

Educational Research and Reviews

Volume 9 Number 22 23 November, 2014

ISSN 1990-3839



*Academic
Journals*

ABOUT ERR

Educational Research and Reviews (ISSN 1990-3839) is published bi-monthly (one volume per year) by Academic Journals.

Educational Research and Reviews (ERR) is an open access journal that publishes high-quality solicited and unsolicited articles, in English, in all areas of education including education policies and management such as Educational experiences and mental health, the effect of land tenure system on resource management, Visualization skills and their incorporation into school curriculum, Gender, education and child labour etc. All articles published in ERR are peer-reviewed.

Contact Us

Editorial Office: err@academicjournals.org

Help Desk: helpdesk@academicjournals.org

Website: <http://www.academicjournals.org/journal/ERR>

Submit manuscript online <http://ms.academicjournals.me/>.

Editors

Prof. Peter Massanyi

*Slovak University of Agriculture, Faculty of
Biotechnology and Food Sciences, Department of
Animal Physiology
Tr. A. Hlinku 2, SK-949 76 Nitra, Slovak Republic
Slovak Republic.*

Prof. Name Mostafa El-Sheekh

*Faculty of Science, Tanta University,
Tanta 31527, Egypt
Egypt.*

Prof. Minghua Zhou

*Nankai University
No. 94, Road Weijin,
Nankai District,
Tianjin 300071, China
China.*

Prof. Muhammad Abdul Rauf

*United Arab Emirates University
United Arab Emirates.*

Prof. Shao Hongbo

*Qingdao University of Science Technology
Zhengzhou Road 53, Qingdao266042, China
China.*

Prof. Ghasem D. Najafpour

*Oshirvani University of Technology
Babol, Iran
Iran.*

Prof. Toyin Ayodele Arowolo

*Department of Environmental Management &
Toxicology
College of Environmental Resources Management
University of Agriculture
P.M.B. 2240
Abeokuta 110001
Ogun State
Nigeria.*

Dr. Vikrant John Vedamanikam

*University Malaysia Terengganu,
Mengabang Telipot,
21030 Kuala Terengganu,
Terengganu,
Malaysia.*

Dr. Xue Song Wang

*Department of Chemical Engineering, Huaihai Institute
of Technology, PR. China
CangWu Road 59#, Lianyungang, Jiangsu, PR. China
China.*

Dr. Mohamed Nageeb Rashed

*Aswan Faculty of Science, South Valley University,
Aswan,
Egypt.*

Prof. Hamayun Khan

*Department of Chemistry
Islamia College University
Peshawar-25120,
Pakistan.*

Editorial Board

Prof. García Mayo, María del Pilar

*Departamento de Filología Inglesa y Alemana y de Traducción e Interpretación
Universidad del País Vasco (UPV/EHU)
Paseo de la Universidad 5
01006 Vitoria- Spain*

Dr. Faisal Manzoor Arain

*C-5, Block # 7, Gulshan-e-Iqbal, Karachi 75300,
Pakistan.*

Prof. Frank Witlox

*Ghent University – Department of Geography
Krijgslaan 281, S8
B-9000 Gent
Belgium.*

Prof. Georgios D. Sideridis

*University of Crete
Department of Psychology
Rethimno, 74100
Greece.*

Prof. Mutendwahothe Walter Lumadi

*North West University
Private Bag x 2046
Mmabatho
2735
South Africa..*

Dr. Miriam McMullan

*Faculty of Health and Social Work
University of Plymouth
Plymouth PL6 8BH*

Dr. Jitendra Pandey

*Banaras Hindu university
Environmental Science Division, Department of Botany,
Banaras Hindu university, Varanasi – 221005,
India.*

Prof. Moshe Barak

*Graduate Program for Science and Technology Education
Ben-Gurion University of the Negev, Beer Sheva 84105
Israel*

Dr. Boniface Francis Kalanda

*Malawi Social Action Fund
Private Bag 351
Lilongwe
Malawi*

Dr. Hiam Zein

*Psychology and Education
Lebanese American University
P.O.Box: 13-5053.Chouran-Beirut,
1120 2801-Lebanon
Lebanon*

Dr. Joel O. Eriba

*Faculty of Education
Benue State University,
Makurdi
Nigeria.*

Prof. Bingjun Yang

*School of Foreign Languages,
Southwest University, Beibei,
Chongqing 400715, P. R. China,
China*

Dr. Ernest W. Brewer

*The University of Tennessee,
Educational Administration and Supervision,
324A Claxton Addition,
Knoxville,
Tennessee*

Prof. Gail Derrick

*Regent University
School of Education
1000 Regent University Drive
Virginia Beach, VA 23464.*

Dr. Evridiki Zachopoulou

*Department of Early Childhood Care and Education,
P.O. Box 141, Sindos 57400,
Thessaloniki,
Greece.*

Prof. Michael Omolewa

*Nigerian Permanent Delegation to UNESCO Rue Miollis
75015, Paris.*

Dr. Francesco Pastore

*Research fellow, IZA Bonn
Assistant Professor, Seconda Università di Napoli
Palazzo Melzi, Piazza Matteotti, 81055,
Santa Maria Capua Vetere (Caserta)
Italy*

Dr. Syed Iftikhar Hussain Shah

*Technical Education and Vocatio TEVTA Secretariat,
96-H Gulberg-II, Lahore
Pakistan.*

ARTICLES

Research Articles

- Job satisfaction levels of secondary school Physics, Chemistry and Biology teachers** 1173
A. Kadir Maskan
- Prospective teachers' views about video-enhanced general biology instruction** 1182
Gülcan Çetin
- Teachers' views on the new measurement and assessment approaches with regard to Mathematics curriculum reform** 1200
Meral CANSIZ AKTAŞ^{1*} and Adnan BAKİ²
- The effect of concept mapping- guided discovery integrated teaching approach on Chemistry students' achievement and retention** 1218
Fatokun K.V.F.* and Eniayeju P. A.
- Who are 'non-traditional students'? A systematic review of published definitions in research on mental health of tertiary students** 1224
Ethel Chung* and Deborah Turnbull

Educational Research and Reviews

Table of Contents: Volume 9 Number 22 23 November, 2014

ARTICLES

Research Articles

- Individual literacy activities with hearing-impaired children in the preschool period** 1239
H. Pelin Karasu
- Medicine for somewhere: The emergence of place in medical education** 1250
Brian M. Ross^{1*}, Kim Daynard^{1,2} and David Greenwood²

Full Length Research Paper

Job satisfaction levels of secondary school Physics, Chemistry and Biology teachers

A. Kadir Maskan

Z.G. Education Faculty Department of Physics Education, Dicle University Diyarbakir, Turkey.

Received 14 October, 2014; Accepted 12 November, 2014

The purpose of this study is to determine the job satisfaction levels of the teachers participating in the study and to investigate whether their job satisfaction levels differ with respect to certain variables. The participants of the study were 297 science teachers (physics: 104, chemistry: 105, biology: 87 and 1 N/A) from secondary schools in the city of Diyarbakir (Turkey). The research data were collected with a questionnaire form applied to determine the participants' demographic backgrounds and with the Job Satisfaction Scale. For the analysis of the data, frequencies, percentages, mean scores, standard deviations and t-test were used. As for the multiple comparisons, ANOVA and Scheffe test were used. According to the mean scores that the participating teachers received from the Job Satisfaction Scale, they had a medium level of job satisfaction. It was also revealed that the teachers' levels of job satisfaction did not differ depending on their gender, their experience in teaching, their field of teaching, their marital status and the location of the school. In Turkey, the Ministry of National Education should take all the financial, social and cultural precautions to make the profession of teaching favorable and to prevent preservice teachers from becoming a teacher incidentally.

Key words: Physics-chemistry-biology teachers, Job satisfaction levels, teachers' problems.

INTRODUCTION

Employees' job satisfaction is one of the most important subjects in corporate life. Therefore, it is important for corporates to determine the factors influential on employees' job satisfaction and to make effort to improve their satisfaction (Bozkurt and Bozkurt, 2008). Job satisfaction, a two-end concept defining employees' satisfaction or dissatisfaction with their job, still draws researchers' attention just as it did even before 1900s (Günbayı and Toprak, 2010; Ertürk and Keçecioglu, 2012). According to Hoppock, job satisfaction is a different combination of psychological, physiological and environmental situations that cause individuals to say "I

am happy with my job". Therefore, for individuals in organizations and for the organizations themselves, the concept of job satisfaction is now defined more extensively (Rinehart and Short, 2003). Vroom (1964) refers to job satisfaction as a part of employees' different job attitudes towards their perceptions, emotions and behavior. There is a linear relationship between employees' motivation and job satisfaction. Maintaining motivation within the organization is defined as a process of behaving in a way to satisfy employees' various needs (Silah, 2005). This is such a process that employees' needs are in a constant change and that differences may

E-mail: akmaskan@gmail.com.

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

thus occur in their behavior. Therefore, the job satisfaction level (high or low) changes depending on employees' level of motivation. In literature, generally, theories of motivation are gathered in two groups. These are content theories and process theories (Efil, 2006). According to content theories, it is necessary to identify the factors which are intrinsic and which cause individuals to behave in a way that determines their needs. Therefore, the initial motivation theories tried to find answers to the question of "What motivates people?" Maslow's Hierarchy of Needs (1954), Herzberg's Two-Factor Theory (1959), Alderfer's Existence, Relatedness and Growth Theory (1972) and McClelland's Achievement Motivation Theory (1958) are regarded as some of content theories.

Hierarchy of Needs developed by Maslow is one of the most well-known theories in the field. According to this theory, all the behaviors demonstrated by an individual are for meeting certain needs of that individual. Also, an individual has certain needs ranging from those with least importance at the bottom to those with most importance at the top. Without first meeting the needs at the bottom, those at the top do not cause an individual to demonstrate certain behavior. According to Maslow, an individual's needs include biological and physiological needs, safety needs, belongingness and love needs, self-expression need, and self-actualization needs. Thus, if managers can understand which needs of employees they want to meet, they can then guide their employees' behaviors by creating the environment in which their employees can satisfy their needs. According to the content theory developed by Herzberg regarding motivation, some factors in work place are related with satisfaction, and some are with dissatisfaction. Herzberg examined these factors as intrinsic and extrinsic factors. The researcher defined intrinsic factors as motivators developed in line with one's responsibilities and with his or her success.

As for the external factors, defined by Herzberg also as hygiene factors, they included corporate policies related directly to dissatisfaction, poor working conditions, low salary and safety problems. Even though good external factors are not enough for motivation, they may still prevent dissatisfaction at work. In order to achieve job satisfaction, corporates should focus on such motivational factors as individual awarding (Judge et al., 2001). McClelland's theory focused on the need for strength relationships and achievement at work. McClelland demonstrated that some of these needs gain importance depending on employees' careers. In later studies, it was claimed that the question of "What motivates people?" did not explain motivation efficiently and that the important question would be "How do people get motivated?" This point of view resulted in process theories regarding motivation. Process theories are motivation theories that try to explain how people get motivated. Process theories included Vroom's Expectation Theory (1964), Adams' Equity Theory (1965) and Locke's Goal Setting (1983).

According to Vroom's Expectation Theory (1964), individuals make effort to achieve what they believe they can succeed in and what they find attractive. What makes a thing attractive depends on whether a thing done by individuals will provide them important and valuable benefits or not (Yücel and Gülveren, 2007). Process theories are related to how the motivation process functions, and these theories try to explain for what purposes individuals get motivated. According to Rollinson and Broadfield (2002), process theories focus more not only on events influential on the strength of motivation but also on mental processes that transform motivation into a certain pattern of behavior. As mentioned in related theories, employees' job satisfaction levels have influence on a number of variables just as their job satisfaction levels are influenced by these variables.

Today, it is important to determine teachers' job satisfaction levels and the factors influential on their job satisfaction levels and to make effort to increase their satisfaction levels. In Turkey, just as it is in the world, the factors that result in teachers' dissatisfaction with their job cause teachers not only to feel discontent with their job but also to find a new job (Delfgaauw, 2005). Hammond (2001) stated that approximately 30% of new teachers give up their profession in five years and that special education teachers (for instance, teachers of the visually-impaired, hearing-impaired and mentally-retarded) have a higher tendency to quit their job when compared to the teachers of other fields (for instance, teachers of biology, math and so on) (Williams and Poel, 2006). In one study titled "The Phenomenon of Alienation in Education and the Teacher" Erjem (2005) regarded "job dissatisfaction" as an indicator of alienation. The findings obtained via the interviews held with the teachers revealed that 65% of them felt dissatisfaction with their job. Among the reasons for their dissatisfaction with their job was the fact that the classrooms were too crowded; that their students did not get prepared for the lessons; and that they had too much work load.

However, in the world as well as in Turkey, studies conducted so far have failed to explain what cause teachers to feel dissatisfaction with their job. In addition, teachers' job satisfaction is influenced by such important factors as teachers' way of selecting the profession of teaching, their gender, working conditions, difficulties in the profession, financial conditions, experience in teaching, relationships with colleagues, corporate policies, and opportunities of promotion within the school, administrators and management. However, it is an issue of discussion and research how and to what extent these factors influence teachers' job satisfaction. The present study was conducted to investigate secondary school physics, chemistry and biology teachers' reasons for choosing the profession of teaching, to determine their job satisfaction levels and to examine whether their job satisfaction levels significantly differ depending on certain variables.

METHOD

Participants

The present study was conducted with 297 physics, chemistry and biology teachers in the academic year of 2011–2012. Of all the participants, 240 of them (80.8%) were teaching at schools in the central town of the city of Diyarbakir in Turkey; 54 of them (18.2%) were teaching at schools in the districts of the city; and 3 of them (1%) did not mention where their schools were located. Besides, among these teachers, 104 of them were physics teachers (35%); 105 of them (35.40%) were chemistry teachers; and 87 of them (29.30%) were biology teachers (One participant did not mention his or her field of teaching). Of all the participants, 105 of them (35.40%) were females, and 192 of them (64.60%) were males. Moreover, 215 of the participants (72.40%) were married, and 79 of them (26.60%) were singles (three participants were not included in data analysis since they did not state their marital status). Of all the teachers, 60 of them (20.20%) had a teaching experience of 1 to 5 years; 64 of them (21.50%) had a teaching experience of 6 to 10 years; 49 of them (16.50%) had a teaching experience of 11 to 15 years; 92 of them (31%) had a teaching experience of 16 to 20 years; and 32 of them (10.80%) had a teaching experience of 21 years or longer.

Data collection tools

For the purpose of collecting the research data, a questionnaire made up of three parts was applied to the participants. The first part of the questionnaire included 10 items regarding the demographic backgrounds of the teachers. The second part included 10 items developed by Smith et al. (Smith et al., 1969) and adapted into Turkish by Becerikli (2006) to determine employees' reasons for choosing their job. As for the third part of the questionnaire (Job Satisfaction Scale (JSS), it was made up of 13 multiple choice items adapted into Turkish by Becerikli (2006). Each item in the scale included such choices demonstrating the participants' levels of job satisfaction as "Very Happy", "Happy", "Neutral", "Unhappy" and "Very Unhappy". The positive items found in the scale were scored as 5,4,3,2 and 1; and the negative items were scored reversely as 1,2,3,4 and 5. The participants received a maximum score of 65 and a minimum score of 13 for their responses to the statements in the items. For the scale, the participants' scores were regarded as $13 \leq$ very bad < 23.4 ; $23.4 \leq$ bad < 33.8 ; $33.8 \leq$ average < 44.2 ; $44.2 \leq$ good < 54.6 ; and $54.6 \leq$ very good ≤ 65 . The reliability of the scale was calculated, and for the whole scale, Cronbach Alpha coefficient was found to be 0.872. For the validity of the scale, the items in the questionnaire were evaluated via face-to-face interviews held with the participants and with experts in the fields of measurement and evaluation and Turkish Language. These evaluations focused on the scope and comprehensibility of the items and on whether the items measured the teachers' reasons for their selection of the profession and their levels of job satisfaction. The suggestions put forward during the interviews were taken into account by the researchers, and the necessary corrections, if any, were made.

Data analysis

For the analysis of the data regarding the demographic backgrounds of the participants, frequencies, percentages and mean scores were used. In the second part of the Job Satisfaction Scale, ANOVA and Scheffe test were applied to determine whether there were significant differences between the items regarding the participating teachers' reasons for becoming a teacher. As for the analysis of the third part of the Job Satisfaction Scale, t-test and Scheffe test were conducted. For these analyses, SPSS ver. 15.0

package software was used.

FINDINGS

This part presents not only the reasons why the physics, chemistry and biology teachers participating in the study became a teacher but also the differences regarding their reasons for becoming a teacher. This is followed by the findings demonstrating the participants' levels of job satisfaction as well as demonstrating whether there were significant differences in their job satisfaction levels with respect to their gender, marital status, field of teaching, experience in teaching and the location of their school. Table 1 presents the results of the frequency analysis regarding the participants' reasons for becoming a teacher. According to the data presented in Table 1, 34.7% of the participants became a teacher because they wanted to; 22.6% of them became a teacher incidentally; 16.5% of them stated that finding a job was guaranteed after graduation; 4.7% of them became a teacher in line with their parents' desire and only 0.7% of them became a teacher as the salary was satisfying.

According to the data presented in Table 2, there were significant differences between the participants' reasons for becoming a teacher. Table 3 presents the results of Scheffe test conducted to determine which groups caused the differences.

As can be seen in Table 3, there was a difference between Item-1 (It allows me to do the job I want, see Table 1) and Item-9 (I became a teacher totally incidentally) in favor of the former item ($p < .005$). As other multiple comparisons did not reveal any significant differences, they are not presented here in Table 3.

The mean score of the 297 participating teachers obtained via the Job Satisfaction Scale was 41.41 (maximum score = 65; minimum score = 13), which shows that the teachers had a medium level of job satisfaction. Table 4 presents the results of independent groups t-test conducted to determine whether the participants' job satisfaction levels differed depending on their gender.

According to the data presented in Table 4, there was no significant difference between the participants' job satisfaction mean scores with respect to their gender. However, the female teachers' job satisfaction mean scores were higher than those of the male teachers. Table 5 presents the results of ANOVA test conducted to determine whether the participants' job satisfaction levels differed depending on their field of teaching.

When the data presented in Table 5 are examined, it is seen that there was no significant difference between the participants' job satisfaction mean scores with respect to their field of teaching (physics, chemistry and biology). Table 6 presents the results of independent groups t-test conducted to determine whether the participants' job satisfaction levels differed depending on their marital status.

Table 1. Results of the frequency analysis regarding the participants' reasons for becoming a teacher.

Items	F	%
1. It allows me to do the job I want	103	34.7
2. It provides the chance to take responsibility	16	5.4
3. It allows progress in business life	3	1.0
4. The workplace is suitable for me	16	5.4
5. This job is appropriate to the demands of my family	14	4.7
6. I have chosen this job based on others' recommendations	7	2.4
7. Finding a job is guaranteed	49	16.5
8. The salary is satisfactory	2	0.7
9. I became a teacher completely by chance	67	22.6
10. Other (Obligation, wrong choice and so on)	20	6.7
Total	297	100

Table 2. Results of ANOVA regarding the participants' reasons for becoming a teacher.

Groups	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	3539.408	9	393.268		
Within Groups	22460.652	287	78.260	5.025	.000
Total	126000.061	296			

Table 3. Results of Scheffe test regarding the difference between the participants' reasons for becoming a teacher.

(I)	(J)	Mean difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-1.94842	2.37720	1.000	-11.8111	7.9143
	3	3.19741	5.18136	1.000	-18.2994	24.6942
	4	2.42658	2.37720	.999	-7.4361	12.2893
	5	5.57836	2.51988	.841	-4.8763	16.0331
	6	11.14979	3.45540	.323	-3.1863	25.4858
	7	4.59877	1.53524	.443	-1.7707	10.9683
	8	15.36408	6.31584	.747	-10.8396	41.5677
	9	6.93870*	1.38848	.004	1.1781	12.6993
	10	6.51408	2.16167	.433	-2.4544	15.4826

Table 4. T-test results regarding the difference between the participants' job satisfaction scores with respect to the variable of gender.

	Gender	N	Mean	Std.Deviation	T	Sig.
Total	1	105	42.2019	9.09644	1.075	.283
	2	192	40.9740	9.53606		

1: Female teacher; 2: Male teacher.

According to the data presented in Table 6, no significant difference was found between the participants' job satisfaction mean scores with respect to their marital

status. However, it was seen that the single teachers had a bit higher job satisfaction mean scores than the married ones. Table 7 presents the results of independent groups

Table 5. Results of ANOVA regarding the difference between the participants' job satisfaction scores with respect to their field of teaching.

Group	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	336.330	4	84.082	.951	.435
Within Groups	25640.057	290	88.414		
Total	25976.386	294			

Table 6. T-test results regarding the difference between the participants' job satisfaction scores with respect to their marital status.

	Marital status	N	Mean	Std. Deviation	T	Sig.
Total	1	215	41.2419	9.60369	-.367	.714
	2	79	41.6962	8.83808		
	N/A	3				

1: Married teachers; 2: Single teachers; N/A: Not Available.

Table 7. T-test results regarding the difference between the participants' job satisfaction scores with respect to the location of their school.

	Location of schools	N	Mean	Std.Deviation	T	Sig.
Total	1	240	40.9833	9.52379	-1.461	.382
	2	54	43.0370	8.40926		
	N/A	3				

1: Central Town; 2: District.

Table 8. ANOVA results regarding the difference between the participants' job satisfaction scores with respect to their experience in teaching.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	389.298	4	97.325	1.110	.352
Within Groups	25610.763	292	87.708		
Total	26000.061	296			

t-test conducted to determine whether the participants' job satisfaction levels differed depending on the location of their school.

