum score was 70, and the maximum score was 117 obtained from the scale. The mean score of the pre-service teachers was X = 95.04. This means pre-service primary school teachers have positive views about their science teaching skills. Examining the mean scores of the dimensions, the scores were X=22.21 for

Table 4. T-test for the comparison of pre-service teachers' pedagogical development level of science teaching and their gender.

Groups	N	X	Sd	t	p
Female	85	96.55	9.00	2.38	0.019*
Male	43	92.06	11.89		

*p>0.05.

Table 5. T-test for the comparison of the pre-service teachers' pedagogical development level of science teaching and their gender in terms of the dimensions.

Dimensions	Gender	N	X	Sd	t	p
Theory	Female	85	22.41	2.62	1.13	0.26
	Male	43	21.81	3.18		
Development of the children	Female	85	19.52	2.30	1.72	0.88
	Male	43	18.74	2.68		
Planning	Female	85	27.12	2.98	2.97	0.003*
	Male	43	25.34	3.57		
Practice	Female	85	27.48	3.06	2.09	0.038
	Male	43	26.16	3.90		

*p<0.05.

theory, X=19.26 for development of children, X=26.53 for planning, and X=27.03 for practice. The response of the pre-service teachers inclined to be "totally agree" and this shows that they have positive views about their science teaching skills in general. Pre-service teachers have positive perceptions that they can use their theoretical information in planning and practicing dimensions considering the development of the children.

Findings of the second research question

The second research question of the study was "Is there any significant difference between the pre-service teachers' pedagogical development level of science teaching and their gender?" Table 4 displays the findings of the analysis. As shown in Table 5, there is no difference between the gender of the pre-service teachers and their pedagogical development level of science teaching. The mean scores of the two groups are close to each other.

The only significant difference between the pre-service teachers' pedagogical development of science teaching and their gender was found in terms of planning dimension. The items of the planning are about designing an integrated and clear course structure. The difference was in favor of female students; however, it should be considered that the difference between the mean scores was low.

The findings of the third research question

The third research question of the study was: "Is there any significant difference between the pre-service teachers' pedagogical development of science teaching and their high school type?" Table 6 displays the findings. There is a significant difference between the pre-service teachers' pedagogical development of science teaching and their high school type only in terms of theory and planning dimensions. As for the dimension of theory, there is a statistical difference between the pre-service teachers who graduated from Anatolian High Schools (X= 22.16) and from other high school types (X= 24.32). Here, the other school types were categorized as Anatolian Teacher Training High Schools and Science High Schools. These high schools have a deeper and busier curriculum than the others. Moreover, students in Anatolian Teacher Training High School have courses of teacher training like planning and evaluation in instruction. This leads to the significant difference in pedagogical development of the preservice teachers who graduated from these types of high schools.

DISCUSSION

The main purpose of this study is to identify the pre-service primary school teachers' pedagogical development level of science teaching. Findings show that the

Table 6. Comparison of pre-service teachers' pedagogical development level in terms of their high school type.

Dimensions	High school type	N	X	Sd	df	F	p	Sig.
Theory	General High School	60	91.85	9.40	2/125	11.18	0.000	1-3
	Anatolian High School	43	96.60	8.61				
	Other	25	100.04	12.31				
	General High School	60	21.36	2.48				2-3
	Anatolian High School	43	22.16	2.75				
	Other	25	24.32	2.73				
Development of the children	General High School	60	18.75	2.64	2/125	2.68	0.072	-
	Anatolian High School	43	19.60	2.15				
	Other	25	19.92	2.30				
Planning	General High School	60	25.36	3.10	2/125	8.19	0.000	1-2
	Anatolian High School	43	27.32	2.81				1-3
	Other	25	27.96	3.61				
Practice	General High School	60	26.36	3.05	2/125	2.31	0.103	
	Anatolian High School	43	27.51	2.74				
	Other	25	27.84	4.81				

pre-service teachers totally agreed they have science teaching skills generally. They "totally agree" with the dimensions of the scale (theory, development of children, planning, and practice) also. It is a good finding that the pre-service primary school teachers perceived themselves as efficient in teaching science and making students have positive attitudes towards science course. MEB (2017) identified 6 main efficiencies in "teaching proficiency main efficiencies guide" and the participants of the current study have the efficiencies such as recognizing students and curriculum-content knowledge. Hudson and Ginns (2007) also reached the same results in their study that pre-service teachers had a high level of awareness in planning their course. In another study, Kurtuluş and Çavdar (2010) compared the self-efficiency of pre-service primary school teachers and pre-service science teachers in science teaching. Results showed that pre-service primary school teachers had a high level of self-efficiency but not more than pre-service science teachers. Wenner (2001) found that pre-service teachers considered themselves efficient in the development of children and practicing of the curriculum. Savran (2002) made a research with pre-service science teachers also, and found that they have a high level of self-efficiency. Andersen et al. (2004) stated that novice teachers saw themselves as efficient but their self-efficiency beliefs were based on their workplaces. Altunçekiç et al. (2005) found that pre-service teachers considered themselves efficient in terms of science education. There was no significant difference in the pedagogical development of the teacher candidates' science lesson compared to their genders. This finding is in consistent with some of the studies in related literature (Hacıömeroğlu and Şahin-Taşkın, 2012; Altunçekiç et al., 2005; Savran, 2002; Wenner, 2001). However, some others found a significant difference in terms of gender variable (Akkoyunlu and Orhan, 2003; Yaman et al., 2004; Çakıroğlu et al., 2005; Yılmaz et al., 2006; Gencer and Çakıroğlu, 2007). It is striking that there was a difference in planning dimension for female students. Özdemir (2008), Başer et al. (2005) and Kiremit (2006) also got the same result. This may be because of the common belief that girls consider planning and programming in their daily life more. After all, the items in planning dimension are about effective designing of the course.

There was a significant difference in the pedagogical development of pre-service primary school teachers according to high school type in the theory and planning dimensions. As for the theory, pre-service teachers who graduated from other high school types – which are Anatolian Teacher Training High Schools and Science High Schools – had higher scores than the students who graduated from Anatolian high schools. Kiremit (2006) and Akkoyunlu and Orhan (2003) also found a significant difference in terms of Anatolian Teacher Training High School graduates. In Anatolian Teacher Training and Science High Schools, students have a more intense curriculum. Moreover, students in Anatolian Teacher Training High Schools have the courses of planning and evaluation in instruction. This may lead to a significant

difference in pedagogical development.

Conclusion

Below are some suggestions given based on the results of the current study:

(i) Pedagogical development levels of the pre-service teachers should be periodically investigated, and based on the results teacher training programs should be revised. Specifically, boys have a low level of awareness in terms of planning so there should be various activities to acknowledge male students.
(ii) The current study was conducted with pre-service primary school teachers at Pamukkale University. Similar studies should be conducted in different universities and different branches. Furthermore, future qualitative studies should be conducted to investigate whether pre-service students' pedagogical development level is affected by various variables.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

Açıkgöz KÜ (1996). Effective Learning and Teaching. İzmir: Kanyılmaz's Press.

Akkoyunlu B, Orhan F (2003). Relationship between self-efficacy beliefs of students at computer education and instructional technology department and their demographics towards computer using [Electronic version]. The Turkish Online Journal of Educational Technology 2(3):86.