When the data presented in Table 7 are examined, it is seen that there was no significant difference between the participants' job satisfaction mean scores with respect to the location of their school. However, the participants teaching at schools located in the districts had higher job satisfaction mean scores than those teaching in the central town. Table 8 presents the results of ANOVA conducted to determine whether the participants' levels of job satisfaction differed depending on their experience in teaching.

According to the data presented in Table 8, no significant difference was found between the job satisfaction mean scores of the participants with respect to their experience in teaching. Table 9 shows the percentages and frequencies regarding the participants'

responses to the items in the job satisfaction scale.

According to the participants' responses to the items of the job satisfaction scale, as can be seen in Table 9, 48.1% of all the participants felt happy since they were always busy in their job, while 37.7% of them were not happy with this. It was seen that there was not much difference between the percentages of those who were happy because their job allowed them to work independently in the work place (32.6%) and the percentage of those who were unhappy (38.7%). In addition, the percentage of those who were happy because their job allowed them to do things for others was 83.5%, while the percentage of those who were happy because their job allowed them to tell people what to do was 83.2%. When Table 9 is examined, it is seen that the percentage of those who were happy with their job and with their salary (14.2%) was a lot lower than the percentage of those who were unhappy (73,4%). Moreover, the percentage of

Table 9. Distribution of the percentages and frequencies regarding the participants' responses to the items in the job satisfaction scale.

Items	Very happy		Happy		Neutral		Unhappy		Very unhappy	
	f	%	f	%	f	%	f	%	f	%
1. Because I am always busy in my job	23	7.7	120	40.4	42	14.1	85	28.6	27	9.1
2. Because it allows me stay alone	12	4.0	85	28.6	85	28.6	85	28.6	30	10.1
3. Because it allows me to do things for others	130	43.8	118	39.7	25	8.4	14	4.7	10	3.4
4. Because it allows me to tell people what to do	93	31.3	154	51.9	27	9.1	17	5.7	6	2.0
5. Because my and the salary are satisfying	5	1.7	37	12.5	37	12.5	97	32.7	121	40.7
6. Because I have the opportunity to get promoted in my job	10	3.4	50	16.8	52	17.5	88	29.6	97	32.7
7. Because I have the opportunity to do things using my own abilities	43	14.5	118	39.7	36	12.1	62	20.9	38	12.8
8 Because I am free to put my own decisions into practice	40	13.5	115	38.7	40	13.5	68	22.9	34	11.4
9. Because I can use my abilities in my job	52	17.5	127	42.8	36	12.1	58	19.5	24	8.1
10. Because the working conditions appeal to me	21	7.1	91	30.6	44	14.8	84	28.3	57	19.2
11. Because my colleagues work with each other	46	15.5	143	48.1	53	17.8	39	13.1	16	5.4
12. Because I am appreciated for the good things I do	27	9.1	107	36.0	57	19.2	65	21.9	41	13.8
13. Because I experience the feeling of success in my job	74	24.9	139	46.8	28	9.4	37	12.5	19	6.4

those who were happy because of the promotion opportunity in their job (20.2%) was far lower than the percentage of those who were unhappy (62.3%). However, the percentage of those who were happy because they could do things using their abilities (54.2%) was higher than the percentage of those who were unhappy (33.7%). The percentage of those who were happy because they were free to put their own decisions into practice was 52.2%, and the percentage of those who were happy because they could use their abilities in their job was 60.3%. The percentage of those who were happy because of the working conditions was 37.7%, while the percentage of those who were unhappy was 47.5%. It was also found that 63.6% of the participants were happy because their colleagues could work with each other. In addition, the percentage of the teachers who were happy because they were appreciated for the good things they did (45.1%) was higher than the percentage of those who were unhappy (35.7%). Lastly, it was seen that the percentage of the teachers who were happy because of their feeling of success in their job (71.7%) was much higher than the percentage of those who were unhappy (18.9%).

DISCUSSION AND CONCLUSION

This study was carried out with 297 physics, chemistry and biology teachers from secondary school in the city of Diyarbakir (Turkey). This part discusses the results obtained via the analysis of the data collected from the participants. Of all the participating teachers, 34.7% of them became a teacher because they wanted to; 22.6% of them became a teacher totally incidentally; 16.5% of

them became a teacher because finding a job was guaranteed after graduation; 4.7% of them became a teacher in line with their parents' desire and only 0.7% of them became a teacher because they found the salary satisfying. Furthermore, 6.7% of the teachers reported that they became a teacher due to external factors (Table 1). In the study, no significant difference was found between the participants' reasons for becoming a teacher (Table 2). However, there was a difference between Item-1 (It allows me to do the job I want; 34.7%) and Item-9 (I became a teacher totally incidentally; 22.6%) in favor of the former item (Table 3; $p < .005$). These findings demonstrate that majority of the participants became a teacher not incidentally but consciously. Findings obtained in national and international studies conducted to examine teachers' reasons for becoming a teacher, their job satisfaction and other related factors are parallel to some of those obtained in the present study. According to a study on "Teacher Competencies" carried out by Turkish Education Association (TEA, 2009) with 2007 teachers (973 elementary school teachers and 1034 field teachers), 28.4% of field teachers became a teacher because it was their ideal job; 21.4% of them became a teacher because finding a job was guaranteed; 13.8% of them became a teacher to be beneficial for the society and for children; and 7.7% of them became a teacher in line with their parents' desire. The findings obtained in this study are consistent with the fact mentioned by previous studies that financial causes (Kniveton, 2004) or external factors (Bastick, 2000; Boz and Boz, 2008; Saban, 2003) have influence on choosing a profession. Just as it was in the present study, the low and average levels of job satisfaction with the profession of teaching reported in other related studies explain why so many

people quit the profession of teaching (Erden, 2008). If employees in a corporate make their preferences based on their own benefits and on external factors and if they are doing their job just to avoid 'being unemployed', they are more likely to quit their profession of teaching when they find another job with better opportunities.

In the study, no significant difference was found between the participating teachers' job satisfaction mean scores with respect to the variable of gender. However, it was revealed that the female teachers had higher job satisfaction mean scores than the male participants (Table 4). These findings are parallel to those of other related national and international studies. In one study carried out by Ololube (2006) in Nigeria Rivers State with 680 teachers from 146 public secondary schools, it was found that female teachers had higher levels of job satisfaction than their male colleagues. Another similar study on teachers' job satisfaction levels was conducted in Pakistan with 785 teachers selected randomly from public high schools. In the study, it was found that the female teachers received higher mean scores from the Job Satisfaction Scale than the male teachers (Mahmood et al., 2011). Moreover, another comparative study on "Job Satisfaction among School Teachers" was conducted by Agnihotri (2013) in India (Nadaun Tehsil of District Hamirpur, Himachal Pradesh) with a total of 300 teachers. It was found that the female teachers had higher levels of job satisfaction when compared to the male teachers.

In the study, no significant difference was found between the participating teachers' job satisfaction mean scores with respect to their field of teaching (Table 5). One study carried out by Tuncan and Çetin (2009) in Istanbul with 265 high school teachers revealed a difference between teachers of vocational courses and field teachers in terms of their job satisfaction in favor of the teachers of vocational courses. In the study, it was found that science and math teachers had a medium level of job satisfaction. In another study conducted with 198 high school teachers, Sarpkaya (2000) compared the teachers' job satisfaction levels with respect to their field of teaching and reported that the lowest level of job satisfaction belonged to the teachers of vocational courses and that it was foreign language teachers who had the highest level of job satisfaction. In another study, Özdayı (1990) reported that teachers' job satisfaction level was highest in favor of foreign language teachers and that the lowest level belonged to the teachers of philosophy and science.

In this study, no significant difference was found between the job satisfaction mean scores of the participating teachers with respect to their marital status (Table 6). However, the single teachers' job satisfaction mean scores were a bit higher than those of the married teachers. Depending on this finding, it could be stated that single teachers have more free time than married teachers and that the former try harder to improve their

professional skills or to get promoted. When the related literature is examined, it is seen that there are various related findings. In one study, Şahin (2013) reported that single teachers had higher satisfaction scores regarding their job in general, the salary and the administration. Different from this finding, Canbay (2007) found that married teachers had higher job satisfaction levels when compared to single and widow teachers. In the study, no significant difference was found between the participating teachers' job satisfaction mean scores with respect to the location of their school. However, the teachers working at schools in districts had higher job satisfaction mean scores than those working at schools in the city center (Table 7). Based on this result, it could be stated that the financial states of teachers working at schools in districts helped them have better living conditions than those working at schools in the city center. On the other hand, in another study carried out by Mahmood and colleagues (2011) in Pakistan with 785 teachers randomly selected from public high schools, it was found that there was no significant difference between the job satisfaction mean scores of the teachers working in urban and rural areas.

In the study, no significant difference was found between the participating teachers' job satisfaction mean scores with respect to their experience in teaching (Table 8). Similarly, in one study titled "Examining the Life Satisfaction, Job Satisfaction and Professional Fatigue in Teachers of Technical Courses" carried out by Avşaroğlu, Deniz and Kahraman (2005), it was reported that the teachers' job satisfaction mean scores did not significantly differ depending on the variable of experience in teaching. Different from this result, in another study titled "High School Teachers' Job Satisfaction: A Case from Manisa" conducted by Sarpkaya (2000), it was revealed that the teachers' job satisfaction levels increased in line with their experience teaching. In one other study titled "Job Satisfaction among School Teachers" carried out by Agnihotri (2013) in India, it was demonstrated that experienced teachers had higher levels of job satisfaction when compared to those with less experience in teaching. According to the participants' responses to the items found in the Job Satisfaction Scale (Table 9), 48.1% of all the participating teachers felt happy as they were always busy with the profession of teaching. In addition, the percentage of those who were happy because their job allowed them to do things for others was 83.5%. Furthermore, 83.2% of the teachers were happy because the profession of teaching provided them with the opportunity to tell people what to do. The percentage of those who were happy because of their salary was quite high (14.2%). The percentage of those who were happy because of the promotion opportunities at school was 20.2%. These findings demonstrate that the participating teachers were happy with all the aspects of the profession of teaching except for the financial and promotion-related aspects. However, the percentage of those who were happy because they were able to use

their abilities and to do good things was 54.2%, while the percentage of those who were happy because of the freedom of putting their own decisions into practice was 52.2%. On the other hand, the percentage of those who were happy with the working conditions was 37.7%. Moreover, 63.6% of the participating teachers were happy because their colleagues could work together. The percentage of those who were happy because they were appreciated for the good things they did was 45.1%, and the percentage of those who were happy because of the feeling of success in their job was 71.7%. The participating teachers' mean score obtained from the Job Satisfaction Scale was 41.41 which shows they had a medium level of job satisfaction. Similarly, in the study titled "High School Teachers' Job Satisfaction: A Case from Manisa" conducted by Sarpkaya (2000) with 198 teachers, it was reported that the teachers had a medium level of job satisfaction mean score. Considering all the discussion above, it could be stated that even in developed countries in the world, teachers experience problems regarding job satisfaction. For instance, the annual MetLife Survey of the American Teacher was conducted by telephone among 1,000 U.S. public school teachers of grades K-12 and 500 U.S. school principals in public schools, grades K-12, in 2012. This longitudinal survey revealed a 23% decrease in American teachers' job satisfaction in five years since 2008. Only 39% of the teachers reported that they were very satisfied (Resmovits, 2013). Related studies demonstrate that employees' job satisfaction levels are fairly important for the success of a corporate. Employees' higher levels of job satisfaction increase their motivation and cause them to do their job more willingly, which eventually increases the quality of the job they do (Nidich and Nidich, 1986). As mentioned by Oliver (2007), if administrators do not provide teachers with a working environment without first considering the variables influential on job satisfaction and if teachers' job satisfaction levels are thus low, these teachers will not have the feeling of school engagement; they will experience fatigue; a positive corporate culture will not be established; there will be an increase in teachers' attendance at work; no one at school will be happy; and the academic achievement level will not increase at school. For all these reasons, if teachers have increasing levels of job satisfaction, their school engagement level will increase as well. In addition, teachers with low levels of job satisfaction will tend to cause trouble at school, to complain about things all the time and to demonstrate such behaviors as having conflict with colleagues, gossiping and resisting to renovations (Mitchell and Larson, 1987; Başaran, 2000; Eren, 2000). In one study, Hughes (2006) pointed out that employees' engagement with their corporate has connection with their belief in and acceptance of the corporate goals; that all these factors have positive influence on teachers' job satisfaction and on their performance; and that students' performance at school

will thus increase. Corporates which fail to commune with their employees and which have employees with job dissatisfaction will neither be able to prevent their employees from quitting their job nor develop a loyal work force. The more satisfied employees are with their job, the less they will quit their job; the more positive organizational behavior they will demonstrate; and the happier they will be with their life (Judge and Watanabe, 1993). Consequently, there could be independent factors influential on job satisfaction, and the degree of influence of these factors may change from one corporate to another. The findings obtained in the present study demonstrated that the participating teachers' job satisfaction did not differ with respect to their gender, field of teaching, experience in teaching, marital status and the location of their school. In addition, it was seen that the teachers participating in this study had a medium level of job satisfaction. A great majority of the participants stated that they became a teacher because it was totally incidental, because finding a job was guaranteed or because they had to have a job.

Suggestions

According to the results obtained in the present study, the participating teachers' medium level of job satisfaction could have negative influence on their success at school, their motivations, in-class atmosphere and on the learning climate. Therefore, it is important for teachers to have satisfaction in terms of both internal and external motivators. For this purpose: The Ministry of National Education and the Higher Education Council should encourage students - who want to become beneficial for the society and for future generations and who thus want to become a teacher - to prefer teacher-training faculties. For this reason, incentive precautions should be taken, and related funds should be provided. In this way, students graduating from a high school can prefer the profession of teaching without being under the influence of any external pressure. If the Ministry of National Education wants teachers to become productive, the Ministry should provide teachers with better working conditions at the beginning of their professional career, award them using internal and external motivators and help them develop more optimistic attitudes in terms of individual and corporate expectations. It is also important to provide teachers with better financial conditions so that the success of the corporate and the academic achievements of the students can increase. This could also help teachers gain a better status in the society. Teachers should be provided with opportunities necessary to develop themselves and to get promoted in their job. Teachers should be promoted and awarded for their success according to certain objective criteria. Allowing teachers to take part in the administration and to become a sharer of the decisions made could have

positive influence on their attitudes towards their school.

Conflict of Interests

The author has not declared any conflict of interests.

REFERENCES

- Adams JS (1965). Inequity in social exchange. In L. Berkowitz (Ed.), *Advances in experimental social psychol.* 2: 267-299. New York: Academic Press.
- Agnihotri AK (2013). Job Satisfaction Among School Teachers, *Indian Streams Res. J.* 3(2), 1-7.
- Alderfer CP (1972). *Existence, Relatedness, and Growth; Human Needs in Organizational Settings*, New York: Free Press.
- Avşaroğlu S, Deniz EM, Kahraman A (2005). Teknik Öğretmenlerde Yaşam Doyumu, İş Doyumu ve Mesleki Tükenmişlik Düzeylerinin İncelenmesi, *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 14:115-129. Erişim tarihi:11.12.2013, http://www.sosyalbil.selcuk.edu.tr/sos_mak/articles/2005/14/S.
- Bastick T (2000). Why teacher trainees choose the teaching profession? Comparing trainees in metropolitan and developing countries. *Int. Rev. Educ.* 46(3/4):343-349.
- Başaran İE (2000). *Örgütsel Davranış*, Ankara: Feryal.
- Becerikli YS (2006). "Örgütlerde Sosyodrama Kullanımı ve İş Doyumu Düzeyi Arasındaki İlişki: İlkokul Öğretmenleri Üzerinde Bir Araştırma", *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 15:113-135.
- Boz Y, Boz N (2008). Kimya ve matematik öğretmen adaylarının öğretmen olma nedenleri. *Kastamonu Eğitim Dergisi*, 16(1):137-144.
- Bozkurt Ö, Bozkurt I (2008). A Field Study on Job Satisfaction Effecting Internal Factors in Education Sector, *Doğuş Üniversitesi dergisi*, 9(1):1-18.
- Canbay S (2007). İlköğretim okullarında çalışan öğretmenlerin iş doyum ve denetim odağı ilişkisi. (Unpublished dissertation). Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, İzmir.
- Hammond DL (2001). The challenge of staffing our schools. *Educ. Leadership*, 58(8):12-17.
- Delfgaauw J (2005). The Effect of Job Satisfaction on Job Search : Not Just Whether, But Also Where. Tinbergen Institute Discussion Paper, October, Rotterdam, Erasmus University.
- Efil İ (2006). *İşletmelerde Yönetim ve Organizasyon*, İstanbul: Alfa Aktüel.
- Erden M (2008). *Eğitim bilimine giriş*. Ankara: Arkadaş Yayınevi.
- Eren E (2000). *Örgütsel Davranış ve Yönetim Psikolojisi*. İstanbul, Beta Yayınları.
- Eren E (2001). *Yönetim ve Organizasyon: Çağdaş ve Küresel Yaklaşımlar*. 5. Bası. Beta Yayınevi, İstanbul.
- Erjem Y (2005). Eğitimde Yabancılaşma Olgusu ve Öğretmen: Lise Öğretmenleri Üzerine Sosyolojik Bir Araştırma. *Türk Eğitim Bilimleri Dergisi*. 3(4):395-417.
- Ertürk E, Keçecioğlu T (2012). Relations Between the Levels of Employees Job Satisfaction and Burnout: A Sample Application on the Teachers, *Ege Acad. Rev.* 12(1):39-52.
- Günbayı İ, Toprak D (2010). A Comparison of Primary School Teachers and Special Primary Teachers' Job Satisfaction School Levels, *Elementary Educ. Online*, 9(1):150-169.
- Herzberg F, Mausner B, Snyderman BB (1959). *The Motivation to Works* (2nd ed.). New York: John Wiley & Sons.
- Hughes VM (2006). *Teacher Evaluation Practices and Teacher Job Satisfaction*, Unpublished Dissertation. University of Missouri, Columbia.
- Judge NtA, Watanabe S (1993). Another Lock at the Satisfaction-Life Satisfaction Relationship. *J. Appl Psychol.* 78:939-948.
- Judge TA, Thoreson CJ, Bono JE, Patton GK (2001). The job satisfaction-job performance relationship: A qualitative and quantitative review. *Psychol. Bull.* 127:376-407.
- Kniveton BH (2004). The influences and motivations on which students base their choice of career. *Res. Educ.* 72:47-57.
- Locke E (1983). *Nature and Causes of Job Satisfaction*, J. Durnette (Ed.), *Handbook of Industrial and Organizational Psychology*, USA: Wiley & Sons.
- Mahmood A, Nudrat S, Asdaque MM, Nawaz A, Haider N (2011). Job Satisfaction of Secondary School Teachers: A Comparative Analysis of Gender, Urban and Rural Schools, *Asian Social Sci.* 7(8):203-208.
- Maslow AH (1954). *Motivation and Personality*. New York: Harper and Row. first edition, USA.
- McClelland DC (1958). Methods of measuring human motivation. In J. W. Atkinson (Ed.), *Motives in fantasy, action, and society* (pp. 7). Princeton, NJ: D. Van Nostrand Company, Inc.
- Mitchell TR, Larson JR (1987). *People in Organizations – An Introduction to Organizational Behaviour*, NY: McGraw-Hill.
- Nidich RJ, Nidich SI (1986). A Study of School Organizational Climate Variables Associated with Teacher Morale, *Clearing House*, 60(4):189-191.
- Oliver RE (2007). *Relationship Between Teacher Job Satisfaction and Teaming Structure at the Middle School Level*. Unpublished dissertation, University of Kansas, Kansas.
- Ololube NP (2006). *Teachers Job Satisfaction and Motivation for School Effectiveness: An Assessment*, *Essays Educ.* 18:1-19.
- Özdayı N (1991). *Resmi ve Özel Liselerde Çalışan Öğretmenlerin İş Tatmin Durumlarının Karşılaştırılması*. (Yayınlanınanış Doktora Tezi). İstanbul Üniversitesi. İstanbul. Resmovits R (2013). http://www.huffingtonpost.com/2013/02/21/teacher-survey-job-satisfaction-2012_n_2729062.html. Date of Access: 20.06. 2014
- Rinehart JS, Short P (2003). Job Satisfaction and Empowerment Among Teacher Leaders, Reading Recovery Teachers and Regular Classroom Teachers. *Educ.* 114(4):570-580.
- Rollinson D, Broadfield A (2002). *Organisational Behaviour and Analysis*. London: Prentice Hall.
- Saban A (2003). A Turkish profile of prospective elementary school teachers and their views of teaching. *Teaching Teacher Educ.* 19:829-846.
- Sarpkaya R (2000). Liselerde Çalışan Öğretmenlerin İş Doyumu: Manisa İli Örneği. *Amme İdaresi Dergisi*, 33(3):111-124.
- Silah M (2005). *Sosyal Psikoloji Davranış Bilimi*, Ankara: Seçkin.
- Smith PC, Kendall LM, Hulin CL (1969). *Measurement of Satisfaction in Work and Retirement*. Chicago, IL: Rand McNally.
- Şahin İ (2013). Öğretmenlerin İş Doyumu Düzeyleri, *YYU J. Educ. Faculty*. Cilt:X, Sayı:1, 142-167, <http://efdergi.yyu.edu.tr>
- Tuncan S, Çetin C (2009). A Study on Determination the Factors that Effect State School teachers' Job Satisfaction, *M.Ü. Atatürk Eğitim fakültesi, Eğitim Bilimleri Dergisi*, 29:155-172.
- TEA (2009). *Öğretmen Yeterlikleri*. http://portal.ted.org.tr/yayinlar/Ogretmen_Yeterlik_Kitap.pdf, Date of Access: 24.04.2013.
- Williams K, Poel EW (2006). *Stress Management for Special Educators: the Self Administered Tool for Awareness and Relaxtion (Star)*, *Teaching Exceptional Children Plus*. 3(1):1-12.
- Vroom HV (1964). *Work and Motivation*, John Wiley&Sons Inc. USA.
- Yücel C, Gülveren H (2007). Sınıfta Öğrencilerin Motivasyonu. M. Şişman ve S. Turan (Edt.), *Sınıf yönetimi içinde* (s. 69-84). Ankara: PegemA Yayıncılık.