Altunçekiç A, Yaman S, Koray Ö (2005). The research on prospective teachers' self-efficacy belief level and problem solving skills. Kastamonu Education Journal 13(1):93-102.

Andersen AM, Drasges S, Evans R, Sorense H (2004). The Relationship Between Changes in Teachers' Self-efficacy Beliefs and the Science Teaching Environment of Danish First-Year Elementary Teachers. Journal of Science Teacher Education 15(1):25-38.

Başer N, Günhan BC, Yavuz G (2005). A research on comparison of teacher efficacy perceptions of pre-service primary school teachers and inservice primary school teachers XIV. Congress of ational Educational Sciences, Denizli: Pamukkale University pp. 515- 521.

Bower G, Hilgard E (1981). Theories of Learning. Englewood Cliffs, Nj.: Prentice Hall.

Brooks JG, Brooks MG (1993). In Search of Understanding: The Case for Constructivist Classrooms. Alexandria: VA: Association for Supervision and Curriculum Development. http://www.ascd.org/publications/books/199234.aspx

Çakıroğlu J, Çakıroğlu E, Boone WJ (2005). Pre-service teacher self-efficacy beliefs regarding science teaching: A comparison of preservice teachers in Turkey and the USA. Science Educator 14(1):31-40.

Çiltaş A, Akıllı M (2011). Pedagogical Competence of Teachers. Univercity of Mehmet Akif Journal of Social Sciences Institute 0(4).

Demirel Ö (2008). Constructivist Education: Symposium of Contemporary Approaches in Education, 03-04 April 2008. İstanbul: War Colleges Publication.

Gencer AS, Çakıroğlu J (2007). Turkish pre-service science teachers' efficacy beliefs regarding science teaching and their beliefs about classroom management. Teaching and Teacher Education 23(5):664-675.

Gudmundsdottir S (1990). Values in Pedagogical Content Knowledge. Journal of Teacher Education 41(3):44-52.

Hacıömeroğlu G, Şahin-Taşkın Ç (2012). Adaptation of Pedagogic Developmental Scale to Turkish: Level of development of mathematics teaching of classroom teacher candidates. Dicle Univercity Ziya Gökalp Journal of Education Faculty 18:48-68.

Hudson P, Ginns I (2007). Developing an instrument to examine preservice teachers' pedagogical development. Journal of Science Teacher Education 18:885-899.

Kan A (2009). Statistical Operations on Measurement Results (Statistics on Assessment Results) H. Atılgan (Ed.), Assessmenet and Evaluation in Education. Anı Publication: Ankara pp. 397-456

Karasar N (2007). Bilimsel Araştırma Yöntemi Scientific Reseach Method. Ankara: Nobel Publication.

Kurtuluş N, Çavdar O (2010). Self-Efficacy beliefs of pre-service teachers towards science teaching. E-Journal of New World Sciences Academy 5(3).

Kiremit HÖ (2006). Comparison of self-efficacy beliefs of science education students towards biology. Unpublished PhD. İzmir: Dokuz Eylül University, Institute of Educational Sciences.

McKillup S (2012). Statistics explained: An introductory guide for life scientists (Second edition). United States: Cambridge University Press.

MEB (2017). Guide of Teacher Proficiency Efficiencies, (reached on :08.02.2018) http://oygm.meb.gov.tr/meb_iys_dosyalar/2017_12/11115355_YYRETMENLYK_MESLEYY_GENEL_YETERLYKLERY.pdf.

Morgan CT (1995). Introduction to Psychology. (Translated by: H.Arıcı v.d.). Ankara: H.U. Publication of Psychology Department.

Özdemir SM (2008). An Investigation of Prospective Primary Teachers' Self-Efficacy Beliefs Regarding Teaching Process in Terms of Certain Variables. Educational Administration: Theory and Practice Spring 54:277-306.

Öztürk E, Horzum MB (2011). Adaptation of technological pedagogical content knowledge scale to Turkish. Ahi Evran University Journal of Faculty of Education 12(3):255-278.

Uşak M (2005). Pedagogical Knowledge of Pre-service Science Teachers on Flowering Plants, Unpublished PhD. Gazi University Institute of Educational Sciences, Ankara.

Savran A (2002). Preservice Science Teachers' Efficacy Beliefs Regarding Science Teaching and Their Classroom Management Beliefs. (Unpublished Masters' Thesis), ODTÜ: The Middle East Technical University.

Wheatley GH (1991). Constructivist Perspectives On Sciences And Mathematics Learning. Science Education 75(1):9-21.

Yaman S, Koray ÖC, Altunçekiç A (2004). A research on examining self-efficacy beliefs of pre-service science teachers. Journal of Turkish Educational Sciences 2(3):355-366.

Yılmaz M, Gerçek C, Köseoğlu P, Soran H (2006). An analysis of the self-efficacy beliefs about computers of the biology student teachers in Hacettepe University. Hacettepe University Journal of Faculty of Education (30):278-287.

Yurdakul B (2005). New Approaches in Education Demirel, Ö. (Ed.), Constructivism, Pegem A Publication Ankara pp. 39-61.

Wenner G (2001). Science and Mathematics Efficacy Beliefs Held by Practicing and Prospective Teachers: A 5 Years Perspective. Journal of Science Education and Technology 10(2):81-187.

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Analysis of preschool curriculum in East Gojjam Zone: Implication to quality early childhood education

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Developmentally appropriate curriculum is a component for quality early childhood care and education. This study was conducted in Debre Markos town, East Gojjam Zone, Ethiopia. The study aimed to evaluate if the textbooks implemented by private preschools are developmentally appropriate or not. Qualitative case study approach was employed and Mathematics and Environmental Science textbooks for upper kindergarten class of one private preschool were purposefully selected. The textbooks were analyzed using a checklist focusing on the extent to which contents in the textbooks are appealing, play-based, employ concrete/realistic contexts; contain activities of counting, simple addition and subtraction; contain activities of seriation and conservation, and concepts about shapes and colors. The study found that the Environmental Science textbook pictorially represents parts of the body along with corresponding names, personal hygiene and children's daily routines, concepts of time, pictures of different sizes of animals and objects and domestic and wild animals and colors. Besides, it introduces children about the sources and uses of water and air. Likewise, the Mathematics textbook comprises pictures of different animals and objects and activities related to ascending and descending orders. Counting from 0 to 10 and counting forwards and backwards, names and pictures of simple geometric figures and basic colors, and lines and shapes are also emphasized. Both textbooks contain contents related to size, color and classification. Despite these qualities, these textbooks are less appealing to children and do not provide concrete examples; they are poor in containing play, songs and rhymes and fail to suggest the use of environmentally available, concrete and realistic teaching materials to enhance understanding of idealistic concepts. The two textbooks lack several developmentally appropriate contents and fail to relate contents with naturalistic and environmentally available materials. This implies that the textbooks need to be revised to fit with preschool children's level of cognitive development. The findings of this study have implication for designing developmentally preschool curriculum.

Key words: Curriculum, developmentally appropriate, preschool, Mathematics, Environmental Science.

INTRODUCTION

Research shows that the earliest years of a child's life is a critical time for the biological, neurological,

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psychological, social and emotional development. There is strong and consistent evidence that high quality Early Childhood Education (ECE) impacts children's academic development and their emotional and social well-being more powerfully than any other phase of education (Whitebread, 2015). Studies indicated that quality Early Childhood Care and Education (ECCE) enables children develop greater confidence and ability to concentrate; better regulation of their emotion and behavior and improved cooperation with peers and adults (Rossiter, 2016).

Quality curriculum is one which is relevant, consistent, effective and sustainable (Stabback, 2016) and shall include topics that have particular importance to the local community and tasks in which children are familiar with (Whitebread, 2015) and developmentally appropriate.

The quality of the curriculum is the key component which contributes to the holistic development of children (Stabback, 2016). Thus, curriculum in ECCE should be designed to nurture the holistic development of the child. In other words, the curriculum should be developmentally appropriate and be designed in line with developmental abilities, needs and interests of preschool children.

One of the characteristics of a good quality ECCE curriculum is to employ play since early childhood stage is a play age. Children at this stage learn through imitation, talking, and experimenting (Samuelson and Carlsson, 2008). Therefore, more focus should be given to play based learning approaches within the school curriculum (Whitebread, 2015).

A developmentally appropriate preschool curriculum is one which is more culturally appropriate that provides children with learning skills and helping children to succeed in secular primary schools and includes a wide range of factors that impact the care and education of young children (Diwunma and Obiagel, 2013) among which teaching method, child teacher interactions and equipment and material. It is also characterized by play based educational practices; learning based on experience of children; emphasis on emotional wellbeing of children; nurturing children's cultures (Walsh et al., 2010) and it is mainly based on the cognitive constructivist perspective of Piaget.

Curriculum for preschool children should be motivating and it has to inculcate the needs as well as developmental stages of children and it should be indigenous since non-indigenous curricula will have a negative impact on social inclusion of children and promote children's negative identity (Rossiter, 2016).

Early childhood education in Ethiopia was given less focus for a long period of time and it was left mainly for private business owners and faith organizations (MoE, 2010, 2015). However, there is rapid expansion in this sector in recent years. The expansion allows preschool children the opportunity to get access of literacy and numeracy. Yet, there is a great disparity on what preschool children are expected to learn theoretically and what they have been learning practically.

Debre Markos town is the capital of East Gojjam Administrative Zone located in Northwest Ethiopia. There are more than 15 private owned preschools in this town. These preschools do not implement state mandated curricula and the majority of them are established with the primary purpose of generating business than provision of education and care service to children. The textbooks used by these private preschools have never been audited by concerned stakeholders. Besides, no study was conducted to evaluate if the textbooks used by private preschools are developmentally appropriate or not.

The major objective of this study was to evaluate the extent to which Mathematics and Environmental Science textbooks for upper kindergarten classes implemented by privately owned preschools in Debre Markos town are developmentally appropriate. The age of children attending upper Kindergarten class in this particular school ranges from 5-6 years. Viewed from the theory of Piaget's cognitive development. This stage is called preoperational stage and children's thought is based on what they see. Mathematics and Environmental Science textbooks were selected since these two subjects are highly integrated and support language, literacy and vocabulary development. (Brenneman, et al, 2009).

The study has the following environmental specific objectives:

(1) To investigate the extent to which Mathematics and Environmental Science textbooks contain contents related to Classification, Seriation and Conservation.
(2) To evaluate the extent to which play and rhymes are included as pedagogy to teach Mathematics and Environmental Science.
(3) To check if the contents in Mathematics and Environmental Science textbooks contain culturally relevant and contextual contents
(4) To investigate the degree to which the contents are related to realistic and concrete objects.
(5) To investigate if contents related to counting and concepts of time are included in the textbooks.
(6) To examine if basic shapes and colors are included or not in Mathematics and Environmental Science textbooks.

The findings of this study would be useful to policy makers, curriculum designers, parents and teachers. Besides, these findings may serve as a bench mark and preliminary evidence to conduct similar studies in different preschool centers and also to conduct an evaluative study on other textbooks. Overall, the findings of this study could contribute to the designing of developmentally appropriate curricula for preschoolers.

Although there are several dimensions of quality early childhood care and education, this study was delimited to exploring quality of the curricula in one private owned

preschool in Debre Markos town, East Gojjam Zone, Amhara Regional State, Ethiopia. The study was also delimited to evaluating only Mathematics and Environmental Science textbooks for the upper kindergarten classes. Moreover, although curriculum is a broader concept which includes content, teaching learning process and assessment, the focus of this study was only on the contents of two textbooks for upper kindergarten classes in one preschool.

There are several features of quality early childhood care and education. Yet, this study did not include textbooks of all subject matters and those which are implemented by other private preschools in Debre Markos town. Thus, the findings of this study could not be generalized to other private schools found in the study area.

MATERIALS AND METHODS

This study employed a qualitative case study approach in which data were collected through document analysis. The analysis was done to check if the text books are developmentally appropriate or not.

Since the design of this study is qualitative, purposive sampling was employed to select textbooks for analysis. Hence, among four textbooks (Amharic, Mathematics, English, and Environmental Science), Mathematics and Environmental Science textbooks were purposefully selected. One of the reasons for selecting these textbooks was that the contents in the two disciplines are horizontally integrated and reinforce each other.

In this study, the investigator developed checklists to collect data after thoroughly reviewing literature on areas of developmentally appropriate curriculum, cognitive development of preschool children, contents and methods of teaching preschoolers and on the importance of rhymes and songs to teach Science and Mathematics for preschoolers and similar issues.

The investigator was guided by ethical issues while conducting this study. For example, he obtained consent from the school principal to evaluate the textbooks. Moreover, the investigator guaranteed to the school principal that the name of the school and its specific location would not be disclosed.

Thematic analysis was employed to analyze data collected from textbooks using checklists. To simplify the analysis, the items measuring developmentally appropriate curriculum were first categorized into sub-themes and these sub-themes were later categorized under nine major themes based on their similarity as indicated in the findings section of this manuscript.

FINDINGS

This section presents major themes emerged from the analyses of the two textbooks. These themes are concreteness and realistic, Play and songs, Classification and sorting, Counting and sense of time, Shapes and Colors, Counting numbers in ascending and descending orders, Spatial Relationships and Positions, Conservation and size, Measures of time and volume. Themes found in each textbook are presented in detail in this section.

Themes in the Environmental Science textbook

The following themes emerged from the analysis of Environmental Science textbook: concreteness and realistic, play and songs, classification and sorting, counting and sense of time and shapes and colors.

Concreteness and realistic

The Environmental Science textbook begins by presenting contents about parts of the body. It contains pictures of external parts of the body along with their names. It also recommends the teacher to ask children to touch all their body parts and learn their names. The textbook comprises the number of specific parts of the body such as the number of hands, fingers, toes, noses, and asks children about the functions of parts of each part of the body. Moreover, the Environmental Science textbook pictorially displays those parts of the body which are single such as the nose and paired ones like ears, eyes, legs, hands. As part of assessment, the textbook requires children to match the names with pictures of body parts.

In addition to parts of the body, the textbook has contents related to sense organs. Pictures of the five sense organs and their functions are presented side by side. In the consecutive pages, there are exercises in which pictures of the five sense organs are to be matched with their names and functions.