Full Length Research Paper

Prospective teachers' views about video-enhanced general biology instruction

Gülcan Çetin

Department of Science and Mathematics Education, Faculty of Necatibey Education, Balıkesir University, Turkey.

Received 16 July, 2014; Accepted 17 November, 2014

The aim of the study is to determine the views of the prospective physics and chemistry teachers about the video-enhanced General Biology instruction. The participants included 19 second-year prospective teachers (10 in Physics and 9 in Chemistry Education) at Necatibey Faculty of Education, Balıkesir University, Turkey in the 2011-2012 academic years. Data were collected using semi-structured interview technique and analyzed by descriptive and content analysis techniques. The results of the study showed that the video-enhanced General Biology instruction increased the participants' interest in biology and made learning more permanent. However, a few participants complained about problems such as language that the videos showed in the courses was mostly in English, Internet connections, opening video links and downloading videos. There is a need for more video clips related to biology concepts on a university level in the Turkish language or it may be useful to translate videos from English to Turkish. Teachers should be more competent in the more effective use of educational tools such as websites and videos in biology courses.

Key words: Video, video-enhanced instruction, General Biology, prospective teachers, qualitative research, biology education.

INTRODUCTION

The purpose of a biology course is not only to prepare students for the university entrance exams but also to provide them with biological literacy. In their work, Kurt et al. report that prospective biology teachers are not as biologically literate as may be desired and that they are unable to make the conceptual association between their knowledge of biology and daily life. They cannot turn their knowledge of biology into practical knowledge (2009). Although biology is interlaced with our daily life, some students still do not like this course, have difficulty and trouble understanding it.

There are many studies in literature that investigate

learning difficulties and misconceptions about biology concepts such as diffusion (Yıldırım et al., 2004), photosynthesis (Ekici et al., 2007), photosynthesis and respiration (Ören et al., 2010; Tekkaya and Balcı, 2003), diversity of organisms and classification (Türkmen et al., 2002), classification of vertebrates (Çinici, 2011). Genetics concepts such as cell division, mitosis and meiosis were hard to learn by students (Bahar et al., 1999; Çimer, 2012; Dikmenli, 2010; Kara and Yeşilyurt, 2008; Murniza et al., 2012; Tekkaya et al., 2001; Topçu and Şahin-Pekmez, 2009; Williams et al., 2011). For instance, Bahar et al. (1999) studied with 207 first-year

E-mail: gulcan_cetin@hotmail.com. Tel: 090 2662412762 (144).

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](http://creativecommons.org/licenses/by/4.0/)

university students studying biology. They found the concepts of diffusion and osmosis, obtaining food and animals in plants, enzymes, active transport and secretion of material, defense mechanisms in plants the least difficult. On the other hand, they perceived the concepts of monohybrid and dihybrid crosses and linkage, genetic engineering, meiosis, gametes, alleles and genes related to genetics the most difficult. Similarly, Topçu and Şahin-Pekmez (2009) asserted that 128 elementary school students in İzmir, Turkey had major difficulties in learning genetics, the function of cell and chromosome concepts and other related concepts.

Akçay (2009) indicated that 407 pre-service science teachers in Turkey showed a success level of 57.9%. The topics they were most successful in were circulation in animals, environmental pollution and control, recycling of waste materials, respiratory system and health. On the other hand, the most unsuccessful topics were variations on Mendel's theory, protists, fungi, plants and animals, human genetics, energy metabolism, oxygen consumption, energy flow in live systems, ecosystems and biosphere, plant reproduction, fertilization and embryology. In other study, while Turkish high school students perceived the concepts of hormones, genes and chromosomes, mitosis and meiosis, nervous system, and Mendelian inheritance difficult to learn, they found the concepts of cells and organelles, and ecology easy to learn (Tekkaya et al., 2001). Çimer (2012) has stated that cycles of matter, endocrine system and hormones, aerobic respiration, cell division, and genes and chromosomes were the most difficult topics in biology for 11th grade students in Rize, Turkey.

The factors that can play a role in causing learning difficulties in biology may include the nature of a topic, a teacher's style of teaching, students' learning and studying habits, students' negative feelings and attitudes towards a topic and lack of resources (Bahar et al., 1999; Çimer, 2012, 2007; Topçu and Şahin-Pekmez, 2009). For the subject of biology to be more effective and permanent, it is important to understand first of all how teachers and students perceive the course and what their expectations are. For instance, Prokop et al. (2007) reported that biology was not popular among students and that it was elected by only 145 (15%) out of 941 elementary school students in grades 1-9 in Slovakia. Fifth-grade students had difficulties in botany. Sixth grade students were attracted to zoology. Girls had more of an interest and less difficult in biology than boys as well. In their study, Altunoğlu and Atav (2005) and Yeşilyurt and Gül (2008) showed that teachers believed that students had a negative attitude toward the subject of biology because they came to class with inadequate knowledge from elementary school. They would like to have the textbooks reviewed in terms of content, and learn how subjects can be taken up in class, and about suggestions for other methods that can assist in teaching.

Therefore, teaching biology through several strategies (i.e. using practical work, teaching biology by connecting

topics with daily life, making learning biology interesting, reducing the content of the biology curriculum, using word association tests, grids, concept maps, conceptual change texts, analogies, and concept cartoons) can be useful to overcome learning difficulties and to eliminate misconceptions in biology and make biology learning more effective (Bahar, 2003; Çetin et al., 2004; Çimer, 2012; Ören et al., 2010).

Teachers also need educational videos and games as well other educational materials in Science and Biology classes. Teachers can use Internet to benefit from different technologies that include virtual laboratories, videos, animations and other different technologies in their classrooms (Şorgo et al., 2010). Videos are teaching aid materials and they can be used educational purposes like motivate learning and provide permanent learning since they can be watched anytime. For instance, materials can be provided from websites like YouTube and DailyMotion (Yıldırım and Özmen, 2011). Users can either look for these themselves online or they may be provided with these ready for use (Başaran and Gönen, 2012; Genç, 2013; Kellam, 2010; Pekdağ, 2010; Pekdağ and Maréchal, 2007).

Many studies related to videos are used for educational purposes. For instance, Murniza et al. (2012) developed a learning support tool that made use of a scenario-based learning approach to a virtual biology laboratory and was integrated into a system that enhanced teaching and learning. Croker et al. (2010) developed videos using domestic-quality equipment as self-directed guides for students without the need for any professional audio-visual training, aiming to integrate this approach into laboratory-based learning to support lectures, but these proved to have a low production quality. They presented the following results from the study: More autonomous learners, more time to pool and analyze class data, demonstrators' time being used for higher-level interaction with students, and the production of reusable learning materials for practical implementation in the laboratory. Computer-assisted instructional materials were effective in understanding photosynthesis (Taş et al., 2006) and cell division (Kara and Yeşilyurt, 2008).

Furthermore, making use of an interactive video is significantly effective in terms of learning about outcomes and learner satisfaction in e-learning environments among other lecture settings. Interactive instructional videos may be integrated into e-learning systems (Zhang et al., 2006). Kellam (2010) incorporated digital video resources into an online educational environment (ePhysicianHealth.com) to increase learning outcomes. Many of the participants thought that the digital videos made positive contributions to making the learning environment more authentic, memorable, varied, realistic, and accommodated different learning styles. As stated by Brecht (2012) many students found online video lectures helpful in understanding topics, that they received better grades, experienced a greater ease of learning, and that course dropout rates were reduced when compared

with the alternative of not conducting video lectures.

On the other hand, Escalada and Zollman (1997) showed although there were no significant differences between the experimental and control groups in an introductory college physics course, students could perceive interactive videos as easy to use and effective. In the study of Karamustafaoğlu et al. (2012), it was observed that the students generally liked Vitamin software program containing activities and tests, used in Science and Technology classes, but were thought to be too scant, and the lack of a question-asking feature as well as the difficulty of the existing questions was sources of discontent. Başaran and Gönen (2012) developed a website including videos, animations and problem-solving aids such as true-false questions, open-ended and multiple-choice questions and other instructional materials for physics units of force and movement. This website was useful for students' success in physics, but there were some technical problems such as the lack of opportunity to access the Internet during out-of-class hours and also problems with the students' computers.

With regard to watching films/video clips in class, Pekdağ and Maréchal (2007) and Berk (2009) recommend that teachers allow the students to watch a film at the start of the class before instruction begins, pointing out that this may provide the foundation for understanding the topic that will then be taught. The teacher may consequently be able to form an association between the film and the topic and help the students in their comprehension. Another alternative would be for the teacher to run the film after instruction is given on the topic. This is useful in terms of helping the students better understand the concepts taught. This method is also effective in allowing the teacher to structure a discussion to help students grasp the relationships between concepts. Similarly, Tan and Pearce (2011) point out videos are just teaching aids and the use of videos was effective for learning. Videos should be also supported with explanations and discussion in classroom. It can be visited the website "Video using in education" for further information about integrating videos to a course.

What is important is that biology videos or animations on the subjects to be taught in class with content that is useful for course goals are found and selected on the Internet. The videos should be chosen according to various criteria. For example, to avoid distraction and disinterest, video playing times should not be too long, sound and image quality should be good, content should be scientific and current and of a quality that will attract the students' attention; the videos should also be explanatory, using animation or real time shots to make the content more comprehensible and visually appealing. "Although many video curations sites have their own standards, calculations, ratings and measures for judging the quality of a given video, it does not mean the video will work for you and your students. It is important to preview the videos and evaluate them with your goals

and objectives in mind." (Tucker, 2013, p.6). Later, careful planning should be carried out as to how these are to be integrated into the lesson. The teaching planning should also determine the teaching methods and techniques that will be used outside of the videos in biology instruction; other classroom materials should also be selected and the potential problems that may arise with showing videos in classroom should be taken into account. Videos can be shown during the courses, even beginning or end of the course. This is also important in terms of providing the students with the opportunity of reviewing and reliving the experience of the course and therefore, videos play lists should be accessible for the students (Croker et al., 2010).

In Turkey, increasing number of schools and classrooms with access to the Internet diversifies teaching methods and techniques recently. Thus, instead of relying solely on lecturing and using slides, teachers will be able to conduct their classroom teaching using various materials from the Internet. On the contrary, Kahyaoğlu (2011) stated that though the elementary school science teachers and classroom teachers thought that using new technologies in class was very effective, the rate of using such technologies in Science and Technology instruction was noticeably low. Taşçı et al. (2010) presented similar results. Although the technological infrastructure of schools had improved, there were still a remarkably high percentage of teachers who were either not using these new techniques or using them very rarely. This finding indicated that teachers need to take pre-service computer and foreign language courses to improve their skills in using the new technologies (Altunoğlu and Atav, 2005; Yeşilyurt and Gül, 2008).

Nonetheless, "The educational use of video on campus is accelerating rapidly in departments across all disciplines-from arts, humanities, and sciences to professional and vocational curricula. Faculty, librarians, and administrators expect their use of video in education to grow significantly over the next five years ... Faculty and administrators expect the sources of their video to shift from offline analog storage to online delivery" (Kaufman and Mohan, 2009, p.2).

A review of the related literature shows that there are some studies on, for example, the expectations of biology teachers in the context of teaching biology more effectively (Altunoğlu and Atav, 2005) or with regard to the views, usage and preferences of students with regard to the video class materials used in distance learning (Esgice et al., 2012) as well as the students' views related to the use of a software program (Karamustafaoğlu et al., 2012).

However, no research has been encountered on the views of the prospective teachers in Turkey on video-enhanced General Biology instruction. We think therefore that the findings of the present study will contribute to the literature.

Purpose of the study

The purpose of the study was to determine the views of the prospective physics and chemistry teachers about the usage of the video-enhanced General Biology instruction. Four research questions guide the study:

1. What are the expectations of the prospective physics and chemistry teachers with regard to General Biology instruction, and the video-enhanced General Biology instruction?
2. What are the views of the prospective physics and chemistry teachers with regard to General Biology instruction, and the video-enhanced General Biology instruction?
3. What are the views of the prospective physics and chemistry teachers with regard to the contributions of the video-enhanced General Biology instruction?
4. What are the views of the prospective physics and chemistry teachers with regard to the constraints in the video-enhanced General Biology instruction, and what are their suggestions?

METHOD

The qualitative research method aims to obtain detailed results rather than to generalize the results of the study. As this study is of a descriptive nature, qualitative methodology was used to address the research questions in this study (Yıldırım and Şimşek, 2006).

Participants

While a total of 34 prospective physics teachers were enrolled in second year undergraduate General Biology courses I and II, 30 prospective chemistry teachers were enrolled in total in the same courses. Convenience sampling method was used in the study (Büyükoztürk et al., 2013). The participants of the study were 19 prospective teachers (10 in physics and 9 in chemistry education) at Necatibey Faculty of Education, Balıkesir University in Turkey during the 2011-2012 academic years. Interviews were conducted with individuals on a volunteer basis.

Video-enhanced General Biology instruction

Biology is an important course for other disciplines such as physics and chemistry teacher education, since it provides a background for understanding the relationship between the students' knowledge of biology and daily life (Kurt et al., 2009). Biology aims to integrate the students' knowledge of physics and chemistry with biology. Knowledge of biology can be also useful in the event that the prospective physics or chemistry teachers eventually become science teachers.

Prospective physics and chemistry teachers take General Biology I and II courses as required courses in line with the second year program at the Necatibey Faculty of Education, Balıkesir University. While biology courses are 2+0 credits in physics teacher education, they are 3+0 credits in chemistry teacher education (Balıkesir University Information Package/Course Catalogue, 2014). Programs and credits of General Biology I and II Courses at the university are determined by the Council of Higher Education in Turkey.

The aims of the General Biology I and II courses are to use a systematic and logical approach to being able to realize relationships between subjects and between the subjects and other areas. The contents of the General Biology I encompass the basic components of life, cells, cell types, cell events, classification logic, the classification of living things, ecosystems, relationships between living things, tissues, systems and relationships between systems, respiration, photosynthesis, and an overview of biology topics according to systematic logic. The content of the General Biology II includes cell cycles, mitosis division, meiosis, DNA, RNA, protein synthesis, heredity, plant physiology, an introduction to evolution, and ecology (Balıkesir University Information Package/Course Catalogue).

The author of the present study teaches General Biology I and II to both the prospective physics and chemistry teachers. This study is based on video-enhanced General Biology instruction. As Pekdağ and Maréchal say "Making use of films in the classroom is not only convenient for the teacher in teaching the topic at hand, but the method is also helpful to students because it allows them to more easily construct the concept in their minds" (2007, p.78). Moreover, videos clips may develop critical thinking, decision-making and creativity (Logan, 2013).

A computer, a projector and the Internet were employed in each classroom in the study. However, the cable Internet connection in the classrooms was not working well at the Necatibey Faculty of Education, Balıkesir University. Since the author of the present study, who was the instructor of the General Biology I and II courses, was using videos in her classes for the first time, her inexperience led her to encounter some problems with opening up links and downloading videos. At the time of the study, in the 2011-2012 academic years, the video-enhanced instruction was not very widespread in the faculty. Although the use of videos in classes is much more common today, traditional methods are still used to a greater extent. Although the Turkish Ministry of National Education Department of Educational Material Production provides a limited supply of videos and films to be used at different class levels, films are still not commonly used in education. This may be because of the limited funds allocated to education, technical infrastructure deficiencies at the schools, a limited store of film archives, and the limited number of studies on educational practices (Yakar, 2013).

The steps in teaching the General Biology I and II courses in the study were as follows:

At the start of each class, the topic for that session and how it would be treated was explained. In the next classes, students were given homework related to the next topic at the end of the session. In each class, the students were reminded about the topics of the previous week and their preliminary knowledge about their research assignments was assessed. The class proceeded with the reading/explaining of current news on biology. This practice helps the students in the discussion of their assignments, not only in learning the new topic but also in being informed of various issues related to biology. This is beneficial to the students in terms of helping them form an association between biology and their daily life (15-20 min). Later on in the class, Word documents, PowerPoint presentations, videos related to biology concepts were used to review the new topic. The techniques of questions and answers, discussions, providing examples from daily life, and group work were used.

The class watched videos or sometimes animation links brought to class by the teachers and/or students. The students watched the Turkish videos or animations. If the videos or animations were in the English language, the teacher made a summary of the English videos and animations, translating the content into Turkish. Some students were able to comprehend the English videos and animations. When videos or animations were too long (i.e., 10-15 min), the students were presented with only some parts of the videos. The videos or animations were stopped from time to time so that the summary could be given. In short, the explanations of the

topics were reinforced with videos and animations. Sometimes after the watching of the video, the students were asked to give the class their own summaries.

In addition, the classes also included only one session where biological materials such as bacteria and fungi were examined under the microscope in the laboratory or shown by demonstration techniques. Once the varieties of plants in the schoolyard were pointed out, the topic of plant classification was reviewed. During the classes, homework was given to the students to urge them to research news items on biology and also delve into the topics that would be treated in the next week. A summary was made, which ended the session at the end of the classes.

The Turkish or English biology videos used in General Biology I and II classes were selected according to the content and objectives of the General Biology I and II courses mentioned above, although there are a variety of science and biology videos available on the Internet. Care was also taken to show the students real life or short video clips. This was because Biology is a course taken in high school (MoNE Commission, 2013) and on a university level (Campbell and Reece, 2008) that is taught orally and in which many of the concepts are referred to in their Latin forms. Other teaching methods and techniques are needed if students are to internalize these concepts. It is very important that students at the university level are provided with videos suitable for use in their Biology courses and that these are presented to them preferably in the classroom. In this way, students will seize the opportunity of seeing many things in real-life videos about which they have had only abstract notions; the animations they watch will give them the chance to envision the concepts in their minds and bring them to life. It should be ensured that the videos will help to clarify topics in the student's mind and that the videos or animations will not lead to misconceptions about the topics.

First of all, many science and biology videos prepared in Turkish/Turkish translation or in English on the Internet were reviewed for the study. Since not many Turkish/Turkish translation biology videos that suited the content and objectives of the General Biology I and II courses were available on the Internet, the author of the present study decided to use the biology videos and animations in the English language in the General Biology I and II classes. The Turkish biology videos were mainly chosen from several websites such as 'Website of Turkish Science and Technology', 'The Living World' and 'YouTube'. The English language biology videos used in the classes were mainly culled from 'YouTube', 'TeacherTube' and 'Dailymotion'. Some Turkish videos such as 'Oxidized waste of foods SHIT' and 'Diction training-how to breath correctly?' were used in the classrooms, while some English videos such as 'The Six Kingdom Classification: Part 1, Animals, Plants, & Fungi', 'Bacteria Multiplying', 'Bread Molds' were shown (See Appendix A). Most websites and videos are open access resources. However, the required permissions were obtained from some of the persons or companies featured on the websites and in the video clips.

Data collection tool

Data were collected at the end of the General Biology II course using semi-structured interview technique (Yıldırım and Şimşek, 2006; Büyüköztürk et al., 2013). This is a preferred technique because of the flexibility it allows to ask different types of questions (Miles and Huberman, 1994). A pilot study was conducted to design the interview questions with 2 teacher trainees before the core study. The scope of the questions in the interview was tested with a pilot study to determine the number of questions to be included in the interview form and their comprehensibility. The final version of the interview form had six open-ended questions after the necessary corrections were made. A mathematics educator in the education faculty validated the interview form. The interviews were conducted on the basis of volunteerism and were held face-to-face.

The interviews with the 19 subjects were completed in approximately 6-10 min and were recorded on a voice recorder.

Data analysis

Prior to the analysis of the interviews, the prospective physics teachers were numbered as PS1-PS10 and the prospective chemistry teachers were assigned the codes CS1-CS9. All of the voice recordings of the 19 participants were transferred to the electronic medium and transcribed. These recordings and transcriptions of the audio-tape are on file.

The analysis of the data was performed with the qualitative research analysis method of descriptive and content analysis techniques (Yıldırım and Şimşek, 2006). Themes and sub-themes were not pre-determined for the research questions; these were obtained from the answers the participants gave to the questions in the interview. The statements or concepts described by the participants in their responses to the questions were listed first and then categorized under themes and sub-themes according to each question in the interview. Themes and sub-themes corresponding to each question derived from the participants' responses were checked and re-checked and the needed corrections were made. Care was taken to ensure that each sub-theme featured aspects independent of the others. The coding was repeated many times by the author at intervals. This provided intra-rater reliability. Frequencies of sub-themes for each question were calculated and tables were drawn up. If only one person had expressed a statement or concept with respect to a sub-theme, this was not included in the table but sometimes the view of that person was inserted into the text.

Although there was a total of 19 interviewees, sometimes a participant or participants responded with more than one statement in answer to a question. These were considered as different sub-themes. Although there were 10 prospective physics teachers and 9 prospective chemistry teachers in the study, sometimes the total frequency for physics and the total frequency for chemistry exceeded 10 or 9 respectively. The real names of the participants mentioned in the text were not rendered and instead, the prospective physics and chemistry teachers were assigned codes. For example, PS5 represented a prospective physics teacher and CS5 represented a prospective chemistry teacher. Interesting remarks made by the participants were rendered in quotations accompanied by the participant's code, e.g. "... " (CS5).