Besides, there are practical and experimental activities relating to different tastes. For example children are requested to mix different substances with water and then they are requested to taste using their tongue and tell whether it is sweet, salty or sour. In addition to this, the textbook recommends the teacher to help children identify different things found around children's environment using different sense organs. The sources and importance of water and air are also included as contents in pictures and mimic actions. Lastly, the textbook contains an activity in which children are made to recall the uses of water. There are also contents related to the characteristics of air (air is all around us; we cannot see air, we can only feel it and so on).

Play and songs

The Environmental Science textbook consists of concepts of hygiene. Moreover, it contains rhymes about washing hands, face, clothes, brushing teeth, combing hair, cutting nails and keeping the environment clean. There is also a song called 'Clean Lines' to help children memorize these activities. Besides this, there is a song about the color of different vegetables especially about green and yellow.

Classification and sorting

The book introduces children with pictures of different groups of food items like dairy, fruits, vegetables, protein and grains. It requests children to identify and match names with pictures of different food categories. Moreover, it demands children to categorize the different food items under the four groups of food: fruit, vegetable, grains and protein. Furthermore, the textbook contains lessons about the characteristics of living and non-living things, edible and non-edible animals, and domestic and wild animals. Besides, the textbook contains pictures of a bird and a flower and presents assessment questions like "which one does grow, reproduce, move, breathe, and need food" and so on. In addition, there are contents about the characteristics of living and non-living things. Furthermore, children are required to write living and non-living things found around them.

Under the concept of living things, the book presents the characteristics and parts of a plant and how and where plants grow and what they need to survive. Besides, different pictures of domestic and wild animals are presented and there are activities that demand children to tell what these animals eat and where they live. Furthermore, the book shows a list of animals and asks children to classify them as domestic and wild.

Counting and sense of time

The Environmental Science textbook comprises topics related to sense of time. It begins by asking how many times children eat food within a day and introduces the names of meals eaten within different intervals of a day (breakfast, lunch and dinner) vis-à-vis intervals within a day (morning, midday, afternoon). There are illustrations of associating concepts of day and night with the Sun and the Moon.

Shapes and colors

In the textbook, an attempt is made to teach about different shapes and colors by associating with traffic rules (Green, yellow and red colors symbolizing traffic rules). Under this broad area, the textbook presents safety rules at home as well as on the road. There are DOs and DONTs written in simple language (for example: do not play near fire, do not play with sharp things, and many more rules). Besides, as an assessment, the textbook requests children to think about additional safety rules in class and in the school. Furthermore, the text presents lessons about traffic lights and the meaning of green, red and yellow colors in the traffic rules and regulations. Traffic symbols representing 'Stop', 'One way' and 'Bend to the right' are also included in the textbook.

Themes in the Mathematics textbook

The following major themes emerged from the analysis of Mathematics textbook: counting numbers in ascending and descending orders, spatial relationship and positions, conservation and size, shapes and colors, and measurement of time and volume. Some of the themes found in the Mathematics textbook are somewhat similar with the themes in the Environmental Science textbook. For instance, contents about shapes and colors are found in both textbooks.

Counting numbers in ascending and descending orders

The textbook for Mathematics requires children to match different figures and pictures (boxes, tables, flowers, animals) with equal numbers. Besides, it contains numbers to be matched with words. Furthermore, it contains exercises related to *addition* in which children are requested to count the dots put in different boxes and adding them together. There are also activities about counting forward and backward of numbers from 0 to 9 written in a number line and arranging these numbers from big to small and small to big. The textbook comprises activities of missing numbers on a number line. Assessment activities on writing numbers from 1 to 10 in ascending and descending orders are also shown in the textbook.

To teach the concept of order, the textbook asks children to write the name of cloth they wear first, second and at last among shoes, pair of trousers, T-shirt, pant, socks, shirt and coat.

Furthermore, the textbook introduces two digit numbers and place values of tens and ones and it tries children's understanding of place values by presenting *single and teo-digit* numbers.

Spatial relationships and positions

Concepts of spatial relationships and positions are also given focus in the textbook. For example, there are contents about directions like right, left, middle, bottom right, right center and top right. To assess children's understanding of these concepts, the Mathematics textbook asks children to circle the picture found in the middle, right or left of other pictures.

Conservation and size

The textbook introduces children to concepts of

conservation, amount and size. For instance, mathematical symbols of addition, subtraction, is equal to, greater than and less than are presented contextually in the textbook. There are also simple addition activities illustrating the numeric symbols and orders children to match equations with their correct answers on the other column. Furthermore, pictures of different sizes are presented to teach the concepts of “bigger” and “smaller” and “shorter” and “taller”.

Shapes and colors

The textbook defines basic shapes and provides activities for children to color these shapes. There are also exercises demanding children to match objects of different shapes with the names (circle, square, triangle, oval and rectangle). Furthermore, features of major geometric figures are presented in the textbook. For example, the number of sides that each geometric figure has, the number of lines it is made of and the number of corners are indicated.

Measures of time and volume

Besides shapes and colors, the concept of time and volume is given due focus in this textbook. For example, there are lessons about measures of months of the year, days of the week, hours of a day and activities that children do in each time of a day, measurement of time, liquids, and space.

DISCUSSION

The two textbooks have both strengths and limitations when viewed from the perspective of developmentally appropriate practice. For example, there is an attempt made to make the contents in the Environmental Science textbook to be somewhat realistic and contextual though not sufficient. This textbook provides opportunity for children to learn concepts of number by enquiring them with questions like “how many hands, legs… do you have”. Teaching about the number of sense organs in the Environmental Science textbook demonstrates the attempt made by the writers to integrate it with Mathematics.

The Environmental Science textbook occasionally suggests the teacher to use concrete and realistic materials to help children understand the given concepts easily. For instance, it reminds the teacher to order children to bring different vegetables to the classroom and learn their smells, colors and tastes. In line with this finding of Bose et al. (2013) recommend that children should learn through exploration, inquiry and discovery than memorizing isolated scientific and mathematical concepts.

Both textbooks have limitations since play, songs and outdoor activities have been overlooked. In contrast to this, Bose et al. (2013) remind that outdoor activities are essential components for teaching Mathematics and Science to preschool children. Likewise Lee, (2011) argues that young children develop many concepts of Mathematics while they are playing in their daily life experiences and hence they need to be given opportunities for indoor and outdoor plays which are particularly initiated by children themselves. Similarly, Wood and Hedges (2016) indicate that play and freely chosen activities enable them to develop independence, control, and autonomy. Empirical literature (Morrison and McLoyd, 2000; Bose et al., 2013) indicate that teachers should understand that children learn all the time through play and interaction with their surrounding environment.

The role of vernacular language in the learning of preschool children has been totally forgotten by the writers of the two textbooks. In other words, both textbooks are written in English and implemented on children whose vernacular language is Amharic. Furthermore, the songs and rhymes used in the Environmental Science textbook are written in English with difficult words. As a result, children are expected to learn both the contents and the language. In contrast to this, the New Education and Training Policy recommends that preschool and primary education in Ethiopia should be given using local vernacular language (UNESCO, 2007).

Environmental Science textbook has deficiencies in helping children understand the concepts fully. For example, in its attempt to teach about *water* and *air*, it lacks to inform children about the sources of water and what kind of water is drunk at home and so on. Moreover, the concept of air is presented in an abstract manner which is difficult to be understood by children. Furthermore, little effort has been done to use make believe activities using concrete materials to demonstrate the characteristics of air (such as air has weight and occupies space). Elaborating this fact, Morrison and McLoyd (2000) indicates that preoperational children base their judgment on concrete objects and hence their learning need to be assisted with concrete teaching materials. Likewise, Bose et al. (2013), recommend that there must be application of hands-on materials for preschoolers to help them believe and see it happen.

To simplify the concept of air, it would have been good to use different balloons and inflate some of them with air and deflate (letting out the air) to make children believe that air occupies space. In line with the current finding, theoretical literature (Rossiter, 2016) states that the challenge for curriculum for younger children is that it is implemented without the necessary adjustments for

children's developmental capacities and ways of learning. Concepts related to classification are presented in both textbooks. For instance, children are required to identify among the four categories of food. In support of this scheme, scholars (Bose et al., 2013; Brenneman et al., 2009), recommend that children need to be exposed to curricula related to identification, sorting and classification of different objects and animals found in children's surrounding environment. However, the Environmental Science textbook analyzed in the current study has shortcomings in that it presents concepts such as protein, healthy food and so on. These are complex and vague concepts to preschool children. Likewise, there is no consecutive content that enables children to learn these concepts. Moreover, some of the names of the food items presented in the textbook are non-indigenous ones which are beyond children's imagination. In relation to this, Shizha (2013), states that school curriculum in Africa is suffering from lack of indigenous contents and socio-cultural worldview of the African child.

The Environmental Science textbook fails to incorporate context related examples in teaching different concepts. For example, in teaching about the classification of animals, it does not assess children's prior knowledge about the type of domestic and wild animals found at their homes, and in their surroundings.

The Mathematics textbook illustrates different pictures of clocks to teach the concept of time. However, some of the concepts are beyond the level of understanding of the children. For instance, it might be difficult to imagine that children can tell time of the day by looking at the arms of clocks and match them with time of the day (morning, midday, night, and afternoon). Besides, the textbook requires children to write the time that each analogue clock reads and this is too abstract for preoperational children. It would have been good if digital clocks (numbers telling time) are used instead of analogue ones.

The names of traffic colors contained in the Environmental Science textbook (green, yellow and red) have not been presented with respective colors. This might create confusion to children when they see such symbols on the road in real context. Moreover, understanding road signs is too complex for preschool children. The textbook fails to teach the meaning of traffic light colors using songs. Thus, association of colors with traffic rules would be tough for children to memorize. Correspondingly, theoretical literature (Bose et al., 2013) suggests that rhymes and songs need to be used as natural ways of learning for children and should not be excluded from the teaching learning process.

It is good that the Mathematics textbook contains basic mathematical operation symbols of addition, subtraction, is equal to, greater than and less than. However, it fails to consider the cognitive developmental stage of preschool children and lacks to recommend the use of concrete materials in teaching these abstract symbols. Preschool children could learn these concepts best only if there is association of these symbols with concrete and contextual objects such as potatoes, beans, corks and so on. Likewise, the use of parts of the body such as fingers to help children learn addition and subtraction is not indicated at all. But scholars in the field suggest (Sinclair and Pimm, 2015) that fingers are important to teach counting and addition to preschool children.

Realistic, contextual and concrete examples have not been employed in both textbooks. For example, in teaching about geometric figures, the Mathematics textbook presents concepts such as corner and segment which are vague for children. But, there is no any indication about the use of realistic and local objects that could represent major geometric figures. It would have been good if there is a demonstration of realistic and concrete materials having different shapes (example, the classroom, the school compound, television) and other locally available realistic objects as an illustration of different geometric figures. Likewise, Adefunke and Olatunde (2015) indicate that teachers shall use materials that are readily available in the child's environment while teaching preschool children.

CONCLUSION AND RECOMMENDATION

The findings obtained from the analyses of the two textbooks showed that some of the contents are beyond the level of cognitive development of children. The two text books also lack to incorporate concrete and contextual learning experiences and totally disregard the use of vernacular language. These deficiencies imply that there is a need to audit the relevance and appropriateness of private school curricula by the Zonal and Regional Education Bureau.

CONFLICT OF INTERESTS

The author has not declared any conflicts of interest.

REFERENCES

Adefunke T, Olatunde P (2015). Mathematics Learning , Montessori Approach to Teaching / Learning in Early Childhood Education : A Case Study of Ifo Local Government Area of Ogun State Arts and Social Sciences Education Dept University of Lagos 5(6):45-54.

Bose K, Tsamaase M, Seetso G (2013). Teaching of Science and Mathematics in Pre-Schools of Botswana: The Existing Practices. Creative Education 4(7):43-51. https://doi.org/10.4236/ce.2013.47A1006

Brenneman K, Stevenson-boyd J, Frede EC (2009). Early Mathematics and Science: Preschool Policy and Practice: Preschool Policy Brief (19):1-23.

Diwunma, O, and Obiageli, E.(2013). The Role of Teachers of Young Children in ensuring Developmentally Appropriate Practice in Early Childhood Education Curriculum Implementation. Journal of Emerging Trends in Educational Research and Policy Studies

(JETERAPS) 4(5): 821-826© Scholar link Research Institute Journals, 2013(ISSN: 2141-6990)jeteraps.scholarlinkresearch.org

Lee E (2011). An Analysis of the Mathematical Experiences of Young Children in Spaceship and Fruit Store Role-Playing Activities, 5(2):93-106.

MoE (2010). Education Sector Development Program IV (ESDP IV). Addis Ababa: The Federal Democratic Republic of Ethiopia, Minstry of Education.

Ministry of Education (MoE) (2015). Education Sector Development Program V (ESDP V). Addis Ababa: the Federal Democratic Republic of Ethiopia, Ministry of Education.

Morrison GL, McLoyd VC (2000). Parents' management of their children's education within the home, at school, and in the community: An examination of African-American families living in poverty. The Urban Review 32(1):1-23

Rossiter J (2016). Scaling Up Access to Quality Early Education in Ethiopia:Guidance from International Experience. Young Lives .

Samuelson I, Carlsson M (2008). The Playing Learning Child: Towards a pedagogy of early childhood. Scandinavian Journal of Educational Research 52(6):623-641.

Shizha E (2013). Reclaiming our indigenous voices: The problem with postcolonial Sub-Saharan African school curriculum. Journal of Indigenous Social Development 2(1):1-18. https://doi.org/10.1007/978-94-017-9355-1_15 ADDIN Mendeley Bibliography CSL_BIBLIOGRAPHY

Sinclair N, Pimm D (2015). Mathematics using Multiple Senses : Developing Finger Gnosis with Three- and Four-year-olds in an Era of Multi-touch Technologies 9(3):99-110.

Stabback P (2016). What Makes a Quality Curriculum? Current Critical Issues in Curriculum and Learning (2):8-12. Retrieved from http://unesdoc.unesco.org/images/0024/002439/243975E.pdf.

UNESCO (2007). Strong Foundations of Early Childhood Care and Education.Education for All Global Monitoring Report. UNESCO Publishing. Paris.

Walsh G, Sproule L, McGuinness C, Trew K, Ingram G (2010). Developmentally appropriate practice and play-based pedagogy in early years education :A literature review of research and practice. School of Psychology, Queen's University Belfast.

Whitebread D (2015). Quality in Early Childhood Education: an International Review and Guide for Policy Makers. Contemporary Issues in the Early Years pp. 47-62.