Inter-coder reliability was established by a faculty member and the researcher of the study. After data were coded, themes and sub-themes were established and compared. Two researchers had a consistency between themes and sub-themes.

FINDINGS

Expectations of the General Biology instruction

When the first question was asked of the prospective physics and chemistry teachers about what their expectations were regarding the General Biology instruction, only PS5 and CS8 expressed an interest in General Biology, but they said they had no expectations. The other participants' expectations about the courses were collected under two themes: Learning and teaching (Table 1).

According to Table 1, the expectations about the participants regarding the General Biology instruction were observed to be more associated with the learning

Table 1. Frequencies of themes and sub-themes related to the expectations of the General Biology instruction.

Theme	Sub-theme	Some examples of quotations	P f	C f	T f
Learning	Learning about themselves and environment/nature, examining plants and animals, learning what they contribute to nature and what nature contributes to them	“The biology course is for learning about people and also animals; we examined the plants ... In order to get to know our environment, and in certain situations such as poisoning incidents. We ate some mushrooms, for example, and got poisoned. We need to know that the mushrooms were the reason. Some cycles occurring in nature are again related to biology.” (PS1)	6	1	7
		“When I think of biology, I think of living beings, the animal world, plants, etc. A flower blossoms, for example. I would like to learn what the characteristics of a flower are ...” (PS8)			
	To remediate deficiencies, reinforcing what has been learned, learning new things	“... I've always been deficient in biology. Learning about my deficiencies, learning about myself and my body ...” (PS6)	1	2	3
		“... To learn things I don't know, to reinforce what I've learned a bit more.” (CS6)			
Teaching	Learning useful information about daily life	“... To learn about general things we don't know about life and biology or about say, a flower, an animal or a plant ...” (PS2)	1	2	3
		“... Instead of learning details about human or animal anatomy, I would like to learn something general about people, plants and animals ...” (CS3)			
	Memorizing and reviewing the topics in high school	“... I was thinking that the instruction would be based on memorizing just like we always did in high school and middle school. When I saw that it was based on research, I got a lot more out of it ...” (P10)	3	1	4
	More applied teaching, an association with chemistry/difficult	“... When we had a first look at it, we thought it would be like classic courses. We had seen that in high school and middle school, that kind of class was not productive at all. We realized this when we got to the university.” (CS5)	-	3	3

P: Physics Teaching; C: Chemistry Teaching; T: Total

theme rather than with the teaching theme.

Theme 1. Learning: Compared to the prospective chemistry teachers, the expectations about “learning about themselves and environment/nature, examining plants and animals, learning what they contribute to nature and what nature contributes to them” were greater in the prospective physics teachers. On the other hand, the expectation frequencies of both the prospective physics and chemistry teachers in the sub-scale of “to remediate deficiencies, reinforcing what has been learned, learning new things” and “learning useful infor-

mation about daily life” were close to each other.

In short, many participants reported that they wanted to learn more about themselves, the environment, animals and plants in particular, in General Biology classes and to learn how all of these interact with nature. It was observed that the participants expected to see some kind of relationship between the lessons and daily life; they wanted to make up for their deficiencies, reinforce what they had learned, and learn something new.

Theme 2. Teaching: Some participants thought that the General Biology classes would be taught by having the lessons memorized. PS7 expected that the classes would

be repeats of the subjects taught in high school, CS5 thought that the classes would concentrate on practical instruction, and CS7 waited for the course to be connected to chemistry. CS4 however expected the classes to be difficult and said:

I thought that the biology course would be a little harder ... They always taught us by lecturing, they always made us memorize ... I thought the course was not based on memorization because it had been enriched with videos and visuals. (CS4)

It can be seen that some of the participants expected the class work to be based on memorization and that they had never seen General Biology courses taught in this way. Additionally, although one participant in the physics education thought that the class would be a repetition of high school topics, some prospective chemistry teachers apparently expected the class to concentrate on applications, be associated with chemistry and be challenging to them.

To sum up, while the prospective physics teachers largely expected to get to know themselves and the environment, to examine plants and animals and learn about their interactions with nature, the prospective chemistry teachers mostly expected to eliminate their deficiencies, reinforce what they had learned, learn new things, and find out useful information about life in general and daily life. Some prospective physics teachers were expecting the classes to be spent with memorization and a repetition of high school topics whereas some prospective physics teachers expected the classes to concentrate on applications, waiting for some association of the course with chemistry, and thinking that it would be difficult.

Views of the General Biology instruction

The second question asked of the prospective physics and chemistry teachers was about how the General Biology instruction was taught and what percentage of class time the videos took up. The explanations of the participants about how the General Biology courses taught were reviewed under theme of methods and techniques (Table 2).

As can be seen in Table 2, the participants said that the General Biology courses were taught using video, discussion, research homework, trips/observations and laboratory techniques. Only one prospective physics teacher (PS1) out of the participants thought that the General Biology classes were generally entertaining but sometimes boring; this participant did not provide any information about the percentage of class time the video used up. Most of the participants (physics 4; chemistry 6) were of the opinion that videos were used in 60-75% of class time. This was followed by 80-90% (physics 3;

chemistry 2), 50/50% (physics 2; chemistry 2), and 30-40% (physics 1). These results suggest that most of the participants believed that videos were used in class too much.

Theme of teaching methods and techniques: The thoughts of some of the participants related to the sub-theme of “videos, discussion, research homework, trip observations, laboratory” are presented below:

... videos [were used] in the first semester. We went out into the yard this semester ... It was very exciting ... looked at female and male organs [of plants] ... We carried out lab work as well. The laboratory class was actually even more exciting ... More stayed in our mind, actually. We examined them, looked at them through the microscope. We watched the videos. (PS1)

PS1 said that the classes were actually enjoyable and entertaining with the videos and that what was learned in class made a more permanent impression in the mind. On the other hand, PS1 said that when the videos were too long and in English, they were hard to understand and the participants got bored from time to time.

Moreover, some of the participants said that the techniques of the questions and answers and providing examples from everyday life were used in General Biology classes in addition to lectures and videos about the topic; the participants were found to have been satisfied by having the classes taught in this way. PS5's thoughts on the subject are striking:

A topic was explained and then, examples from everyday life were given in general. Later, the previous subjects were reviewed. 80% of the classes were spent with the video ... The videos attracted my attention. (PS5)

In conclusion, the participants stated that concentrating on videos in their General Biology classes as a technique and method of teaching took up an average of 60%-75% of class time. The participants also said that the techniques of discussion, research assignments, trip-observations, laboratory work and providing examples from daily life were also employed in addition to the videos.

Expectations of the video-enhanced General Biology instruction

When the participants were asked in the interviews what their expectations were about having the video-enhanced classes, the answers they gave to this question could be collected under two themes: Learning and boring course (Table 3).

As can be seen in Table 3, most of the expectations of the prospective physics and chemistry teachers about

Table 2. Frequencies of themes and sub-themes related to the views of the General Biology instruction.

Theme	Sub-theme	Some Examples of Quotations	P f	C f	T f
Teaching methods and techniques	Videos, discussion, research homework, trip observations, laboratory	“... They were more visual classes. They stayed in the mind more, though. The Latin words were provided but we understood more by logic ... The videos were about 6-7 minutes long and we watched 4-5 videos over the course of the class. This took up 30%-40% of class time.” (PS4)	7	8	15
		“The classes were spent in a warm atmosphere with the videos. They generally addressed us and were related to the research we had carried out. They came after we did the homework ... We used videos from the Internet, animations and slides ... The [the videos] took up about 60%-70% of class time ... I first thought that I couldn't learn anything this way. But it was just the opposite; visuals are always important in terms of learning and much more effective ... For instance, when we were studying the ferns, it helped us to learn about how they grow, their forms and structure, and seeing the spores helped us to learn it better.” (PS6)			
		“The classes were mostly carried out with video shows. There were discussions of about 10-15 minutes after the videos. ... The biology classes made an impact. The videos contributed a lot ... The videos took up about 70% [of General Biology class].” (CS3)			
	Explanations of the topic, video, question and answer, research homework, laboratory, examples from daily life, reinforcing the topics	“We watched videos in class. Covering the topic not with a lecture but visually was more effective. It was easier for us to understand. The videos were in front of us and they helped us to keep more things in our mind ... Because there wasn't a lecture, we were also given research to do ... They [the videos] took up about 80% [of class time] ...” (CS6)	3	-	3

P: Physics Teaching; C: Chemistry Teaching; T: Total

taking the video-enhanced General Biology courses could be collected under learning theme.

Theme 1. Learning: Most of the participants expected that the videos would help them to more easily understand the topic and keep it in their minds.

Theme 2. Boring course: One participant each from the participants had negative expectations about General Biology class being taught with the enhancement of a video but that later on, as the classes progressed, their thoughts had turned positive. In addition, one of the prospective chemistry teachers (CS8) said that the expectation was that it would be a more visual course instead of the usual type of class.

Because four participants (PS1, CS2, CS4 and PS5) gave us nonsensical answers when we asked them about their expectations about the video-enhanced class

approach, the responses of these participants were encoded as “uncategorized.”

Briefly, most of the participants said that they expected the videos to help them to better understand the material and that this knowledge would stay with them.

Views of the video-enhanced General Biology instruction

When the prospective physics and chemistry teachers were asked what their expectations were about having the video-enhanced General Biology instruction, the answers they gave to this question could be collected under three themes: Teaching methods and techniques, microscope and daily life (Table 4).

According to Table 4, many participants had different

Table 3. Frequencies of themes and sub-themes related to the expectations of the video-enhanced General Biology instruction.

Theme	Sub-theme	Some Examples of Quotations	P f	C f	T f
Learning	Facilitating understanding and keeping in mind	"... I thought that the video would make me remember it more than the lecture. I can't always keep what the teacher says in my mind. But when I see something in the video, it's more important to me, it sticks in my mind." (PS3)	3	3	6
		"I thought that teaching with the video would make the lesson more comprehensible. I thought they would be videos that narrated the subject. But they were more interesting than that and it was more entertaining for us." (CS9)			
Boring course	Boring course	"I was waiting for some concrete information. And I was able to get this. Not by memorizing what's in the book but seeing and feeling with my senses was more effective ..." (CS7)	1	2	3
		"For example, when I first heard that we would be watching videos in class, I thought I would be very bored. But then I saw that it was good, I was learning good things, without getting bored. The videos were simple to understand and it was good because the topics were connected to each other. For example, we saw plants catching bugs. We had learned about this earlier but we could see from the video exactly what the plant was doing, step by step. I found something way beyond my expectations." (PS10)			
		"We thought that it wouldn't be any good at first. We were thinking, how effective could it be with a video? But later our expectations were surpassed when we saw that the visuals had a good effect on us ..." (CS6)			

P: Physics Teaching; C: Chemistry Teaching; T: Total.

thoughts about learning General Biology lessons using videos.

Theme 1. Teaching methods and techniques: Some examples following the participants' thoughts: "Explaining subject, watching videos, giving information about the subject or stopping the video and making an explanation/discussion/question and answer" are given in Table 4.

In short, many participants' descriptions of the video-enhanced General Biology instruction that after an initial explanation was given about the topic, the lesson would continue with the video, and then there would be discussions, and the question and answer technique would be used in class.

Theme 2. Microscope: Some examples about the participants' thoughts on "reviewing cells and cell organelles, bacteria, mitosis and meiosis under the microscope" are given in Table 4. The participants said that they were allowed to see the videos of cells and cell organelles, bacteria, mitosis, meiosis and other organisms under the microscope in the General Biology classes.

Theme 3. Daily life: Some examples of the participants' thoughts on "giving information about developments in biology, topics pertaining to daily life" can be seen in Table 4. In short, the participants emphasized that they

had seen many things in the video from daily life such as plants, deterioration and photosynthesis.

Many of the participants' descriptions about the video-enhanced General Biology classes were that the lesson would continue with the video after an initial explanation about the topic, and the techniques of discussion or questions and answers would then be used in class. In addition, while the prospective physics teachers emphasized the videos on daily life, which demonstrated plants, animals, photosynthesis and deterioration to the class, the prospective chemistry teachers spoke highly of the videos about looking through a microscope at cells and cell organelles, bacteria, mitosis and meiosis.

Views of contributions of the video-enhanced General Biology instruction

When the prospective physics and chemistry teachers were asked what the video-enhanced General Biology instruction contributed to the course, the answers they gave to this question could be collected under two themes: Helping to learn and raising interest (Table 5).

According to Table 5, many of the participants had similar thoughts about learning about the contribution of

Table 4. Frequencies of themes and sub-themes related to the views of the video-enhanced General Biology instruction

Theme	Sub-theme	Some Examples of Quotations	P f	C f	T f
Teaching methods and techniques	Explaining subject, watching videos, giving information about the subject or stopping the video and making an explanation/discussion/question and answer	“[The teacher] spoke about the topic first and then let us watches the videos. Then she stopped the videos and gave us an explanation about the topic. After the video was over, the students discussed the topic and what they understood about it.” (PS9)	5	3	8
		“... When our teacher was explaining the lesson, we were watching the video very carefully in the beginning. Then she would stop the video, ask about our thoughts about the topic, and then there would be discussions and comments. Then we would continue with the videos.” (CS5)			
Microscope	Reviewing cells and cell organelles, bacteria, mitosis and meiosis under the microscope	“... We saw the shape of the bacteria ...” (PS8)	3	6	9
		“... We saw the cell organelles, the mitosis ...” (CS4)			
Daily life	Giving information about developments in biology, topics pertaining to daily life	“... I remember the meiotic division, subjects like cells ...” (CS9)	6	2	8
		“... We saw the fast-forward version of a plant growing ...” (PS7)			
		“... We saw the shapes of the plants ...” (PS8)			
		“... Deteriorationphotosynthesis ...” (CS4)			

P: Physics Teaching; C: Chemistry Teaching; T: Total.

videos to General Biology lessons.

Theme 1. Helping to learn: The comment made by most participants on the contribution of the videos to the course was “the lessons stayed in our mind and contributed to our learning.”

Briefly, the participants seemed to be pleased with having the videos shown in class and emphasized that the videos made learning easier and increased retention.

Theme 2. Raising interest: Some examples of the participant’s comments in the context of the sub-theme, “raising interest and curiosity through effective and entertaining teaching” can be seen in Table 5. While CS3 said that when they had an exam or when there was a discussion outside of class, the videos came to mind and an association with daily life could be made, CS2 said that the assignment to search for the videos developed their visual and intellectual abilities.

Briefly, the participants said that when they watched the videos in class, they found the lesson much more entertaining and interesting.

To conclude, most of the participants pointed out that the videos made learning the lessons easier, increased their retention, and made the classes much more

entertaining.

Views of constraints in the video-enhanced General Biology instruction and suggestions

When the prospective physics and chemistry teachers were asked about constraints in the video-enhanced General Biology instruction and for their suggestions, 4 participants in physics education and 3 participants in chemistry education said they were happy with the way the lessons were supported with videos, that this was a very good practice and there was no need for anything extra. For instance,

I think that everyone should teach using this method because when the class is taught by lecturing, we always have to memorize. But in the video we can see what we’re learning and we get a more permanent result. (PS8)

... The classes were taught with both videos and also examples from our own lives ... You taught us by having

Table 5. Frequencies of themes and sub-themes related to the views of the contributions of the video-enhanced General Biology instruction.

Theme	Sub-theme	Some examples of quotations	P f	C f	T f
Helping to learn	Helping to learn	"... The videos made the lessons more comprehensible; we learned more theoretical and more practical knowledge. I learned the concepts more easily ... When I looked at a word in a definition, its shape came to mind ..." (PS4)	7	9	16
		"... I had never liked biology until now. We would always have to memorize in lectured class scheme but now the videos in class make the materials stick in our minds. For example, we saw the shapes of the plants, the shape of the bacteria, etc." (PS8)			
		"[About the contribution of the videos to class] If we speak about percentages, the contribution of the videos is as big as 80% ..." (PS6)			
		"... [About the contribution of the videos to class] it's 80% ... We were expecting some visuals in Biology class ..." (CS3)			
Raising interest	Raising interest and curiosity through effective and entertaining teaching	"... We watched a lot of videos in class. It was useful to us in terms of reinforcing the subject matter. The concepts and the narration were in sync ... For someone who doesn't like lectures in biology class, it was much better to do the lesson visually." (CS1)	4	2	6
		"... In a lecture, the subject matter just dangles in the air. When it's given visually, we can understand better how everything works. For instance, we studied the cell. Seeing the cell through a microscope in the video helped us to understand better." (CS6)			
		"I would use videos too if it were me because they make the class interesting. If it was a lecture, children become bored. But when you have visuals like this, I think it's of the greatest benefit. Interest in the course increases, the students aren't distracted, they are curious about what's happening ..." (PS3)			
		"Doing the lesson in class with the video makes the subject matter more permanent and the class interesting ..." (CS8)			

P: Physics Teaching; C: Chemistry Teaching; T: Total.

us watch the videos and listen to examples, by role-playing ... (CS4)

It would be nice to have it stick in our minds and base the material on visuals ... The videos and the subject matter complemented each other ... There were things we knew already but I still think it added new things to learn. (CS8)

Other participants however pointed to certain problems that occurred while watching videos in class and made suggestions as to how these could be resolved. These were collected under two themes: Video and internet (Table 6).

According to Table 6, the participants mostly pointed to the fact that the videos were in English and the problems with sound and the Internet.

Theme 1. Video: Some participants' priority in mentioning the problems occurring in class was the fact that most of the videos were in English and they had difficulty understanding.

Some of the participants (e.g., PS3, CS1 AND CS8) suggested that since the videos were in English, Turkish videos should be shown or the English videos should be translated into Turkish.

The sound problems with the videos caused issues with watching the video. Some of the participants pointed to the sound problem as a second issue and made some suggestions. CS5 said that there was a problem with the video sound at the beginning but that this was resolved later. CS9 suggested that an additional loudspeaker be used for the laptop. As a third problem, the participants spoke of the quality of the video image. Some of them

Table 6. Frequencies of themes and sub-themes related to the views of the constraints in the video-enhanced General Biology instruction, and suggestions.

Theme	Sub-theme	Some examples of quotations	P f	C f	T f
Video		"... Some of the videos were not comprehensible at first look because they were in English. We were trying to understand by looking at the images." (CS1)			
	Difficulties in understanding of videos in English	"... We watched some Turkish videos but they were mostly in English. The teacher translated the ones in English for us and it was enough just to listen to what the teacher said. Since we know the subject already, when the teacher explains it to us we learn some more." (PS3)	3	3	6
	Videos should be in Turkish.	-	1	4	5
	Sound problems in the videos	"... Sometimes there was no sound [from the video] ..." (PS7) "The sound on some of the videos wasn't synchronized ... Looking at it [video] and following it without sound was better than having you teach the class." (PS4)	4	2	6
	Video should be muted during the lesson; an additional loudspeaker should be used.	-	1	1	2
	Problems in the quality of the video images	-	1	2	3
	Problems in the sequence of the videos, wasting time to look for a new video on Internet	-	-	2	2
Internet	Videos should be downloaded before the class, students' choices of videos should be asked.	-	-	4	4
	Problems of slow Internet connections, slow opening or streaming of videos and getting cut off Internet.	"... There were times when there was no Internet connection ..." (PS7) "... We experienced problems with Internet speed. The videos were slow to open." (PS8)	5	4	9
		"The biggest problem was the speed of the Internet connection. When we were watching on YouTube, the videos were interrupted ..." (CP5)			
	The university should resolve Internet speed issue.	-	2	2	4

P: Physics Teaching; C: Chemistry Teaching; T: Total.

(e.g., PS7 and CS2) talked about a problem with the quality of the video images. In connection with this, CS1 said that the quality of the video image had to be

improved.

Two prospective chemistry teachers (CS3 and CS6) stated that there were problems with the order in which

the videos were being watched and also that it was difficult finding a new video for the class. Of these participants, CS3 said that this problem had subsequently been resolved. One of the participants in chemistry education (CS7) said that time was wasted in the attempt to find a video over the Internet during the class period; the participant did not however offer a suggestion regarding this issue. CS2 made the suggestion that the videos to be watched in class should be downloaded beforehand and CS3 said that the participants' opinions should be taken as to which videos they wanted to watch.

Moreover, PS1 said that they got bored when the video took as long as 15 min but that since the instructor let them watch only some parts of the videos, this was not a problem. CS6 and CS8 said that the number of videos watched in class were too many and suggested that there could be some more videos with more narrative content.

As a result, the most frequently mentioned problem that the participants pointed to was that the videos were in English. On the other hand, there were the participants that thought that this was not a problem since the instructor was translating the videos for them. While the participants called attention to the problem of sound in the videos, they also said that since the videos were watched on mute, this did not constitute much of a problem for them. The participants identified the quality of the image and the order of the videos as problems and said that these issues should be addressed.

Theme 2. Internet: Almost half of the participants spoke about a problem with the speed of the Internet connection. For example, PS7, PS9, CS2, CS5 and CS7 were among those that mentioned that while the lesson was being taught with the help of a video, the videos were slow to appear because of the problems with the speed of the Internet. PS6, PS7 and CS9 among other participants stated that the school should solve the problems of connectivity and Internet speed. PS9, stating that the videos were slow to open because of the problems with Internet speed, wanted the instructor to be aware of this.

Consequently, the participants spoke about problems with Internet speed and emphasized that the school should resolve these issues.

Some participants had suggestions about the research assignments. Some participants suggested that it would be better if General Biology course topics were handed out to the participants at the beginning of the term before the presentations and video research assignments were given to the participants. They stressed that when the presentations assignments were handed out, the subject limitations should be better delineated. Of the participants, PS6 said that the number of videos should be increased and that the participants should do research and make their own videos. Among the suggestions made about teaching the lesson with the help of videos, those of PS2 and CS3 were quite interesting:

... We can find our own videos and present these in

class. Since we're studying teaching, our abilities to lecture may develop in this way ... When we become teachers at a school, we may have to substitute as a teacher in some other course. (PS2)

... If the topic headings could be given to the students at the beginning of the term, and the students did research on the topics, it would be so much better if they prepared for class beforehand ... If students could find videos, study them and bring them to class, it would be more effective ... (CS3)

To sum up, the participants spoke mostly about the videos being in English, the sound problem, and also about issues related to Internet connectivity. Their comments about the video-enhanced lessons were mostly that the videos should be in the Turkish language, that video sound and images should be improved, and that the order of watching the videos should be determined beforehand. The issue that the participants pointed out the most was the need for the school to remedy the Internet situation. In addition, some of the participants suggested that the topics be determined at the beginning of the term, that the participants be given their research assignments on the basis of these topics, and that the participants be allowed to find their own videos to present to the class.

DISCUSSION

In the study, many of the prospective physics and chemistry teachers had common opinions about the video-enhanced General Biology instruction. As we examine the results in detail, the following points can be made.

The expectations of the prospective physics teachers in the General Biology courses were mainly related to learn about themselves and environment/nature, to examine plants and animals, to learn what they contributed to nature and what nature contributed to them. The prospective chemistry teachers mostly expected to eliminate deficiencies, to reinforce what they had learned, learn new things, and to find out useful information about life in general and daily life. Videos took place 60-75% in General Biology courses according to most of the participants. Other techniques of handing out research assignments, trips/observations, laboratory work and providing examples from daily life were also employed. Most of the participants' expectations were both that the videos would facilitate their understanding of the lessons and that they would be better able to remember the class work. The General Biology courses were taught with the help of the videos in general, and the techniques of discussion and, question and answer were also used in classes. While the prospective chemistry teachers stressed that the videos demonstrated looking through a microscope at cells and cell organelles, bacteria, mitosis and meiosis, the prospective physics teachers empha-

sized that the videos on daily life demonstrated plants, animals, photosynthesis and deterioration.

Many of the participants' opinions were similar about the contributions of the videos to General Biology classes. The video-enhanced General Biology instruction increased the participants' interests in the courses, while also increasing their retention and ultimately contributing to their learning process. In other words, the participants' expectations of learning at the beginning of the course were met by the video-enhanced General Biology instruction. Therefore, videos can be used as teaching aids in Biology classes.

These results are consistent with the findings of the studies of Başaran and Gönen (2012), Esgice et al. (2012), Pekdağ and Maréchal (2007) that showed that video study materials or films enhance student learning and increase their interest in the course. Pekdağ and Le Maréchal (2010) assert that movies are useful in cognitive (learning more and better, memorizing, remembering) and psychological (motivation, pleasure of learning, etc.) learning in chemistry education. Similarly, Dulaney and Barrett (2004) explained that they used short feature film clips related to the students' class topic concluding that students enjoyed the course and the videos helped them to learn. In addition, computer-assisted instruction material on understanding photosynthesis (Taş et al., 2006) and a software course program were effective to remedy misconceptions in some biology concepts (Kara and Yeşilyurt, 2008).

According to the study results, it was also worth noting that almost half of the participants noted that they had no problem and they were satisfied with the video-enhanced General Biology instruction. However, videos in English language were the main problem indicated by the participants; sound and quality of the images in videos, sequence of the videos, wasting time to look for a new video on Internet during the course were the other problems. Actually, the videos in the English language were used in class more than the Turkish ones, since it has been observed on the Internet that the number of videos suitable for General Biology I and II in Turkish language is less than English videos. Videos in English language was not problem for some participants were not a great problem since the instructor translated the videos in English to Turkish or they were shown in class, summarized and the subject was discussed in the classroom. In the study the participants also suggested that Turkish language videos be used in class or that the English videos be translated into Turkish. As a result, there is a need for more Turkish university-level video clips related to concepts in biology (Yakar, 2013) or as an alternative, English videos can be translated into Turkish. The author of the current study assigns the students in Materials Development and Instructional Technologies class at Necatibey Faculty of Education in Balikesir University the duty of making video clips on various topics in biology. Some of the video clips are related to

the experiments carried out in biology laboratories. Videos used in laboratory courses can provide more autonomous learners, more time to pool and analyze class data, demonstrators' time being used for higher-level interaction with students, and the production of reusable learning materials for practical implementation (Crocker et al., 2010).

To download videos or video links and Internet connections were the other problems determined in the present study. The participants suggested that the faculty could resolve Internet speed issue, videos should be downloaded before the class, and students' choices of videos should be asked. Başaran and Gönen (2012) also reported there were problems about the lack of opportunity to access the Internet during out-of-class hours and the students' computers.

In connection with the results of the current study, in the years following the academic year 2011-2012, various changes were made in the method of teaching the General Biology I and II courses. For example, care was taken to ensure that videos to be shown in class were downloaded beforehand. The students were asked to download videos before class. In this way, the problems experienced with making the videos available to class were overcome. All of the Internet lines were also revamped at Balikesir University over the period 2013-2014 and because a conversion was made to a wireless network system, it is believed that much of the problems with Internet connectivity and video downloading have also been overcome.

To conclude, the video-enhanced General Biology instruction was found much more comprehensible and entertaining by the participants, because videos appealed to both audio and visual senses. In similar to the finding of the current study, Karamustafaoğlu et al. (2012) stated that the participants liked Vitamin software program used in the Science and Technology courses, however they brought up the negative points that there were too few activities and tests, the program had no question-asking feature, and that the existing questions were too easy. Brecht (2012) demonstrated that online video lectures facilitated to understand topics compared with the other techniques. It is therefore understood that video-enhanced instruction may be used at different class levels in Biology courses. Videos can be shown during the courses even after the end of the course. If videos play lists are provide to the students, they can have an opportunity of reviewing and reliving the experience of the course (Crocker et al., 2010).

On the contrary, in the studies by Taşçı et al. (2010) and Kahyaoğlu (2011), it is reported that although technological tools are now more commonly available at schools, Science and Biology teachers are not using these new technologies. Fancovicova et al. (2010) also indicated that the increase in computer hardware at the schools does not mean that technology is being adequately used in Biology courses. Teachers should be

more competent in using educational tools such as websites, videos and animations more effectively in biology courses. In order to take full advantage of videos, and information and communication technologies, teachers and other users need to increase their knowledge and skills about how to integrate these tools into the classroom (Başaran and Gönen, 2012; Kellam, 2010; Pekdağ and Maréchal, 2007; Zhanga et al., 2006). Moreover, to review English videos or websites, one must have a reasonable knowledge of the English language. It is for this reason that it would be useful for users and particularly teachers to organize pre-service training courses for learning English and also for becoming familiar with using information technologies (Altunoğlu and Atav, 2005; Yeşilyurt and Gül, 2008).

The final suggestion for the future studies is that several instruments such as questionnaire, observation form or achievement test can be used to provide a deeper insight into study beside interview form.

Conflict of Interests

The author has not declared any conflict of interests.

ACKNOWLEDGMENT

Dr. Hülya Gür, Balıkesir University, Balıkesir, Turkey is appreciated for providing valuable feedback on the article. Thanks to the prospective physics and chemistry teachers for their participation in this study.

REFERENCES

- Akçay S (2009). İlköğretim fen bilgisi öğretmen adaylarının biyoloji alan bilgileri üzerine bir çalışma [A study on primary education preservice science teacher knowledge in the subject area of biology]. *GÜ Gazi Eğitim Fakültesi Dergisi* (GU J. Gazi Educ. Faculty. 29(3):709-731.
- Altunoğlu BD, Atav E (2005). Daha etkili bir biyoloji öğretimi için öğretmen beklentileri [Teachers' expectations for more effective biology instruction]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi HU J. Educ.* 28:19-28.
- Bahar M (2003). Biyoloji eğitiminde kavram yanlışlıkları ve kavram değişim stratejileri [Misconceptions in biology education and conceptual change strategies]. *Kuram ve Uygulamada Eğitim Bilimleri* (Educational Sciences: Theory Practice. 3(1):27-64.
- Bahar M, Johnstone AH, Hansell MH (1999). Revisiting learning difficulties in biology. *J. Biological Educ.* 33(2):84-86.
- Balıkesir University Information Package/Course Catalogue. Retrieved from http://ebs.Balıkesir.edu.tr/Ders_Bilgileri.aspx?dno=309288&bno=4122&bot=4860.
- Başaran B, Gönen S (2012). Investigation of the effects of scorm adapted whiteboard movie techniques on students' success in physics classes. *Asia-Pacific Forum on Science Learning and Teaching.* 13(2), Article1 (Dec., 2012).
- Berk RA (2009). Multimedia teaching with video clips: TV, movies, YouTube, and mtvU in the college classroom. *Int. J. Technol. Teach. Learn.* 5(1):1-21.
- Boe Dana "The annoying orange 3: TOE-MAY-TOE". *Daneboe/Gagfilms 2nd Channel, YouTube video, 2:11, Dec. 4, 2009, http://www.youtube.com/watch?v=xjdBCeUdAml&feature=relmfu*
- Brecht HD (2012). Learning from online video lectures. *Journal of Information Technology Education: Innovations in Practice.* 11:227-250.
- Büyükoztürk Ş, Kılıç Çakmak E, Akgün ÖE, Karadeniz Ş, Demirel F (2013). *Bilimsel araştırma yöntemleri* [Scientific research methods]. Geliştirilmiş 14.baskı (14th enhanced edition). Ankara: Pegem A Akademi.
- Campbell, NA, Reece, JB (2008). *Biology.* (6.Baskı.) (6th Edition) Çev. Eds. (Translation Eds.): Gündüz E, Demirsoy A, Türkan İ (2008). Ankara: Palme Yayıncılık.
- Çetin G, Ertepinar H, Geban Ö (2004). Developing and implementing an instructional technology aided conceptual change approach in teaching ecology concepts at ninth grade. *Turkish Online J. Educ. Technol.* 3(1):4.
- Çimer A (2007). Effective teaching in science: A review of literature. *Türk Fen Eğitimi Dergisi. J. Turkish Sci. Educ.* 4(1):20-44.
- Çimer A (2012). What makes biology learning difficult and effective: Students' views. *Educ. Res.* 7(3):61-71.
- Çinici (2011). Lise öğrencilerinin hayvanların sınıflandırılması ile ilgili alternatif kavramları: Omurgalı hayvanlar [High school students' alternative conceptions related to the classification of animals: Vertebrate animals]. *Türk Fen Eğitim Dergisi. J. Turkish Sci. Educ.* 8(4):171-187.
- Crocker K, Andersson H, Lush D, Prince R, Gomez S (2010). Enhancing the student experience of laboratory practicals through digital video guides. *Bioscience Education.* 16, Retrieved from www.bioscience.heacademy.ac.uk/journal/vol16/beej-16-2.pdf
- Dikmenli M (2010). Misconceptions of cell division held by student teachers in biology: A drawing analysis. *Scientific Res. Essays.* 5(2):235-247.
- Dulaney C, Barrett J (2004). The use of short feature film clips to enhance student learning. Retrieved from http://www.xavier.edu/faculty_development/lessons%20learned%20oct%202004.htm
- Eğitimde video kullanımı [Video using in education]. Retrieved from <https://www.uzaktanegitim.com/hbrd131-egitimde-video-kullanimi.aspx>
- Ekici F, Ekici E, Aydın F (2007). Utility of concept cartoons in diagnosing and overcoming misconceptions related to photosynthesis. *Int. J. Environ. Sci. Educ.* 2(4):111-124.
- Escalada LT, Zollman DA (1997). An investigation on the effects of using interactive digital video in a physics classroom on student learning and attitudes. *J. Res. Sci. Teach.* 34(5):467-489.
- Esgice M, Küçük S, Aydemir M, Karaman S (2012). Uzaktan eğitimde video derslere yönelik öğrenci görüşlerinin ve kullanımının belirlenmesi [Determining student views and usage of video-enhanced classes in long-distance learning]. *IV. Uluslararası Türkiye Eğitim Araştırmaları Kongresi* (Turkey International Congress of Educational Research), 4-7 May, 2012, Yıldız Technical University, İstanbul, Turkey Yıldız Technical University, İstanbul, Turkey. 396-401.
- Fancovicova J, Prokop P, Uşak M (2010). Biyoloji eğitiminde bir öğretim aracı olarak web sayfaları: Beslenme konusu örneği [Using webpages as a teaching tool in biology instruction: Example of the subject of nutrition]. *Kuram ve Uygulamada Eğitim Bilimleri. Educational Sciences: Theory Practice.* 10(2):893-92.
- Genç M (2013). Öğretmen adaylarının bilgisayar animasyonları hakkındaki görüşleri: Hücre ve dokular örneği [Views of prospective teachers about computer animation: Cell and tissue sample]. *Mersin Üniversitesi Eğitim Fakültesi Dergisi. Mersin University J. Faculty of Educ.* 9(2):288-300.
- Kahyaoğlu M (2011). İlköğretim öğretmenlerinin fen ve teknoloji dersinde yeni teknolojileri kullanmaya yönelik görüşleri [Views of elementary school teachers on using new technologies in science and technology classes]. *Eğitim Bilimleri Araştırmaları Dergisi, Uluslararası E-Dergi. J. Educ. Sci. Res. Int. E-Journal.* 1(1):79-96. Retrieved from <http://ebad-jesr.com/>
- Kara Y, Yeşilyurt S (2008). Comparing the impact of tutorial and edutainment software programs on students' achievements, misconceptions, and attitude towards biology. *J. Sci. Educ. Technol.* 17:32-41.
- Karamustafaoğlu O, Bacanak A, Genç S (2012). Vitamin programının

- fen ve teknoloji dersinde kullanımına yönelik öğrenci görüşleri [Students' opinions about the vitamin program used in science and technology courses]. Retrieved from http://kongre.nigde.edu.tr/xufbmk/dosyalar/tam_metin/pdf/2403-30_05_2012-16_09_59.pdf
- Kaufman PB, Mohan J (2009). Video use and higher education: Options for the future. 1-14. Retrieved from http://library.nyu.edu/about/Video_Use_in_Higher_Education.pdf
- Kellam H (2010). Designing digital video to support learner outcomes: A study in an online learning resource for healthcare professionals and students. Master of Education, University of Ottawa, Canada.
- Kumru Nisan "Diksiyon eğitimi-doğru nefes nasıl alınır? (Diction training-how to breath correctly?)," YouTube video, 12:06, May 30, 2011, <http://www.youtube.com/watch?v=jnYyvLAatGs>.
- Kurt H, Kaya B, Ateş A, Kılıç S (2009). Biyoloji öğretmen adaylarının biyolojik okuryazarlığı [The biological literacy of biology teacher candidates]. Selçuk Üniversitesi Ahmet Keleşoğlu Eğitim Fakültesi Dergisi. Selçuk University J. Ahmet Keleşoğlu Educ. Faculty. 27:17-30.
- Logan R (2012). Using YouTube in perioperative nursing education. Aorn J. 95(4):474-481.
- MEB Komisyonu [MoNE Commission] (2013). Ortaöğretim 9. Sınıf Biyoloji Ders Kitabı [Secondary School 9th Grade Biology Textbook]. Ankara: MEB Yayınları, 121-170.
- Miles M, Huberman A (1994). An expanded source book: Qualitative data analysis, 2nd edition, Thousand Oaks, California: Sage.
- Murniza M, Halimah Badioze H, Azlina A (2012). Virtual biology laboratory (VLab-Bio): Scenario-based learning approach. International Conference on Education and Educational Psychology (ICEEPSY 2012). Procedia-Social and Behavioral Sci. 69:162-168.
- Ören FŞ, Ormancı Ü, Karatekin P, Erdem Ş (2010). Öğretim 6. 7. ve 8. sınıf öğrencilerinin fotosentez-solunum konusundaki kavram yanlışlarının kavram karikatürleriyle belirlenmesi [Determining 6th, 7th, and 8th-grade elementary school students' misconceptions about photosynthesis-respiration using concept cartoons]. International Conference on New Horizons in Education, June 23-25, 2010, Famagusta-Turkish Republic of Northern Cyprus.
- Pekdağ B (2010). Kimya öğreniminde alternatif yollar: Animasyon, simülasyon, video ve multimedia ile öğrenme [Alternative ways in chemistry learning: Learning through animation, simulation, video and multimedia]. Türk Fen Eğitimi Dergisi. J. Turkish Sci. Educ. 7(2):79-110.
- Pekdağ B, Le Maréchal J-F (2007). Bilimsel filmlerin hazırlanması [Preparing scientific movies]. Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi (Necatibey Faculty of Education Electronic J. Sci. Mathematics Educ. 1(1):57-84.
- Pekdağ B, Le Maréchal J-F (2010). Movies in chemistry education. Asia-Pacific Forum on Science Learn. Teach. 11(1):5.
- Prokop P, Prokop M, Tunnicliffe SD (2007). Is biology boring? Student attitudes toward biology. J. Biological Educ. 42(1):36-39.
- Šorgo A, Verčkovnik T, Kocijančič S (2010). Information and communication technologies (ICT) in biology teaching in Slovenian secondary schools. Eurasia J. Mathematics, Sci. Technol. Educ. 6(1):37-46.
- Tan E, Pearce N (2011). Open education videos in the classroom: exploring the opportunities and barriers to the use of YouTube in teaching introductory sociology. Res. Learn. Technol, 19:2156-7077.
- Taş E, Köse S, Çepni S (2006). The effects of computer-assisted instruction material on understanding photosynthesis subject. Int. J. Environ. Sci. Educ. 1(2):163-171. (Special Issue: Science Education in Turkey.)
- Taşçı G, Yaman M, Soran H (2008). Biyoloji öğretmenlerinin öğretimde yeni teknolojileri kullanma durumlarının incelenmesi [Examining the status of biology teachers in terms of using new technologies in biology instruction]. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. HU J. Educ. 38:267-278.
- Tekkaya C, Balcı S (2003). Öğrencilerin fotosentez ve bitkilerde solunum konularındaki kavram yanlışlarının saptanması [Determination of students' misconceptions concerning photosynthesis and respiration in plants]. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. HU J. Educ. 24:101-107.
- Tekkaya C, Özkan Ö, Sungur S (2001). Biology concepts perceived as difficult by Turkish high school students. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. HU J. Educ. 21:145-150.
- Topçu MS, Şahin-Pekmez E (2009). Turkish middle school students' difficulties in learning genetics concepts. Türk Fen Eğitimi Dergisi. J. Turkish Sci. Educ. 6(2):55-62.
- Tucker C (2013). MindShift teachers' guide to videos. Ed. Barseghian, T., p.6.
- Türkmen L, Çardak O, Dikmenli M (2002). Lise öğrencilerinin canlıların çeşitliliği ve sınıflandırılması konusundaki kavram yanlışlarının belirlenmesi [Determination of high school students' misconceptions about diversity of organisms and classification]. V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi (V. National Science and Mathematics Education Congress), ODTÜ Kültür ve Kongre Merkezi, Ankara (METU Cultural and Convention Center, Ankara).
- Uzun Orçin "Besinlerin oksitlenmiş kalıntısı BOK (Oxidized waste of foods SHIT)", YouTube video, 9:22, March 16, 2010, <http://www.youtube.com/watch?v=DQOz8pl1e-4>
- Williams M, Debarger AH, Montgomery BL, Zhou X, Tate E (2011). Exploring middle school students' conceptions of the relationship between genetic inheritance and cell division. Sci. Ed. 1-26.
- Yakar HGİ (2013). Sinema filmlerinin eğitim amaçlı kullanımı: tarihsel bir değerlendirme [Use of cinematographic films for the purpose of education: a historical evaluation]. Hasan Ali Yücel Eğitim Fakültesi Dergisi. Hasan Ali Yücel J. Educ. 19(1):21-36.
- Yeşilyurt S, Gül Ş (2008). Ortaöğretimde daha etkili bir biyoloji öğretimi için öğretmen ve öğrenci beklentileri [Teachers' and students' expectations for more effective biology instruction in middle school]. Kastamonu Eğitim Dergisi Kastamonu Educ. J. 16(1):145-162.
- Yıldırım A, Şimşek H (2000). Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in social sciences]. Ankara: Seçkin Yayınları, 162-163.
- Yıldırım O, Nakiboğlu C, Sinan O (2004). Fen bilgisi öğretmen adaylarının difüzyon ile ilgili kavram yanlışları [Science teacher candidates' misconceptions related to diffusion]. BAÜ Fen Bil. Enst. Dergisi (BAU Journal of Inst. Sci.). 6(1):79-99.
- Yıldırım N, Özmen B (2011). The use of video sharing websites for educational purposes. 5th International Computer & Instructional Technologies Symposium, 22-24 September 2011, Fırat University, Elazığ-Turkey.
- Zhanga D, Zhoua L, Briggs RO, Nunamaker JF (2006). Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness. Inform. Manage. 43:15-27.
- Züal Aslı "Hücreye yolculuk (Journey to cell)". TÜBİTAK Bilim ve Teknik Websitesi (Website of Science and Technology), 2002. Web. 28 May 2012, <http://www.biltek.tubitak.gov.tr/bilgipaket/hucre/01.swf>

WEBSITES

- "Bacteria multiplying," YouTube video, 0:15, <http://www.youtube.com/watch?v=zrx7Xg0gkQ4&feature=related>
- "Bread mold," YouTube video, 0:24, <http://www.youtube.com/watch?v=PXwLddA4Ctw&feature=related>
- "Budding yeast," YouTube video, 5:31, <http://www.youtube.com/watch?v=BTHYaf-EuYs&feature=related>
- "Büyük ve küçük kan dolaşımı oyunu (Game of pulmonary circulation and systemic circulation)," Fen Okulu Net Video (Science School Web video), 3:10, <http://www.fenokulu.net/portal/Sayfa.php?Git=KonuKategorileri&Sayfa=KonuvideoListesi&baslikid=63&videoNo=1317>
- Canlılar dünyası (The living world). TÜBİTAK Bilim ve Teknik Websitesi (Website of Science and Technology), 2002. Web. 28 May 2012. <http://www.biltek.tubitak.gov.tr/bilgipaket/canlilar/index.htm>
- Dailymotion, French Limited Firm (Anonym Firm), 15 March 2005. Web. 28 May 2012. <http://www.dailymotion.com/tr>
- "Phototropism in tomatoes-Timelapse," YouTube video, 0:18, <http://www.youtube.com/watch?feature=endscreen&v=Ze8NV7cvW8k&NR=1>
- "Reproduction in fungi," YouTube video, 2:05, <http://www.youtube.com/watch?v=qDwgSWDqKoQ&feature=related>
- TeacherTube, 6 March, 2007. Web. 28 May 2012. <http://www.teachertube.com>.