Wood E, Hedges H (2016). Curriculum in early childhood education: critical questions about content, coherence, and control. Curriculum Journal 27(3):387-405. https://doi.org/10.1080/09585176.2015.1129981

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Explaining the requirements for teacher's development based on professional competencies approach

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As teacher competencies and skills play a major role in their performance and thus the achievement of school and educational goals, teachers need to equip themselves with a variety of competencies to educate children who are potentially future leaders of the community. In this context, the present study aimed to find the correlation between each of the main dimensions of professional competencies and the main components of Teacher Development (TD) in elementary schools. The study designed an applied research and used a survey method. The statistical population includes all primary school teachers in Isfahan province (N = 1150). Using a multi-stage and proportional cluster sampling method, the sample size was 94 teachers. Data were collected by studying literature, interviewing experts and a questionnaire. The data were analyzed using correlation test and Analytical Network Process (ANP) technique using SPSS and Super Decisions software. The results of the research show that the dimension "skill" has the greatest impact on TD, and the dimensions "attitudes and behaviors", "personality traits", "knowledge", and "ability" are respectively in the second to fifth grades, as the most relevant dimensions of professional competence in primary school TD.

Key words: Teacher development (TD), professional competence, primary school, Analytical Network Process (ANP).

INTRODUCTION

Teachers are the main elements of an education structure, which reducing their knowledge and ability has a direct impact on the performance of education system (Adib et al., 2017). Since the educational system of each country is formed by its teachers, and the success and dynamism of this system and the realization of the goals of education require an increase in the level of knowledge and ability of these teachers, the strengthening and development of this sector, especially teachers, is as the heart and soul of education (Khoroshi et al., 2017). Therefore, an education system is bound to pay particular attention to the maintenance and upgrading of their teachers and not neglect it. According to Ababaf et al. (2014), teacher's improvement is a collection of long-term actions and activities in order to eliminate their work defects and also includes the process that comes out of the form of courses and actions planned and formal and takes an informal, flexible and continuous aspect.

Various factors have an impact on the importance of implementing the teacher development (TD) system,

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factors such as individual interests (increasing teachers' salaries and benefits, robust and sustainable job satisfaction, increasing the sense of job security in terms of empowering, increasing efficiency, performing the task desirable, raising morale, and self-confidence, and professional development), organizational benefits (strengthening sense of belonging and organizational commitment, achieving goals, less attendance, more productivity, and less relocation and transfer), and social benefits (contributing to the durability and strength of the family center, defending organization dignity and credibility, helping to prevent social abnormalities, etc.). Such factors have led TD to be among the basic priorities of education in a fundamental transformation document (Ghanizadeh et al., 2017).

Unfortunately, despite the long history of the implementation of such programs for teachers, there is sufficient evidence that these programs and teacher-improvement activities are not paying attention (Ghanizadeh et al., 2017). Considering that the approach of teachers' professional competence considers the collection of teachers' knowledge, trends and skills, and in fact, the concept of physical, rational, emotional, social and spiritual development of students is in its infancy and it is incongruous, therefore achieving TD in the context of their professional competencies seems to be very desirable.

LITERATURE REVIEW

Teacher development (TD)

Deb (2006), at a glance and naturally, believes that employees development (ED) is a social, cultural and spiritual cohesion, capacity building and empowerment, and they are equipped with skills to have a healthy and satisfying life. According to the definition provided by Ghulamzadeh and Ghalichli (2006), ED is an activity that can develop the level of basic knowledge, efficiency, skill, and satisfaction for individual or organizational benefits, nation, society or humanity in a short and long term. In another definition of ED expressed by Lee and Kim (2001), ED is a natural flow of professional development that over time manages employees to develop new ideas, playing new ways, self-confidence, discovering new ways and promoting knowledge. In his view, there are factors that can have an impact on ED, including individual factor considered as a continuous individual learning, institutional factor reflected from the interactions in workplace between employees and subject of work, and management factor that is responsible for planning and performing ED works. They also introduced the following conditions in their research for ED:

(i) Employed person's knowledge, experience and personality
(ii) Field of word environment
(iii) Professional contacts and exchanges outside work environment

Okereke and Nnenna (2011) have identified the requirements for developing teachers in education. These requirements include directing the recruitment of new teachers, upgrading and maintaining teachers' skills, improving teachers for the future, creating motivation for teachers by creating growth opportunities for them, providing teachers for higher jobs, preventing job cessation or displacement, job satisfaction, and raising and improving productivity and productivity. In the study, the main components and sub-components of TD have been summarized by analyzing the literature and conducting interviews and compiling and completing the questionnaires by some experts at various meetings shown in Figure 1.

Teachers' professional competencies

The term "competence" means, suitable for the purpose, appropriate, complicating, correcting, acceptable result, or the ability to enter a special job, which has a positive relationship with a certificate of knowledge or attestation in that occupation. Teacher, in addition to general competencies, should also have their own job competences in order to enter the profession of full teacher responsibility. Therefore, many studies have been conducted on reasons for job competencies or the establishment of criteria for determining these competencies (George, 2011). In fact, teacher competencies are a set of cognition, orientation and skills that a teacher can achieve in the process of education to promote the physical, intellectual, emotional, social and spiritual development of students. These competencies fall into three areas: cognitive, emotional, and skillful (Maleki, 2005). The aim of cognitive competencies is a set of mental knowledge and skills, which enables the teacher to understand the challenges and issues of education. Emotional competencies are part of the teacher's tendencies and interests in issues and topics related to education and skills competences related to the teacher's skills and abilities in a learning flow (Shahmohammadi, 2014).

In light of studies conducted in the field of teachers' professional competence (Redecker, 2012; Wolf, 2001; Wiliam, 2009; Rychen and Salg anik, 2003; Pepper, 2011; Kerka, 1998; Halász and Michel, 2011) as well as the use of expert opinions in this area, its dimensions and components are classified in Table 1.

Research questions

In this research, the following questions are presented

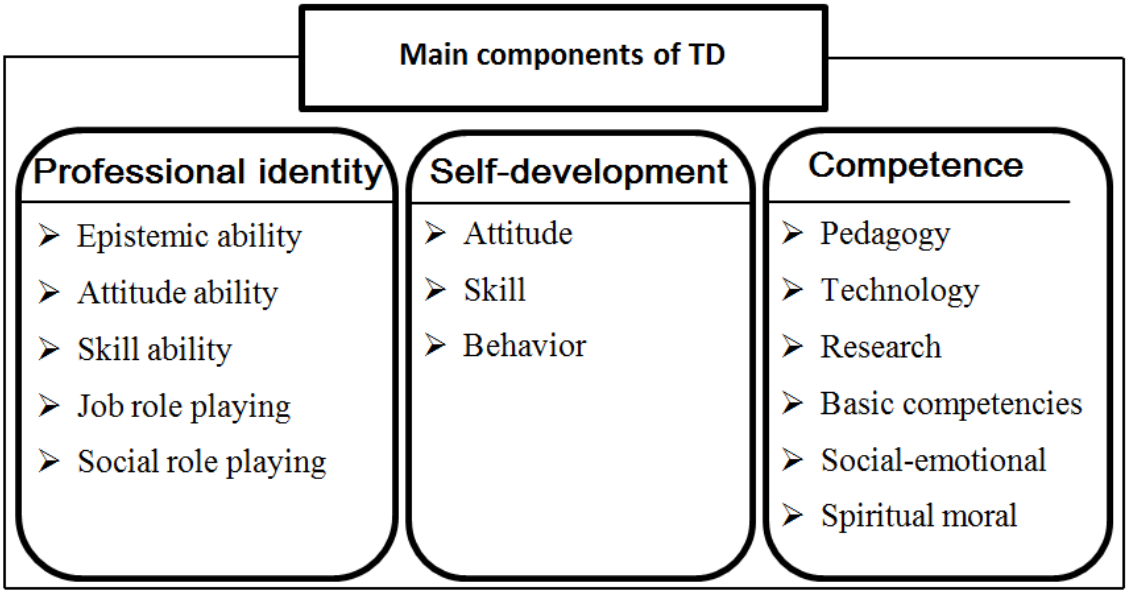

Figure 1. Main components and sub-components of TD (Ghanizadeh et al., 2017).