"The six kingdom classification: Part 1, Animals, plants, & fungi,"
YouTube video, 4:08, posted by "Described and Captioned Media
Program," May 10, 2011,
<http://www.youtube.com/watch?v=F7tVnQ4tVKk&feature=related>
"Time lapse movie of mould growing in a tea cup", YouTube video, 0:39,
http://www.youtube.com/watch?v=O_v4UXHFd00&NR=1&feature=endscreen

Türkiyenin Fen ve Teknoloji sitesi (Website of Turkish Science and
Technology), 2002. Web. 28 May 2012. <http://www.fenokulu.net/>
YouTube, Feb. 2005. Web. 28 May 2012. <http://www.youtube.com>

APPENDIX A. Examples of Turkish and English websites and biology videos used in general biology I and II courses

- The websites used for biology videos in Turkish for General Biology I and II courses:*
Türkiyenin Fen ve Teknoloji Sitesi (Website of Turkish Science and Technology), 2002. Web. 28 May 2012. <http://www.fenokulu.net/>.
Canlılar Dünyası (The Living World). TÜBİTAK Bilim ve Teknik Websitesi (Website of Science and Technology), 2002. Web. 28 May 2012. <http://www.biltek.tubitak.gov.tr/bilgipaket/canlilar/index.htm>.
YouTube, Feb. 2005. Web. 28 May 2012. <http://www.youtube.com>.
- The websites used for biology videos in English for General Biology I and II courses:*
YouTube, Feb. 2005. Web. 28 May 2012. <http://www.youtube.com>.
TeacherTube, 6 March, 2007. Web. 28 May 2012. <http://www.teachertube.com>.
Dailymotion, French Limited Firm (Anonym Firm), 15 March 2005. Web. 28 May 2012. <http://www.dailymotion.com/tr>.
- Biology videos in Turkish for General Biology I and II courses:*
 Uzun, Orçin. "Besinlerin Oksitlenmiş Kalıntısı BOK (Oxidized Waste of Foods SHIT)," YouTube video, 9:22, March 16, 2010, <http://www.youtube.com/watch?v=DQOz8pl1e-4>.
 Kumru, Nisan. "Diksiyon eğitimi-doğru nefes nasıl alınır? (Diction training-how to breath correctly?)," YouTube video, 12:06, May 30, 2011, <http://www.youtube.com/watch?v=inYyvLAatGs>.
 "Büyük ve küçük kan dolaşımı oyunu (Game of pulmonary circulation and systemic circulation)," Fen Okulu Net Video (Science School Video), 3:10. <http://www.fenokulu.net/portal/Sayfa.php?Git=KonuKategorileri&Sayfa=KonuvideoListesi&baslikid=63&videoNo=1317>.
- Biology videos in English for General Biology I and II courses:*
 "The Six Kingdom Classification: Part 1, Animals, Plants, & Fungi," YouTube video, 4:08, posted by "Described and Captioned Media Program," May 10, 2011, <http://www.youtube.com/watch?v=F7tVnQ4tVKk&feature=related>.
 "Bacteria Multiplying," YouTube video, 0:15, <http://www.youtube.com/watch?v=zrx7Xg0gkQ4&feature=related>.
 "Budding Yeast," YouTube video, 5:31, <http://www.youtube.com/watch?v=BTHYaf-EuYs&feature=related>.
 "Reproduction in Fungi," YouTube video, 2:05, <http://www.youtube.com/watch?v=qDwgSWDqKoQ&feature=related>.
 "Bread Mold," YouTube video, 0:24, <http://www.youtube.com/watch?v=PXwLddA4Ctw&feature=related>.
 "Time Lapse Movie of Mould Growing in a Tea Cup," YouTube video, 0:39, http://www.youtube.com/watch?v=O_v4UXHFd00&NR=1&feature=endscreen.
 "Phototropism in Tomatoes-Timelapse," YouTube video, 0:18, <http://www.youtube.com/watch?feature=endscreen&v=Ze8NV7cvW8k&NR=1>.
- Examples of animations in Turkish or English for General Biology I and II courses:*
 Zülal, Aslı. "Hücreye yolculuk (Journey to cell)". TÜBİTAK Bilim ve Teknik Websitesi (Website of Science and Technology), 2002. Web. 28 May 2012, <http://www.biltek.tubitak.gov.tr/bilgipaket/hucre/01.swf>.
 Boe, Dana. "The Annoying Orange 3: TOE-MAY-TOE". Daneboe/Gagfilms 2nd Channel, YouTube video, 2:11, Dec. 4, 2009, <http://www.youtube.com/watch?v=xjdBCeUdAml&feature=relmfu>.

Full Length Research Paper

Teachers' views on the new measurement and assessment approaches with regard to Mathematics curriculum reform

Meral CANSIZ AKTAŞ^{1*} and Adnan BAKİ²

¹Ordu Üniversitesi Eğitim Fakültesi, İlköğretim Bölümü Matematik Eğitimi Anabilim Dalı 52200 Ordu / Türkiye.

²Karadeniz Teknik Üniversitesi Fatih Eğitim Fakültesi, Ortaöğretim Fen ve Matematik Alanları Eğitimi Bölümü, 52200 Ordu / Türkiye.

Received 18 March, 2014; Accepted 13 November, 2014

The aim of this study is to investigate teachers' views on the new measurement and assessment approaches within the context of secondary school mathematics education reform. With this purpose, the factors which affected the implementation process were determined. The research data were obtained from two teachers via in-depth interviews, observations, and researcher's notes and case study throughout an education year. As a result of the analysis of qualitative data with NVivo 7 program, the factors affecting the teachers' views on the measurement and assessment aspect of mathematics curriculum were detected. The results of the study revealed that teachers' culture about measurement and assessment, the usability of assessment tools, infrastructure conditions, new roles of teachers, lack of informing activities and the role of measurement and assessment on student learning had an effect on teachers' views on the new measurement and assessment approaches within the context of mathematics education reform. The findings obtained pointed out that curriculum reform could not actualize the change considered for the measurement and assessment aspect. Suggestions were made for the measures to be taken and researchers in accordance with the results obtained from the research.

Key words: Curriculum reform, measurement and assessment, teachers' views.

INTRODUCTION

The research carried out in the field of education in recent years indicates that measurement and assessment activities at schools must be reorganized to help promote students' learning but not to select, eliminate or classify (Assessment Reform Group [ARG], 2002). The reason for this need is that the classical measurement and assessment practices used at schools are

inadequate to evaluate students' learning process and to determine students' performance in a reliable and valid way (William, 2003).

National Council for Teachers of Mathematics [NCTM] (2000) emphasizes the need to make changes in students' evaluation depending on the learning theories widely accepted in recent years. These standards

*Corresponding author. E-mail: meralcaktas@odu.edu.tr. Tel: +90 505 4858046.

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

suggest using various assessment techniques and tools which can assess what students can or cannot do what they know, promote students' learning mathematics and reveal their written, oral and operational performances. Similarly, mathematics curriculum which regards learning mathematics as an active process has been accepted to be implemented for classes with new students enrolled in high schools since 2005-2006 Education Year in Turkey and this curriculum emphasizes that an environment where students do research, explore, solve problems, share and discuss their solutions and approaches must be provided. It is pointed out that performance assessment must be used in order to lead students to think creatively, work tactfully, use knowledge and work with a group in such environments. Moreover, the importance of measurement and assessment was particularly emphasized to monitor students' development and reveal the weaknesses and strengths of the curriculum in such environments. Therefore, various assessment tools to assess the skills which high school mathematics curriculum aim at developing (Mathematical Modeling Skills, Mathematical Thinking Skills, Problem Solving Skills, Communication Skills, Reasoning Skills and Connections Skills), Affective Behaviours, Self-Regulatory Competencies and Psychomotor Skills were presented for teachers' use in the appendices of curriculum (Ministry of National Education, 2005).

In-service training provides a very important potential for teachers to perform their professional practice by having the qualifications required by the reforms carried out. Ministry of National Education (MEB) is responsible for providing in-service training for teachers in Turkey. Among these educational activities in question, the central ones are carried out by In-Service Training Head of Department and the local ones are performed by Provincial Directorate for National Education. Before new curricula were implemented, a centralized course for in-service training was organized for publicity, and then a short-term local in-service training was given to the other teachers by the teacher trainers and education inspectors who participated in this course. Güneş and Baki (2011) stated that it would be a big mistake to consider this short-term training as adequate for teachers to implement these new learning approaches. Similarly, it is pointed out in many studies that teacher training offered with the intent of new curricula was inadequate and short (Birgin et al., 2009; Bulut, 2007; Eraslan, 2013). On the other hand, the following results were obtained via examination of the studies carried out in Turkey after the curriculum was changed:

1. Teachers think that a great variety of assessment tools are suggested and these tools bring burdens (Acat and Demir, 2007; Güven and Eskiürk, 2007; Sarier, 2007; Selvi, 2006).
2. Teachers' old habits affect the implementations and decline the use of suggested assessment tools (Erdal, 2007; Gelbal and Kelecioğlu, 2007; Güven and Eskiürk, 2007; Yılmaz, 2006).
3. Teachers find the current resources inadequate regarding examples (Erdal, 2007).
4. Teachers state that there is immense pressure on them due to the standardized tests (Çalık, 2007).
5. Teachers complain about lack of time while performing a work (Acat and Demir, 2007; Gelbal and Kelecioğlu, 2007; Güven and Eskiürk, 2007).
6. Teachers lack knowledge about the new implementations (Çalık, 2007; Erdal, 2007).
7. Teachers think that in-service training offered is inadequate and they require to be informed in this field (Gelbal and Kelecioğlu, 2007; Yapıcı and Leblebiciler, 2007).
8. Teachers think that the problems related to infrastructure such as class size and lack of equipment and tools affect their work negatively (Acat and Demir, 2007; Selvi, 2006; Üredi, 2013; Yılmaz, 2006).

It was understood that because the studies were conducted in a limited time by seeking the opinions of a specific population, longitudinal and adequate number of studies which concentrate on reflecting the changes in the process was not included. The reality which must be taken into consideration for the success of the reforms in education is that teachers should directly adopt, understand, and implement these reforms. And if so, at what levels should teachers adopt the suggestions offered by mathematics curriculum about measurement and assessment reform? And whether they are understood well and implemented correctly or not becomes important. It is known that teachers who are engaged in traditional measurement and assessment methods have shown a sign of resistance as it is revealed by the studies conducted in this field. This resistance is the most important obstacle to actualize the reform. The elimination of this obstacle depends on the examination of the resistance in detail. Consequently, this study aims at exploring teachers' views on contemporary measurement and assessment approaches within the context of mathematics curriculum. In addition, the following research questions require an answer: "Which factors affect teachers' views on the new measurement and assessment approaches within the context of mathematics curriculum and how do they affect them"?

METHOD

Case study as a research method was used in this research to illuminate the phenomenon investigated and explicate the relations between the phenomena. Case study research is preferred because it offers an opportunity for an in-depth analysis of a specific group and it also reveals the relations between the data gathered from the data collection tools; it is useful in providing answers to "How?" and "Why?" questions and creates an opportunity for the researcher to investigate an event or phenomena in-depth which he cannot manipulate (Büyüköztürk et al., 2008; Yıldırım and Şimşek, 2005). Bogdan and Biklen (1992)

stated that case studies have different types and added that case studies using an extremely in-depth investigation on a narrowly defined sampling can be described as micro ethnography method used by education anthropologists. When the in-depth interviews and observations carried out during the process for a year with two teachers working in two different towns in Trabzon city, in a high school (T1 with an experience of 7 years and T2 with 6 year experience) are taken into consideration, we can state that case study used in our study has the quality mentioned above. We wished to explore differences between the two teachers whose many variables are similar (experience, age, etc.). T1 and T2 are approximately the same age, both are males and both work in the same type of high schools.

Data collection tools

The interviews carried out in the research for a year are unstructured interviews, one-legged interviews and also ethnographic interviews. The aim of an unstructured interview is to allow for spontaneity with open ended questions in place of forcing them to choose and collect rich and adequate data and it will be convenient for comparison and analysis (Büyüköztürk et al., 2008). Moreover, ethnographic interviews were used when the researcher did not let her researcher's identity be known. These interviews were carried out both with the two participant teachers of the research, and in the meetings which the researcher participated as a teacher, but not as a researcher. Ethnographic interviews aim at discovering the interviewee's particular culture in order to understand the behaviours and experiences which constitute this particular culture. In these settings instead of manipulating the teachers, the researcher carried on a conversation which helped the teachers to answer the questions freely (Büyüköztürk et al., 2008). In addition, non-participant observation was used when the researcher observed a lesson within the process and participant observation was used when the researcher joined the meetings as a teacher and collaborated with her colleagues within the process. During the non-participant observations, the researcher sat at the back of the class and conducted observations without intervening in the setting. In participant observations, the viewpoints of the subjects who are observed were shared so their behaviors and reactions were tried to be discovered. During these observations, short notes were taken and just after the observations the notes were elaborated by the researcher. Moreover, the observations conducted were used to write teachers' portraits.

Data collection events were priori fixed in the first and last interviews which were conducted and situation driven in interim interviews and observations which were conducted throughout the year. While the first interviews were conducted at the beginning of the term and the last interviews were carried out at the end of the term, the interim interviews were carried out during the term and there were 10 -15 days between each interview.

Data analysis

Triangulation is used to check the reliability of the case study. Triangulation was tried to be actualized in this research with interviews, observations and analysis of study products (assessment tools which were suggested in curriculum, worksheets which were used in classroom, students' works in the portfolios, etc.) by means of correlating them. The data obtained in the research were analyzed with NVivo 7 program following the given stages below:

1. Coding the first interviews
2. Identifying the themes (factors)
3. Analysing the interim interviews carried out according to the themes (factors), identifying the new codes which emerged, and

associating the research notes and observations which indicate the same points with the identified themes (factors).

4. Analysing the last interview according to the themes (factors) identified, identifying the new codes which emerged and associating the research notes and observations which indicate the same points with the identified themes (factors).

Double-coding procedure was used for the data analysis. The qualitative data obtained in the process were coded again by another researcher. Intercoder reliability between the researchers was computed with the formula (coder reliability: number of agreements/ (total number of agreements and disagreements) recommended by Miles and Huberman (1994). The percentage agreement in this study was 83% for the first factor, 84% for the second factor, 87% for the third factor, 86% for the fourth factor, 84% for the fifth factor, 80% for the sixth factor. These percentages indicate the reliability of the coding.

FINDINGS

Factor 1

The codes which emerged during the interviews and made up the first factor are presented in Table 1.

T1 and T2 reported in the first interviews that measurement and assessment must be objective and explained that assessment tools based on qualitative data would decrease objectivity. In addition, they stated that how measurement and assessment was carried out must be determined with the legislative regulations. Both teachers mostly expressed their views on the objectivity of assessment and it was understood that they were worried about the objectivity of the assessment with the new tools.

There are no students who will carry out self- assessment objectively. Even though it is defeated and they are used in assessment, it is still not very clear. After the criteria are given to the students, I don't think that their biased attitudes can be prevented. Moreover, if the criteria and benchmark are certain, I believe that this assessment will be carried out more reliably by the teacher (T1).

As it is understood from this expression, T1 does not consider doing self-assessment as necessary while carrying out measurement and assessment; measurement and assessment with such alternative methods is not beneficial; and finally T1 has beliefs belonging to traditional understanding, which indicates that a teacher must be responsible for the assessment. On the other hand, it drew attention that the teachers expressed their dissatisfaction about the use of assessment tools depending on the qualitative data in the first interviews with such statements: "...The students can fill in the self-assessment form by concealing their ideas in order to get the teacher like them (T2)". Another point which drew attention in the first interviews is the statement of T2.

"...Considering these, I am expecting a change with the

Table 1. Teachers' culture.

Codes	First		Interim		Last		f
	f		f		f		
	T1	T2	T1	T2	T1	T2	
Objective	6	5	4	4	1	1	21
Qualitative data	2	1	2	2	1	1	9
Quantitative	1	1	2	0	0	3	7
Legislative regulations	0	2	6	3	6	5	22
Assess the product	0	0	2	0	0	1	3
Assess the process	0	0	0	0	4	0	4

regulations about how to give grades with these assessments (T2)" indicates that he was not informed officially about the changes made in measurement and assessment. Below is given the rest of T2's quote from the interview which indicates that the participant believes that measurement and assessment must be quantitative at the same time:

...The average scores from the participation rates on these forms must be determined and an association must be obtained with it (T2).

About 15 days after the first interviews carried out with the teachers participating in the study, the first and interim interviews were carried out to determine what kind of changes they experienced in the field of measurement and assessment during the process. During these interviews, first, the teachers were reminded of new conditions which they were going to encounter due to curriculum change and then they were asked what kind of changes they experienced in measurement and assessment. The statements of the teachers in the first interviews are given below:

In fact, there is not a lot of change. We haven't carried out a different task yet. We are trying to get to know the students at the moment... (T1)

Students have no ideas about the changes. I have not come up with an explanation yet... I, myself, am trying to understand what has changed. First, I must understand and then I can ask them to do something. (T2)

As pointed out, both teachers stated that they did not experience any changes in the field of measurement and assessment in the first interim interview. T1 determined that he did not do anything about measurement and assessment by asserting that it was the beginning of the term and this statement indicates that the teacher had still beliefs about summative assessment unlike what was suggested in curriculum. It was understood from the statements of this teacher that the teacher had beliefs about assessment of the product.

T2 stated in progressive stages of the interviews that

he occasionally tried to check the works of the students in their portfolios and wrote notes for the students to make necessary changes about missing points; however, students did not pay attention to these notes, most probably, due to lack of such implementations in other courses¹. In addition, T2 said that his colleagues did not carry such an implementation into action and also added that it was because The Ministry of National Education did not make such regulations. Teachers' portraits written depending on the observations carried out in the process and the products generated are given below:

A general evaluation shows that although T2 seems to be more willing, both teachers were reluctant about the portfolio assessment which they were trying to implement in their practices. In addition to this, they showed resistance because they thought that they would not be objective and it was observed that their attempts were only to ask their students to keep portfolios and sometimes remind them that they would be assessing their tasks. It was also understood that the more the number of tasks increased, the more rarely the teachers checked the portfolios and the tasks given were more like homework questions and sometimes teachers copied these assignments and gave them to the students and sometimes the students got them through their own efforts. Teachers' and students' lack of knowledge about portfolios might have caused this condition.

The teachers were asked how they were going to use the data obtained from the tools which they were trying to benefit in the interviews carried out through the end of the first term. T2 stated the following about this issue:

I even did not look at many of them. I don't know but some of them are unnecessary. When I understood that they were unnecessary, I didn't use them...Some of them are not suitable for mathematics.

The forms qualified as unsuitable for mathematics by T2 were the forms which aimed at evaluating the attitudes stated by the teacher in the previous interviews. Then, it can be deduced that the teacher felt uncomfortable due to the use of qualitative data during assessment in mathematics. T1 explained his view about the criteria which must be taken into consideration in measurement and assessment as given below:

like that in primary education...I think their scoring system has changed... There is nothing to do...We will add them to the oral scores. (T1)

Both teachers complained about their discomfort in the first interview at the beginning of the second term and they stated that because necessary adjustments were not

¹ When the research was conducted, curriculum change was carried out with some courses involving Mathematics.

made, they could not directly reflect the tasks onto the grading system in the first term. Below is given the expressions of T2 about the issue:

We did not experience any changes while scoring the term averages. It is what it used to be...Give three written tests and one oral test, it's OK...Although I said that I would grade the oral tests according to these tasks, it was not very convincing. I just graded their oral tests taking my impressions into account but not by using the suggested forms...However, we are not asked to hand in these works. (T2)

The following researcher's note was kept about the implementations in the second term:

Beginning to implement the changes in the second term lasted longer for the teachers than the first term. It was revealed that the teachers did not include any tasks intended to assess the process because they suggested that it was the beginning of the term. This condition caused them not to include portfolio which the students also tried to do in the first term. Therefore, it was considered that the teachers did not ask students to submit their tasks officially. The teachers stated that they did not include any tasks because it was the beginning of the term and this indicated that they still had beliefs to assess the product like in traditional understanding.

Although both teachers determined that they did their best to include the implementations in line with the suggested changes, the discomfort they felt, due to not being able to use them as desired (or reflect them in the results), drew attention. For example, T1 stated the problems encountered about how to use the performances carried out:

We were not informed about any regulatory changes. Because there was not an explanation about how to use the implementations we carried out, the implementations were ineffective despite being few in number. Moreover, in my opinion, some forms which aim at reaching the personal information of the students are not very necessary. Using them in assessment would be wrong for some of my students. Moreover, my other colleagues working in my school and in other high schools do not use these tools. However, I can say that these changes are implemented well in primary schools because primary education is inspected and to me, it is effective (T1).