Table 1. Dimensions and components of teachers' professional competencies.

Component	subcomponent	Component	subcomponent
Knowledge	Professional knowledge	Attitude	Efficiency sense
	Knowledge of curriculum and educational content		The desire for teamwork, cooperation
	Teaching strategies and skills, use of language and multimedia		Critical attitude to his teaching
	Measurement and evaluation		Desire to promote students' democratic attitudes and activities
	Planning, implementation and monitoring of teaching		Commitment to Promoting and Enhancing Learning of All Students
	Use of materials and technologies of teaching		Desire for change, flexibility, continuous learning and professional development
Skill	Managing Students and Groups		Collaboration with partners, parents and community groups
	Supervising, adopting and evaluating of teaching strategies and processes	Ability	Negotiating skills with students, parents and community groups
	Collection, analysis, and interpretation of documents and data		Cognitive and metacognitive abilities
Personality characteristics	Subjective Individual Components (comprehension, critical thinking, active learning ability, general mental skills skills, application of intellectual capacity skills, maturity, judgment ability, creativity, rational or cognitive, cognitive and wisdom, intelligence and knowledge, analytical skills, open mind, Cognitive ability, divergent thinking, critical thinking, intellectual skill, inductive logic, ability to think and analyze information, mental capacity, and rational ability)		
	Individual personality factors (honesty, integrity, self-esteem, morale and sacrifice, being active, being agent, self-control, positive thinking)		

Source: Dibaee et al. (2016).

with the aim of identifying the relationship between the two concepts of employee development and teachers' professional competencies:

1. Is there a significant relationship between professional competencies and teachers' development in elementary schools?

2. Which aspect of professional competency has a growing connection with TD in elementary schools?
3. What is the prioritization of quality programs to accelerate the achievement of TD in elementary schools?

RESEARCH METHOD

The present study is an applied research with a survey method. Data and information collection were done by studying literature, interviewing experts and standard and researcher-made questionnaires. The statistical population of this study includes all primary school teachers in Isfahan province (N = 1150). Using a multi-stage and proportional cluster sampling method, according to the limited population, the sample size was calculated to be 94 people. The first questionnaire of this research examines the dimensions of professional competencies (Dibaee et al., 2016) and TD (Ghanizadeh, 2015) in elementary schools based on the Likert range (from very little to very high). In the second questionnaire, TD assessment was conducted in three parts in primary schools in the form of paired comparisons and by Analytical Network Process (ANP). The software used in this study were SPSS and Super Decisions. In this study also the reliability of the questionnaire was obtained by a Cronbach's alpha coefficient of 0.81 for TD and 0.79 for Professional qualifications among elementary teachers.

FINDINGS

Based on the data obtained from the first questionnaire, the scores of sample members were determined in terms of professional competencies and TD in elementary school. In order to investigate the researchers' commitment to using the collected information, the questionnaires were coded for research purposes only and without the teacher's name. Then, with the aim of achieving the weight of each element of improvement of primary school teachers, the network analysis technique was used. Then, with the aim of achieving the weight of each components of TD in elementary schools, the ANP technique was used. For this purpose, first we conducted paired comparison among each of the dimensions of TD and then among each of the dimensions of professional competencies. After analyzing the results obtained from the super matrix of ANP by the software, the weight of each element of TD in primary school was obtained based on the pair comparison. Accordingly, the dimension competence was ranked in first place with a weight of 0.267, the dimension self-development was ranked in second place with a weight of 0.252, and the dimension professional identity was ranked in third place with a weight of 0.211. In the following, after achieving the importance of TD dimensions of the sample, the correlation between the dimensions of TD in elementary schools and their professional competencies was examined (Figure 2).

According to the results obtained in Table 2, there is a significant correlation between the dimensions skills and attitudes with all dimensions of TD in elementary school, the dimensions knowledge and personality traits with competences and self-development, and the dimension ability with competences and professional identity.

Figure 1 also shows the relationship between professional competencies dimensions with each of TD dimensions in primary school and correlation coefficients for each factor. Now, considering the correlation between professional competencies dimensions with each of TD dimensions in primary school as well as the results obtained from the weight of each of TD dimensions in primary school, the power amount of each professional competencies dimensions to achieve a TD set can be calculated using the following equation:

$$P_{xi} = \sum_{i=1}^{5} (C_{xi} \times W_i)$$

Where, P_{xi} is the power of each professional competence dimension in TD among elementary school teachers, C_{xi} is the correlation coefficient between each professional competence dimensions and TD dimensions, and W_i is the weight of TD dimensions.

Table 3 shows the power amount of each professional competencies dimensions to achieve a TD set. According to the results shown in Table 3, the dimension skill was ranked in first place with a coefficient of 0.465, the dimension attitude was ranked in second place with a weight of 0.423, and the dimensions personality traits, knowledge and ability were ranked respectively in third, forth and fifth places with a weight of 0.367, 0.310 and 0.244.

CONCLUSION

Nowadays, attention to training and developing school teachers is one of the most important ways of improving the quality of public and non-profit schools. Many scholars such as Mirsapasi (2017) and Ghanizadeh et al. (2017) concluded in their studies that the realization of educational goals depends on TD. As TD is influenced by various factors such as professional qualifications, the study of the existing situation of TD in elementary schools in the context of their professional competencies and explaining the power amount of each professional competencies dimensions to achieve a TD set is the main objective of this study.

The results of the first phase of this study showed that the dimensions "skill" and "attitudes" have the most correlation with TD. These two dimensions of professional competencies are related to the overwhelming majority of TD dimensions, and this suggests that these two dimensions are more important in TD among elementary school teachers. This result is consistent with the study by Ghanizadeh et al. (2017). By reviewing the