To sum up, when the first interim and the last interviews were considered for the first factor, the teachers mostly stated that legislative regulations must be made and measurement and assessment must be objective. However, it was discovered that there was a considerable decrease because the teachers did not include the suggestions in their implementations due to their beliefs towards the use of suggested assessment tools which

would decrease objectivity within the process.

Factor 2

In Table 2, the codes which emerged during the interviews and also comprised the second factor are given.

The statements of both teachers in the first interviews indicated a variety of the suggested forms. In relation to that, T1 stated that the variety of suggested assessment tools would cause time problems for teachers and T2 expressed his views about the Mathematics Attitude Scales² used to identify the attitudes of the students towards mathematics:

There is no need for such a form to learn the attitudes of students towards mathematics. I know which students are interested in mathematics, like it and hate it. In order to flatter their teachers, students can fill in this form total opposite of what they think (T2).

Moreover, it was discovered in their first interviews that the teachers considered using suggested assessment tools waste of time as they would hinder teaching activities.

I don't believe that students will benefit from developing projects because they won't be asked questions about this in the most important examination of their life. They lack a lot of knowledge and there is no more time to waste. (T2)

Another point which drew attention in the first interviews is that both teachers stated that alternative assessments such as project would have a negative effect on the students who get prepared for the university exam. The statement of T1 can be given as an example: *"Instead of spending our time and energy with them, we could solve more questions and be more successful in the exam"*

When the teachers were asked what kind of changes they had in curriculum and measurement and assessment in the interim interviews, T1 reported that his previous experiences and the changes made contradicted with each other and more variety of tools were suggested:

We used to give written and oral tests in order to determine the level of the students in the past. But now with the new curriculum, we are asked to make many changes and also use many different tools. (T1)

It was found in the interim interviews that both teachers did not believe in the benefits of forms which especially

² This scale is one of the assessment tools suggested for teachers' use in the appendices.

Table 2. Usability of the assessment tools.

Codes		First		Interim		Last		f	
		f		f		f			
		T1	T2	T1	T2	T1	T2		
Benefits	+	0	0	0	6	7	3	16	
	-	0	1	6	3	4	3	17	
	Scoring	0	4	5	7	1	0	17	
	Close items	0	2	0	0	1	0	3	
Content of tools	Experience	Likeness	1	2	5	3	8	3	22
		Contradiction	1	1	5	1	0	0	8
		Short answers	0	1	1	1	2	0	5
		Language	0	1	0	0	0	1	2
More variety		1	2	4	0	1	0	8	
Waste of time		2	2	4	1	0	0	9	
Student selection and placement examination		1	1	2	0	4	2	10	
Inspection		0	0	0	0	5	2	7	

included affective, psychomotor, psychological, or social skills and student's self-evaluation forms.

In addition, it was determined that they had already obtained the knowledge which they would gain through these forms before through the observations, so using such forms was waste of time. The teachers were asked to evaluate their experiences during the implementations within the process with the last interviews at the end of the term. T1 stated that especially the final year students insisted on continuing their studies as usual due to the university entrance examinations which he acknowledged that it was their right:

I can't even think its implementation in the senior year of high schools...On the one hand, I am going to prepare them for the examination which is going to change their life; on the other hand, I will implement these activities. Students would rather solve more questions than participate in these activities and they are right... (T1)

In the last interview T1 stated that he did not believe that every teacher would use these forms; teachers would pretend to be filling in the form if obligations were imposed on them in terms of implementations, and although the suggested forms were used to assess students, teachers would digress from the criteria and behave as emotionally as they used to do while grading the oral tests. It was understood in this interview that the teachers included expressions which were mostly associated with "benefit" code. When the teachers'

statements associated with this code were examined, it was revealed that T1 usually did not use the suggested forms, but mentioned the benefits which can be gained from these forms after the required adjustments were made and T2 addressed the suggested tools in addition to this and also benefits which he observed when these tools were practised in the process.

To sum up, when the first, interim and the last interviews were taken into consideration, it was understood that the teachers' opinions about the suggested assessment tools being beneficial or not in practice differed within the process. T1 in the interim interviews stated that using the suggested tools would not be beneficial and it was a waste of time; however, in the last interview he implied that in case some conditions were provided (for example, legislative regulations, inspection, and informing), using these tools would bring benefits. T2 referred to the benefits of the tools used within the process and in the last interview he stated that he agreed with what T1 addressed. Moreover, another attention grabbing point is that both teachers agreed that university entrance examination would affect the suggested assessment tools negatively within the process.

Factor 3

The codes which emerged during the interviews and also comprised the third factor are given In Table 3.

When the statements of the teachers in the first

Table 3. Infrastructure conditions.

Codes	First		Interim		Last		f
	f		f		f		
	T1	T2	T1	T2	T1	T2	
Crowded classes	2	2	5	1	1	1	12
Economic reasons	1	0	1	2	0	1	5
Intense subjects	1	1	2	0	0	0	4
Social structure	1	0	1	2	1	0	5
Type of school	1	1	3	0	0	0	5
School's infrastructure	0	3	3	1	1	0	8
Textbook	0	0	3	3	1	2	9
Extra hour	0	0	0	0	5	0	5

interviews were taken into consideration, both teachers agreed that crowded classrooms would create problems while performing the suggested implementations.

When the crowded classrooms are considered, it is very difficult and time consuming for the teachers to observe the groups during group work and take observation notes... (T1)

There are 30-35 students in my classes. How can I track their portfolios? (T2)

Moreover, both teachers stated that different levels of students and their different economic and social environment would have an effect on the problems encountered during implementations.

...However, we are complaining about the lack of student interest. These techniques might be used in some exceptional high schools, but in my opinion they are not possible in high schools and vocational high schools. (T1)

Another point which was emphasized by the teachers is that the equipment required for the use of suggested tools are not the same in all schools. A researcher's note about the points stated by the teachers and reflecting the observations made during the seminar where the curriculum was introduced at the beginning of the term was given below:

During the seminar I made observations which revealed that most of the teachers in the hall, especially middle-aged and older teachers, defended that the qualities of the new curriculum would not be implemented in our education system. They also stated that the use of assessment tools particularly suggested by the curriculum would lead to waste of time and expenditures on stationery.

When Table 3 was examined, it was realized that the teachers mostly referred to the crowded classrooms and the issues related to the textbook in the interim

interviews. T1 stated that crowded classrooms and the different student levels were the obstacles to scatter group work broadly:

No matter how groups are composed, the good student manages it. What are its advantages? Some students support each other. The working students think that they carry the loads of the other students on their shoulders, so they restrain themselves. If the class size were small and student levels were the same, it would be implemented. Therefore, these conditions can exist in the schools where students are accepted after an examination. (T1)

T2 drew the attention on the fact that each student did not have the same conditions to reach knowledge and each of them came from different social environments and explained the obstacles for the use of new tools:

I regard the following as the obstacles: Students' involvement in such an implementation for the first time, students' inadequacy to reach knowledge, the socio-economic conditions of their environment, and teachers' lack of experience (T2).

In another interview, T1 stated that the use of the suggested tools and the processes they required would prevent the subjects from being covered and explained it as follows:

In conjunction with four year secondary education, we have difficulty in teaching the subjects although the course load seems to be reduced. Under such circumstances if we spend more time on these assessments, completing the subjects might become more difficult. (T1)

Teachers mentioned the negative criticisms attributed to the textbook and stated that the questions in the textbook ignored the basic principles which are teaching from simple to complicated and easy to difficult and what

Table 4. Teachers' new roles.

Codes	First		Interim		Last		f
	f		f		f		
	T1	T2	T1	T2	T1	T2	
Lack of time	4	3	1	7	4	1	20
Criticizing	3	0	0	0	0	0	3
Observation taking notes	2	2	1	3	3	0	11
Follow up	2	1	11	8	5	1	28

students try to accomplish through questions are given in pursuit of the questions. Below is given teachers' portraits by the researcher depending on the points observed during the in-class observations and mentioned in the interviews:

... It was revealed during the observations that both teachers mostly did not include the activities in the textbook while instructing. It was observed that teachers used the book to assign homework or to save time because some of the shapes were drawn in the book. This condition was also uttered during the one-legged interviews after the classes.

In the last interview T2 stated that standardized test (central examination) factor was the reason for not using the textbook at a desired level in such a way:

...I don't want to be misunderstood but I don't have positive opinions about this textbook. On the other hand, I don't hold negative views about it, either. At least it is not useless. But, there are other external factors which reduce its usability... Such as Student Selection and Placement Examination, external reactions (students' parents), what the students learn or whether they develop or not is not important for the parents, the result is important, in other words examination... (T2)

In the last interviews, teachers stated that the implementations which began with curriculum renewal were practiced better in primary education. T1 stated that due to inspection in primary schools, such implementations seemed to be practiced better and added that because they were monitored by the Ministry of National Education, the implementations were ostensibly carried out. Moreover, such teacher opinions emerged. They stated that class size and school infrastructure facilities were not at a desired level, which was important and it was meaningless to mention such implementations before these deficits were eliminated.

To sum up, it was revealed throughout the study that crowded classrooms and inadequate school infrastructure facilities were considered as the obstacles to implement the changes brought with curriculum. In the first interviews teachers did not share their opinions about

the textbook; however, what drew attention is that they shared different opinions within the process while using the text book.

Factor 4

The codes which emerged during the interviews and also comprised the fourth factor are given in Table 4.

When Table 4 was examined, it was discovered that lack of time which would hinder teachers' roles was mentioned in the first interviews. In addition, opinions such as tracking the activities and the observations required for the follow-up would hinder teachers' roles were mostly included. T2 asserted that with the curriculum change mathematics course was reduced from 5 to 4 credit hours, so intensive subject load would not let teachers carry out such techniques as group work:

Time is not enough; however, mathematics course was reduced from 5 to 4 credit hours with the new curriculum.... I believe that this system is going to be replaced by another system later on. Although teachers want to perform these works completely, I don't think that enough time won't be allotted to them. (T2)

T1 stated that teachers would be criticized because students, students' parents and even teachers, themselves, were not used to using assessment tools based on qualitative data:

Since the frequent use of assessments based on observation requires the results to be evaluated personally - low score or high score, they will probably cause criticism ... (T1)

In the first interview T2 stated his opinion about the difficulty of tracking the tasks as follows:

My classes consist of 30-35 students. How can I track and check the portfolios of so many students? If I check them in the class, I will spend my time ticking the checklists. If I check them after the lesson, how can I remember what each student has done?(T2)

A researcher's notes about the observations made within

Table 5. Being informed about the changes in the curriculum.

Codes	First		Interim		Last		f
	f		f		f		
	T1	T2	T1	T2	T1	T2	
Need for examples	1	3	6	2	4	6	22
Meaning of the knowledge acquired from the tools	0	3	2	1	1	2	9
Explanations	0	4	8	8	1	1	22
In-service training	1	0	1	0	6	4	12
Relationship between daily life and mathematics	0	0	0	0	1	0	1
History of mathematics	0	0	0	0	1	0	1

the process are given below:

Depending on the in-class observations I made, it was discovered that the changes brought along with the new curriculum were not transferred to the learning environments. Firstly, I can state that lessons were teacher-centred, and trial-run group works were far from the logic of group work based on collaboration. It was revealed in the lessons during the observations that the activities in the textbook were usually not used and the questions similar to exam questions were mostly included in the lessons. I can say that the teachers encouraged their students to search different question types and although rarely done, they also reminded them to include them in their portfolios.

To sum up, it can be stated that the teachers mostly complained about the difficulties of tracking the tasks and lack of time allotted to follow them up in the interviews carried out throughout the study.

Factor 5

The codes which emerged during the interviews and also comprised the fifth factor are given in Table 5.

When Table 5 was examined, it was revealed that the teachers included statements in their first interviews indicating that they needed sample works and the explanations about the subjects were inadequate. In the interim interviews it was found that there were still statements by the teachers which indicated that the explanations were inadequate. For example, T1 stated that he did not have much information about portfolio and he decided where to keep the portfolios based on his experiences:

I had no idea about whether I was going to keep the portfolios or the students. At first I was keeping the portfolios. Then, I realized that it did not have any benefits. Now, students keep them and I sometimes ask them to bring them to me to check them. (T1)

T2 stated in the interviews that he tried to use project method, one of the alternative assessments suggested by the curriculum, but he had to quit due to lack of student interest:

... Because I did not have satisfying resources suggesting project work examples and tasks, I could not help my students; therefore, I quitted this implementation at the beginning of the term. I could not find clear and comprehensible information about the subject in the curriculum guide. (T2)

Similarly, it was discovered in the final interview that the teachers stated that in-service training was inadequate and they needed examples which introduces the relationship between mathematics and daily life and history of mathematics to guide them in their studies. Furthermore, the teachers added that such reasons as students' low levels, their disinterested attitudes and behaviours, implementation tracking being difficult and time consuming and regulatory obligations affected their implementations negatively.

To sum up, teachers mostly mentioned inadequate explanations and their needs for examples related to the fifth factor throughout the interviews in the study. Furthermore, what drew attention in the last interview is that teachers indicated that in-service training offered to them was inadequate.

Factor 6

The codes which emerged during the interviews and also comprised the sixth factor are given in Table 6.

When Table 6 was examined, both teachers stated that students were not ready for such techniques which would have an effect on students' learning. Moreover, T1 mentioned lack of students' interest and T2 stated the differences between student levels as follows:

... We almost complain about our students' lack of

Table 6. Students' Learning.

Codes		First		Interim		Last		f
		f		f		f		
		T1	T2	T1	T2	T1	T2	
Students' characteristics	Differences in students' levels	0	2	10	4	5	2	23
	Non-assertive	0	0	4	0	0	0	4
	Not prepared	1	1	9	2	0	0	13
	Interest + (Interested)	0	0	2	3	0	0	5
	Interest - (Disinterested)	1	0	7	6	1	0	15
Interaction	Imitation	0	0	6	3	0	0	9
	Teacher-student Work + (Yes)	0	0	1	1	1	1	4
	sharing - (No)	0	0	11	2	0	0	13
	Support	0	0	2	0	0	0	2
	Feedback + (effective)	0	0	2	3	5	2	12
	Feedback - (ineffective)	0	0	1	1	0	0	2
	Motivation + (effective)	1	0	0	0	1	0	2
Environment	Motivation - (ineffective)	0	0	0	1	0	0	1
	Noise	0	1	5	0	0	0	6
Examination		0	0	1	0	0	1	2

interest. These techniques might be used in some exceptional high schools, but in my opinion they are not possible in high schools and vocational high schools... (T1)

... This form can be used with the good students and it can be beneficial to them. (T2)

It was indicated in the interim interviews that T1 evaluated students' personal qualities as one of the important factors affecting students' learning. It was determined in the interim interviews that T2 mentioned two main components which could be associated with the sixth factor. When Table 6 and the interviews were examined, T2 mentioned lack of students' interest and thought that the new approaches and measurement and assessment tools were more suitable to implement in the schools where students are accepted after an examination. However, it was determined that while teaching courses, T2 tried to do his best to include teaching and learning techniques such as group work, portfolios and self-evaluation and the new measurement and assessment approaches mentioned in the curriculum.

... Apart from these, I tried to use the project method included in the curriculum. I gave students some time to do research on this subject, but I did not encounter any good examples. I can say that students were really not interested in it. They complained, "How are they going to develop projects?" (T2)

On the other hand in the last interviews it attracted atten-

tion that both teachers mentioned the importance of collaboration in group. The statements of T1 about this subject were given below.

T1: *An enthusiasm and excitement occurs in unsuccessful students during the group work because my aim is to help them think that they can learn something without disturbing the class. Students' participation is very important; in other words, a student cannot solve every question, but I encourage him to do it if I notice that he is zealous. Such students try not to cause trouble and make an effort to be supportive. During the study, they considered themselves a member of the group as they tried to participate and bring documents.*

Considering all the findings gathered from this research, it was revealed with the interviews and observations carried out for a year that six factors were effective in teachers' views on the measurement and assessment aspect of the curriculum, but no permanent changes were experienced with the implementations when evaluating the process.

DISCUSSION

Factor 1: Teachers' Culture

The interviews and observations indicated that teachers used written tests as the key determinant when assessing and evaluating students. This finding overlaps

the results of the studies which stated that teachers preferred mostly traditional methods to assess students' performance (Gelbal and Kelecioğlu, 2007; Karakuş, 2010; Nalbantoğlu-Eyitmiş, 2007). Moreover, the observations carried out within the process indicated that T1 and T2 asked their students to create a portfolio and despite being few in number, they included group works in their lessons. T1 and T2 tried to include these works within the process until the end of the first term despite different problems they encountered; however, they preferred only traditional methods for a long time in the second term. It was understood from the interviews that the reason for this situation was that the data obtained from the works could not be used officially. Although it was stated that the results obtained from these methods were reflected on oral assessments, it was discovered that teachers shared a culture in which they added the assessment results on students' scores as they used to do in the past.

When the documents involving legislative regulations related to measurement and assessment were examined, it was determined that the changes which were limited to only primary education institutions were included from the year when curriculum renewal started to the moment when the study was completed. Failure in legislative regulations for secondary education institutions was considered as a barrier to catch up with the desired changes. Thus, teachers emphasized this point from the beginning of the process to the end and stated that required changes had to be made as soon as possible in order to provide unity. Moreover, it can be stated that what teachers experienced in the field of measurement and assessment until the end of the term was more compatible with the curriculum anticipations. However, because the regulatory changes mentioned were not carried out in measurement and assessment, not being able to use the tasks accomplished at the end of the term tangibly prevented teachers from keeping up with the changes and also caused teachers to behave in ways similar to their previous teaching life for some time.

The studies conducted reveal that teachers focused on product rather than the process while assessing the tasks (Stiggins, 2002) and they were not qualified for process assessment (Yılmaz, 2006). The findings of this research revealed that measurement and assessment methods preferred by T1 and T2 were not very different from the ones used in the previous years and they actually used tests and oral assessments. This finding shows similarities with the results of the other studies (Erdal, 2007; Gelbal and Kelecioğlu, 2007; Nalbantoğlu-Eyitmiş, 2007). Under these circumstances, it was considered that teachers' lack of information due to lack of satisfactory explanations about how to use the suggested tools, lack of importance given to the new implementations included in the curriculum after some time due to not being able to use them officially, and lack of essential regulations for the subjects mentioned must have been effective.

To sum up, it can be stated that the first factor which

affected the teachers' views on contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to the teachers' opinions about how to do measurement and assessment. During the interviews, teachers shared opinions such as objective measurement and assessment which are specified with legislative regulations.

Factor 2: Usability of the assessment tools

Opinions such as the use of suggested measurement and assessment tools in the study under the present circumstances may cause teachers to spend more time and energy and this situation may become a barrier for the students to get prepared for the university entrance exam emerged. It was discovered in the interim interviews that the suggested tools and the use of the processes required by them and student selection and placement examination (SSaPE)³ were emphasized, but it was found that this condition was mentioned less than in the first interviews. However, the observations made within the process demonstrated that teachers focused on the previous exam questions in the past and they warned their students about them. This condition indicated that courses were instructed based on the standardized tests. Because implementations carried out were preparing students for the standardized tests, the opinions which were stated in the interim interviews that the use of suggested tools would hinder preparation for SSaPE diminished. However, it was determined that both teachers addressed this subject many times during a general evaluation in the last interviews. This condition indicates that teachers viewed SSaPE as an obstacle to keep up with the required changes. The same issue was also specified in the previous studies conducted in Turkey (Çalık, 2007; Mercan, 2013). Some studies conducted abroad revealed that such tests would damage the reform (Briars, 1999; Carless, 2005), they could have negative effects on classroom practices (Boardman and Woodruff, 2004; Mabry et al., 2003) and they would be responsible for the emergence of students who got good scores in the standardized tests but were not well-trained.

To sum up, it can be stated that the second factor which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to the usability of the suggested assessment tools. It was identified during the interviews that teachers used expressions such as there was a variety of suggested assessment tools, using these assessment tools would not bring the essential benefits under these circumstances and also cause time loss, and student selection

³SSaPE (Student Selection and Placement Examination) is a standardized test administered every year to select and admit students in higher education. Students get into a university as a result of this exam.

and placement test reduced the usability of assessment tools.

Factor 3: Infrastructure conditions

It was revealed in the interviews that teachers viewed crowded classrooms as a major obstacle to meet the requirements of the curriculum. This finding shows similarities with the results of many studies conducted on new curriculum designs in Turkey (Acat and Demir, 2007; Duru and Korkmaz, 2010; Gelbal and Kelecioğlu, 2007; Selvi, 2006; Yapıcı and Leblebiciler, 2007).

While T1 and T2 expressed their opinions especially about the tasks included in portfolio in curriculum guides, teachers stated that the economic conditions of students would cause problems in the implementation. This result shows similarity with the results of the study conducted by Yılmaz (2006) which stated that teachers received complaints from students' parents about expenditures while students were preparing performance tasks and projects and this condition prevented assignments from being done. These findings are also similar to the results of the study by Garet and Mills (1995) who stated that it is difficult to turn change into action and sustain it and it is also associated with the demographic features of the schools. Similar results are obtained with many research studies conducted on the newly developed curriculum designs in Turkey (Erdal, 2007; Yapıcı and Leblebiciler, 2007).

T1 and T2 usually preferred not to use textbooks in their implementations. Thus, in-class observations indicated that teachers used books which prepared students for university exam as resources and they used textbooks mostly to assign homework or save time by using the drawings in the textbook (for example; function graphs) and explain them. This condition was regarded as an indicator of their not being able to give up their own past experiences.