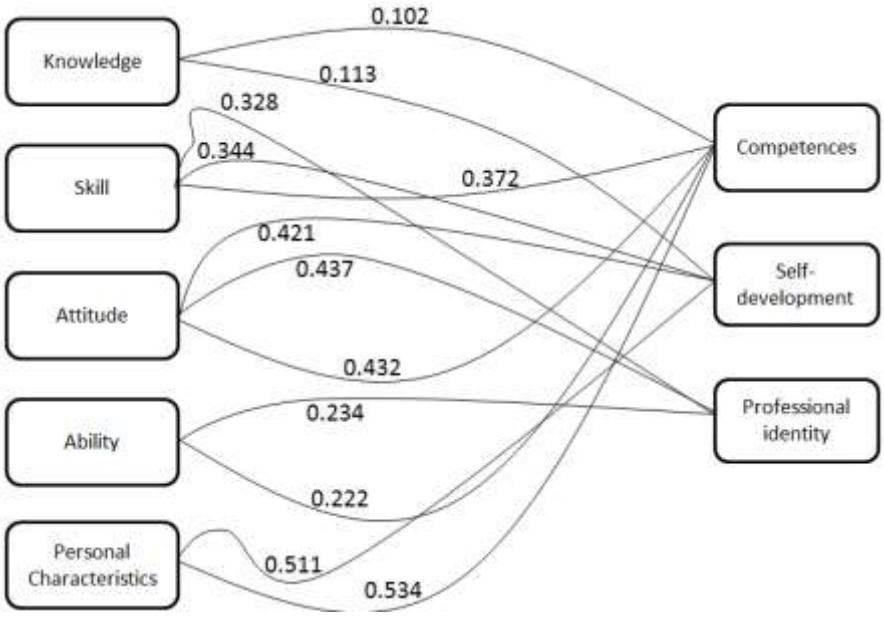

Figure 2. Correlation coefficients between professional competencies dimensions and TD dimensions in elementary schools.

Table 2. Correlation matrix of professional competencies and TD in elementary schools.

			Professional competencies dimensions				
			Personality traits	**Attitude**	**Skill**	**Ability**	**knowledge**
TD dimensions in elementary schools	Competences	Correlation coefficient	0.534 (*)	0.432 (**)	0.372 (*)	0.222 (*)	0.102 (*)
		Sig.	0.022	0.003	0.023	0.084	0.034
		N	94	94	94	94	94
	Self-development	Correlation coefficient	0.511 (*)	0.421 (**)	0.344 (**)	0.043	0.113 (*)
		Sig.	0.031	0.004	0.002	0.034	0.026
		N	94	94	94	94	94
	Professional identity	Correlation coefficient	0.384	0.437 (*)	0.328 (*)	0.234 (*)	0.348
		Sig.	0.087	0.014	0.025	0.037	0.094
		N	94	94	94	94	94

*Significant correlation at 5% level; ** Significant correlation at 0% level.

Table 3. Power amount of each professional competencies dimensions to achieve a TD set.

W_i	**0.267**	**0.252**	**0.211**	P_{xi}
TD dimensions Professional competencies dimensions	**Competences**	**Self-development**	**Professional identity**	
Personality traits	0.534	0.511	-	0.367
Attitude	0.432	0.421	0.437	0.423
Skill	0.372	0.344	0.328	0.465
Ability	0.222	-	0.234	0.244
Knowledge	0.102	0.113	-	0.310

developments made to school teachers, the results were also confirmed, and it is clear that school TD is also logically more influenced by the dimensions "skill" and "attitudes" in professional competencies.

In the second phase of this study, we first calculated the weight of each TD dimension using ANP technique; then, by summing up correlation multiplication product between each dimension of professional competencies and TD in the weight of the performance, the effectiveness and capacity of each dimension of professional competencies was calculated in TD. The findings at this stage, which confirmed the results obtained from the first step, showed that now and with regard to the situation at the elementary schools in Isfahan, "skills" and "attitudes" with the greatest potential to develop teachers should take into consideration the local dimensions of professional competencies for direction and guidance the path of excellence TD in the context of professional competencies.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Ababaf Z, Farasatkhah M, Mehralizadeh Y, Fathi vajargah K (2014). Reflection on the professional competences of teachers in curriculum studies, Journal of Educational Sciences (Shahid Chamran University of Ahwaz) 21(2):157-182.

Adib Y, Fathi Azar A, Arefnejad S (2017). Teacher-student professional Identity in Farhangian University in East Azarbaijan Province, Farhangian University: Quarterly Journal of Tarbiat Moalem 1(1):147-167.

Deb T (2006). Strategic approach to human resource management. Atlantic Publishers and Dist.

Dibaee Saber M, Abbasi E, Fathi Vajargah K, Safaee Movahed S. (2016). Explaining the dimensions of teachers' professional competencies and Analyzing Its Place in the Upper Documents of Education in Iran, Biannual Journal of Training & Learning Researches 13(2):109-124.

George Town College (2011). Developing Scholars who are competent and caring educators, Committed to the spirit of service and learning. Conceptual framework, Department of education, teacher education program.

Ghanizadeh Graeeli M, Jafari P, Gholighorchian N (2017). The effect of professional competencies on the development of high school teachers in Tehran, management on training organizations 6(1):51-72.

Ghanizadeh Gerayli M (2015). Model for Improvement of secondary school teachers (about Tehran Province). PhD in Educational Management, Islamic Azad University, Science and Research Branch of Tehran. [Persian]

Ghulamzadeh D, Ghalichli B (2006). Developing Human Resources and Learning Organizations in Europe, Documenting the Experience of Primary Companies and Countries, by Stewart, Jim. Tehran: Farazandish Sabz Publications and Iran Khodro Co.

Halász G, Michel A (2011). Key Competences in Europe: interpretation, policy formulation and implementation. European Journal of Education 46(3):289-306.

Kerka S (1998). Competency-Based Education and Training: Myths and Realities. From http://www.calpro-online.org/eric/txtonly/docgen.asp?tbl=mr&ID=65

Khoroshi P, Nasr AR, Mirshah Jafari SE, Mosapoor N (2017). Investigating the approach of training a worthy teacher based on Educational Documents of the Islamic Republic of Iran, quarterly Journal of Rahbord Farhang 10(7):163-1186.

Lee JH, Kim YG (2001). A Stage Model of Organizational Knowledge Management: a Latent Content Analysis. Expert systems with applications 20(2001):299-311.

Maleki B (2005). The Effect of Teaching Cognitive and Metacognitive Strategies on Increasing the Learning and Recording of Different Textbooks, Journal of New Cognitive Science (27):42-50.

Okereke CI, Nnenna IB (2011). Training, Manpower Development and Job Performance: Perception and Relevance among Civil Servants in Ebonyi State. Nigeria Journal of Economics and International finance 3(6):399-406.

Pepper D (2011). Assessing Key Competences across the Curriculum — and Europe. European Journal of Education 46(3):335-353.

Redecker C (2012). A Review of Evidence on the Use of ICT for the Assessment of Key Competences. Luxembourg (in press): Institute for Prospective Technological Studies (IPTS). Voorhees, R. A. (2001). Competency – based learning models, a necessary future. 5-13. https://www.education.ie/en/Press-Events/Events/EU-Presidency-2013/Conference-19-20-Mar-2013/Workshop-5_The-Use-of-ICT-for-the-Assessment-of-Key-Competences.pdf

Rychen DS, Salg anik LH (2003). Definition and Selection of Competencies: Theoretical and Conceptual Foundations (DeSeCo). Summary of the final report: "Key Competencies for a Successful Life and a Well- Functioning Society". Paris.

Shahmohammadi N (2014). Competencies and competencies of the present day teacher (the principles that teachers need to know and being able to do), Journal of Elementary Education Growth 18(1):8-13.

Wiliam D (2009). What kinds of assessment support learning of key competences? Paper presented at the Directorate-General of Education and Culture, Brussels.

Wolf A (2001). Competence-based assessment. In J. Raven & J. Stephenson (Eds.), Competence in the Learning Society. New York: Peter Lang.

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