It can be stated that the third factor which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to infrastructure conditions. Teachers indicated during the interviews that the conditions related to infrastructure such as crowded classrooms, lack of equipment and tools in schools, intensive subjects, and students' social and economic conditions caused problems between measurement and assessment aspect of curriculum and the essential change.

Factor 4: Teachers' new roles

Teachers' new roles are very important while implementing the changes carried out in education (Hayward et al., 2004; Patterson and Norwood, 2004). While teachers' views on the measurement and assessment aspect of curriculum were being explored in this study, the fourth

factor generally represented the codes which were composed from the statements mentioned in the interviews and also indicated teachers' new roles. It was found that opinions were formed on the criticisms teachers received while doing assessment with the new assessment tools in the first interviews only, but this subject was not mentioned not only in the interim interviews but also in the last interviews. It was understood in the first interviews that teachers predicted that they would receive criticism due to qualitative data based on observation and evaluating their attitudes. Such statements did not occur during the implementations and assessments in the last interviews, which indicated that teachers might have used this condition as an excuse to escape at the beginning of the implementation. Moreover, lack of preference to use the mentioned assessment tools was considered to be effective in this condition. Borko et al. (1997) reported that if the beliefs of teachers are incompatible with the ones identified officially, teachers either avoid using these new ideas or they try to adapt them to their existing experiences. When considered from this aspect, it can be stated that the findings obtained from the research are similar to the points indicated by this study.

Acat and Demir (2007) indicated in their study that teachers stated that making copies for criteria to assess performance for each lesson and activity especially hindered the implementation of assessment tasks beneficially due to lack of time and the crowded classrooms. The opinions expressed in this study during the first, interim and last interviews were that time allotted to carry out these changes introduced by the curriculum would not be enough. T1 and T2 restated in the study that it became more difficult to check and examine the portfolios due to crowded classrooms, so they could not give feedback at a desired level. Therefore, it is implied that teachers' opinions about this subject did not undergo any changes within the process. Many studies indicating similarities with the results of this study are encountered in Turkey and they reveal that teachers could not experience the essential changes to adopt formative assessment due to lack of time (Çalık, 2007; Erdal, 2007; Gelbal and Kelecioğlu, 2007, Keleş, 2009). In addition to these, many studies carried out abroad indicate the same points (Alsup and Springler, 2003; Borko et al. 1997; Borko et al., 2000; Butler et al., 2005; Carless, 2005; Dawn-Camacho and Vickie, 2007; Hayward et al., 2004; Mabry et al., 2003; Osborne, 1993).

Teachers give meaning to reform in line with their own experiences (Drake and Sherin, 2006). There are really big differences between the teachers in terms of accepting the requirements of the curriculum or showing resistance (Remillard and Bryans, 2000) and using the materials and activities for the suggested subjects, so teachers resort to other different ways related to their beliefs in place of the methods aimed by the curriculum developers and experts in education. When considered from this aspect, it can be stated that similar findings

were obtained in this study. In other words, although both teachers tried to integrate these changes along with their knowledge and experiences, they quitted them, which they made an effort to include, due to their beliefs in time. Two teachers were different from each other in that T2 was more willing than T1 to include the mentioned changes and also he tried to reflect them on his implementations. However, the statements of T2 during the interviews revealed that the teacher perceived the changes made in the field of measurement and assessment as only using the suggested forms. This finding is reinforced with the expectation of the teacher. The teacher has expectations in every opportunity about what the percentages of the scores obtained via these forms will be on average score and how they will be calculated. He also expects them to be determined by legal procedures. On the other hand, the difficulties of following the tasks mentioned by T1 and T2 in the first, interim and last interviews drew attention. It was understood that they mentioned the challenges of following the groups during the group works in the classroom practices and portfolios. It was indicated that such opinions as implementing many tasks and difficulties of implementing the changes under present conditions (Hayward et al., 2004) resulted in achieving success with the goals of formative assessment; therefore, it hindered the progress of the desired changes. When considered from this aspect, the reasons for failing to experience permanent changes with the implementations in connection with the teachers' opinions have been realized better.

It can be stated that the fourth factor which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to the teachers' new roles. It was revealed by the teachers during the interviews that conditions related to teachers' new roles such as lack of time, difficulty of following the tasks and doing observations and taking notes at the same time lead to problems in curriculum to experience the target changes in the field of measurement and assessment.

Factor 5: Being informed about the changes in the curriculum

The fifth factor, which generally represented the codes which were composed from the statements of the teachers in the interviews, indicated information about curriculum change. Although the observations and interviews carried out during the research indicate that some attempts have been made to capture the desired changes, they were either short-term or they were up to teachers' choices due to inadequate explanations and resources, teachers' not being informed about this subject at a required level and the arrangements' not being made according to the regulations. Similarly, it is

determined in the literature that since teachers are not provided with adequate information and resources about which assessment techniques they are going to use and how they are going to use them while doing in-class assessment, the way these assessments are handled will remain limited to teachers' experiences (Baki and Birgin, 2002), teachers who are supposed to use performance assessment have experienced very few changes with their teaching practices (Firestone et al., 1998), teachers prefer to use the method which they think they are competent at (Gelbal and Kelecioğlu, 2007; Erdal, 2007).

On the other hand, teachers' lack of necessary details which are required to implement the innovations prevents them from achieving the goals in the field of measurement and assessment (Hayward et al., 2004). It was determined in the study that due to the reasons mentioned above, teachers' efforts towards the goals of the curriculum decreased and they continued to carry out the teaching and learning activities in line with their past experiences. Therefore, it is revealed that in order to actualize the target changes the teachers need a very good content knowledge (Firestone et al., 1998), satisfying and on-going in-service training (Borko et al., 1997; Briars, 1999) and support and incentive (Carless, 2005).

Moreover, it is reported in the literature regarding the research studies conducted in Turkey that teachers encounter problems such as lack of inadequate explanations about measurement and assessment techniques (Çalık, 2007, Keleş, 2009), lack of examples about how to use the new tools and evaluate the results (Gelbal and Kelecioğlu, 2007), teachers' lack of knowledge about alternative assessments and lack of explicit explanations about how to convert the alternative assessment results into school report grades in course and examination regulations (Bulut, 2006). In addition to these problems encountered by the teachers, it is identified that teachers found the assessment results related to curriculum implementations as meaningless (Selvi, 2006) and they could not use these tools in meaningful ways in their lessons; therefore, teachers could not exactly comprehend and implement what they are asked to do in the curriculum (Selvi, 2006) and they are in need of knowledge.

The interviews revealed that teachers wanted to see task examples (project, portfolio and so on) and they also needed guide books for examples. The interim interviews revealed that teachers needed examples of in-class activities and projects, they also mentioned the importance of access to sample portfolios for the introduction of portfolios on the website of Ministry of National Education and they had difficulties in finding the required samples; therefore, all these affected their implementations negatively. Examples of research studies which have been conducted on new curriculum and obtained similar results are encountered in Turkey (Yılmaz, 2006). In parallel with this, Firestone et al. (1998) found that very few changes were observed with

the implementations of teachers who were supposed to use performance assessment and also indicated that lack of rich activities and sample problems in curriculum materials which promote such approach is the obstacle which hinder the desired change (Morrison et al., 2003). Moreover, Hayward et al. (2004) stated that implicit tools are one of the reasons for achieving less success than the desired one in the field of measurement and assessment.

It is not easy for teachers to learn their new roles. In addition, it is not easy for students to put aside their passive roles and acquire their new role, responsibility. Change requires adequate resources, ownership, knowledge and skills and implementing them at the right time and right place (Morrison et al., 2003).

Therefore, it is obvious that teachers need satisfying information in order to keep up with the changes intended with curriculum. Thus, it is known that in-service training activities designed for the changes are very important for teacher's training and awareness as well as providing the desired development during education. It drew attention that teachers considered in-service training activities related to the introduction of the curriculum as inadequate throughout the research and they also reacted because their needs were not met despite the period of time especially in the last interview.

It can be stated that the fifth factor which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to giving information about the curriculum changes. It was determined in the interviews that such reasons stated by the teachers as inadequate in-service training and task examples, lack of explicit and detailed information given in the field of measurement and assessment in the curriculum caused problems to achieve changes with the measurement and assessment aspect of curriculum.

Factor 6: Students' learning

While the changes with teachers' views on the measurement and assessment aspect of curriculum were being explored, the sixth factor which generally represented the codes which were composed from the statements of the teachers in the interviews indicated student learning. Mathematics education authorities hold positive views about using these assessment techniques to help students to learn mathematics better (Doğan, 2011). As a result of the examination of the interviews carried out in the process, three factors, student qualities, interaction and environment were influential on students' learning. According to the statements of T1 and T2 in the interviews, it was found that student qualities which had an effect on learning were different levels between students, confidence, preparation and imitation.

In the first interviews, it was stated that due to low

mathematics levels of the students, it would not be possible for the students to carry out projects; therefore, the suggested *Project Evaluation Form* would be used with the good students only. This finding revealed that the differences between the levels of the students are considered as an obstacle to carry out the changes in the field of measurement and assessment. In the interim interviews it was stated with the similar logic that Science or Turkish-Mathematics classes would be suitable to implement group work and it seems to support this view. It was also pointed out in the interviews that the differences between the levels of the students caused problems while using worksheets given in the textbook and this condition affected student learning negatively. In-class observations carried out within the process indicated the same point. Another interesting finding which drew attention is that even the best students could not understand what was tried to be taught with the worksheets and the goals were achieved only with the help of the students. This condition can be explained with the fact that students were not used to carrying out such implementations before and they were used to utilizing the information given by the teacher. Thus, this condition was addressed by the teachers in the later interviews. Pupils' not being ready for the system and their not being used to the problems given in the textbook or guide book became the barriers to keep up with the desired changes. Although the existing problem was expected to be solved in time, the observations and interviews at later stages indicated that there were still problems about this issue and that is why teachers quitted using textbooks and they reverted to the old methods and test books in their practices. However, it is emphasized in many studies that student-teacher interaction has been important in formative assessment practices (Barootchi and Keshavarz, 2003; Wiliam et al., 2004).

Portfolios (Birgin, 2011; Simon and Forgette-Giroux, 2000), self and peer assessment (McDonald and Boud, 2003) can promote students' participation in assessment process. It is determined that self-assessment has a very important role in learning and assessment activities (Brookhart, 2001); therefore, students take the responsibility for their own learning (McDonald and Boud, 2003; Hayward et al., 2004). Teachers stated in the study that the tasks mentioned above would be beneficial, but the benefits can be obtained if the necessary regulations are made. As mentioned in the previous sections, due to incomplete infrastructure conditions and official regulations, teachers preferred to quit the implementations which they tried to carry out in the first stages of the study.

It can be stated that the sixth factor which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform is related to the new role of measurement and assessment on student learning. It was revealed by the teachers during the interviews that

student qualities, student-student interaction and student-teacher interaction and environment had an effect on students' learning.

As a result of the examination of the data gathered from the research, six factors (cultural aspect, usability of measurement and assessment tools, infrastructure conditions, teacher's role, informing, student learning) which affected the teachers' views on the contemporary measurement and assessment approaches within the context of mathematics curriculum reform were identified. The findings obtained from the research based on the factors identified in the research were given below.

1. Teachers' culture about measurement and assessment tools affected their views on the new measurement and assessment approaches within the context of mathematics curriculum reform.
2. Teachers share a culture in which assessment should be objective. Teachers are anxious about the suggested tools because they believe that these tools will decrease the objectivity of assessment. Therefore, they did not prefer to integrate them into their implementations which gradually decreased within the process.
3. Teachers continued to assess their students with written and oral examination as well as homework which were stated in the official regulations, but not with the suggested tools in the curriculum and they evaluated their observations about the new implementations which they tried to make use of by reflecting them on oral grades.
4. Teachers stated that both changes in the field of measurement and assessment and necessary official regulations must be made in order to develop unity in implementation.
5. Teachers asserted that the use of forms based on the assessment of affective, social, and psychomotor skills in measurement and assessment implementations would not bring any benefits under the present circumstances.

Teachers' opinions about the usability of assessment tools affected their perceptions towards the new measurement and assessment approaches within the context of mathematics curriculum reform.

1. Teachers think that the use of suggested measurement and assessment tools and the essential processes are obstacles to SSaPE preparation.
2. Teachers think that the content of the suggested measurement and assessment tools have an effect on their usability. Thus, it was understood that criticism related to the criteria (scoring weight of the test items, too broad, not related to mathematics and etc.) to score the tools did not change and that's why teachers did not feel the need to integrate these tools into their teaching.
3. It was determined that teachers' previous experiences contradicted with the desired implementations in curriculum change and this was one of the factors which became a barrier to keep with the desired change.

4. Similarities between the previous experiences and the implementations required due to curriculum change were among the reasons why teachers did not use these suggested tools.

5. Both teachers and the researcher adopted the view introduced in the last interview. According to the view, the inspection would be effective to keep up with the desired changes in the field of measurement and assessment and to disseminate it widely.

6. The interviews and the observations revealed that there was no change with the teachers' views about the use of suggested tools as they considered them waste of time.

Infrastructure conditions affected teachers' views on the new measurement and assessment approaches within the context of mathematics curriculum reform.

1. There was no change with the teachers' views on the crowded classrooms within the process. They stated that crowded classrooms were the obstacles to keep up with the desired changes regarding the measurement and assessment aspect of the new curriculum.
2. There was no change with the teachers' views which stated that students' economic conditions and social environment would be effective to keep up with the desired changes regarding the measurement and assessment aspect of the new curriculum.
3. There was no change with the teachers' views which stated that schools must be equipped to keep up with the desired changes regarding the measurement and assessment aspect of the new curriculum.
4. It was concluded that the activities included in the textbook and the measurement and assessment implementations were criticised by the teachers and the textbook was rarely used during the education.

Teachers' new roles affected their views on the new measurement and assessment approaches within the context of mathematics curriculum reform.

1. There was no change with the teachers' views within the process which stated that time would not be enough to implement the innovations introduced with curriculum in the field of measurement and assessment.
2. There was no change with the teachers' views within the process which stated that it was difficult to follow the required tasks under the present circumstances in order to keep up with the required changes regarding the measurement and assessment aspect of the curriculum. Lack of information activities affected teachers' views on the new measurement and assessment approaches within the context of mathematics curriculum reform.

1. Teachers' needs for the sample works related to the philosophy of the curriculum continued within the process.

2. Teachers stated that in-service training activities for the introduction of the curriculum were inadequate.
3. It was revealed that the explanations given in the introduction of curriculum and guide book were not considered clear and detailed by the teachers.

The role of measurement and assessment in student learning affected teachers' views on the new measurement and assessment approaches within the context of mathematics curriculum reform.

1. There was no change with the teachers' views within the process which stated that students' qualities had an effect on student learning and the desired changes regarding the measurement and assessment aspect of the curriculum.
2. It was concluded that interaction was another factor which had an effect on student learning.

SUGGESTIONS

Teachers were informed about the mathematics curriculum reform by the people who were not experts in the field and it was limited to theoretical knowledge and offered only once; therefore, teachers were involved in the process without understanding the goals related to the changes. Thus, a need for in-service training activities emerged. During these activities while introducing the curriculum, time must also be spared for measurement and assessment because as stated in the first section the results of many studies carried out reveal that teachers had encountered more problems with this aspect.

Teachers stated in the research that they were not satisfied with the in-service training activities offered to them by the teachers like themselves and who were not well informed about the changes made. In order to eliminate this problem, information activities must be given by the experts in the field, they must involve rich examples about the new methods, and the program of the activities must be flexible so that they can be shaped according to teachers' feedback. Therefore, project works must be carried out with the participation of experts and teachers at certain intervals and the results obtained must be shared with teachers. Within the context of these studies, first of all teachers can learn the basic knowledge, they can develop new tasks after examining the sample tasks, and they can share the experiences they have with each other within the process via interaction and communication with their colleagues. Another contribution is that pre-service teachers must be trained in the courses related to measurement and assessment in the universities and they must be involved in the system as well equipped and qualified teachers.

The observations and interviews revealed that the explanations in the curriculum and guide book were inadequate in order to keep up with the required

changes. Therefore, it was introduced that teachers needed a teacher's book equipped with rich examples and explanations to use in their implementations. In addition, the present textbooks must be reviewed, equipped with activities which can utilize educational technologies, and eliminate the points which are not consistent with constructivist approach. Measurement and assessment tasks in the textbooks must enable a student to generate his own knowledge. Teacher's books and textbooks enriched with such tasks will help teachers understand the desired goals and also help them to develop task examples suitable to their own conditions. Moreover, the website of Ministry of National Education should include arrangements where teachers find activity examples and project works and share their knowledge with each other. For example, teacher portals can be designed to give opportunities to share practises carried out. Moreover, teachers must be informed about how to integrate the relationship between mathematics and daily life and history of mathematics into the courses.

It was found in the study that one of the obstacles which hindered teachers was student selection and placement test (SSaPE). If measures for such standardized tests are not taken, it will become difficult for the teachers to include implementations about constructivist approach. Thus, examination system must be reorganized in line with constructivist approach like the curriculum.

The results of the study revealed that infrastructure conditions are an important factor for the required changes. Thus, infrastructure conditions must be tried to be improved as soon as possible and if the conditions are not improved, teachers must be provided with satisfying explanations and examples about how to behave under such circumstances. In addition, by taking into consideration the results of the research conducted, suggested measurement and assessment tools must be rearranged, or even they can be reduced. Moreover, teachers must be given extra hours to examine the implementations and carry out research studies out of the class hours. Therefore, it will make contributions both to the teachers and the students to reach the required changes through the new curriculum.

The effective factors important for teachers' views regarding the measurement and assessment aspect of curriculum were defined in the study. The separate and elaborate examination of these factors is important for the identification of the problems and the measures taken. This study reflects the experiences of two teachers by focusing on the process about the measurement and assessment aspect of curriculum. On the other hand, literature review indicates that change must be interpreted regarding the culture where it occurs. Thus, similar studies should be conducted to examine the change process and also explore the reasons for resistance. Nearly the same years of experience and working conditions of the participant teachers in the study caused

the likely conditions to emerge to be limited. In the future studies, teachers with different years of experiences and working conditions can be chosen and the conditions which have emerged can be examined comparatively.

NOTE: This study was generated from the Ph Dissertation of the first author under the supervision of the second author.

Conflict of Interests

The author(s) have not declared any conflict of interests.

REFERENCES

- Acat B, Demir E (2007). Sınıf Öğretmenlerinin İlköğretim Programlarındaki Değerlendirme Sürecine İlişkin Görüşleri. XVI. Ulusal Eğitim Bilimleri Kongresi. Tokat: Gaziosmanpaşa Üniversitesi.
- Alsop J K, Springler MJ (2003). A Comparison of Traditional and Reform Mathematics Curricula in an Eight-Grade Classroom. *Education*. 123(4):689-694.
- Assessment Reform Group (2002). *Testing, Motivation and Learning*. Cambridge: University of Cambridge Faculty of Education.
- Baki A, Birgin, O (2002). Matematik Eğitiminde Alternatif Bir Değerlendirme Olarak Bireysel Gelişim Dosyası Uygulaması. 5. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, 16-18 Eylül 2002, ODTÜ Kültür ve Kongre Merkezi, Ankara.
- Barootchi N, Keshavarz MH (2002). Assessment of Achievement through Portfolios and Teacher-made Tests. *Educ. Res.* 44(3):279-288.
- Birgin O (2011). Pre-Service Mathematics Teachers' Views on the Use of Portfolios in Their Education as an Alternative Assessment Method. *Educ. Res Rev.* 6(11):710-721.
- Birgin O, Tutak T, Türkođan, A (2009). Primary School Teachers' Views about the New Turkish Primary School Mathematics Curriculum. *E-Journal New Sciences Acad.* 4(2):270-280.
- Boardman AG, Woodruff AL (2004). Teacher Change and "High-Stakes" Assessment: What Happens to Professional Development? *Teaching Teacher Educ.* 20(6):545-557.
- Bogdan RC, Biklen SK (1992). *Qualitative Research for Education: An Introduction to Theory and Methods*. Allyn and Bacon Inc., ABD.
- Borko H, Mayfield V, Marion S, Flexer R, Cumbro K (1997). Teachers Developing Ideas and Practices about Mathematics Performance Assessment: Successes, Stumbling Blocks and Implications. *Teaching Teacher Educ.* 13(3):259-278.
- Borko H, Davinroy KH, Bliem CL, Cumbro KB (2000). Exploring and Supporting Teacher Change: Two Third-Grade Teachers' Experiences in a Mathematics and Literacy Staff Development Project. *Elementary School J.* 100(4):273-306.
- Brookhart SM (2001). Successful Students' Formative and Summative Uses of Assessment. *Assessment Educ.* 8(2):153-169.
- Briars DJ (1999). Curriculum and Systemic Math Reform. *Educ. Digest.* 64(7):22-28.
- Bulut A (2006). 9. Sınıf Matematik Dersi 2005 Öğretim Programının Değerlendirme Boyutuna Dair Öğretmen Görüşleri. *Yayınlanmamış Yüksek Lisans Tezi, Yıldız Teknik Üniversitesi, İstanbul.*
- Bulut, M (2007). Curriculum Reform in Turkey: A Case of Primary School Mathematics Curriculum. *Eurasia J. Mathematics, Sci. Technol. Educ.* 3(3):203-212.
- Butler SM, Mccolskey W, O'Sullivan R (2005). How to Assess Standart Performance in Science: Going beyond Multiple-Choice Tests. Third Edition, Greensboro, NC: Southeast Regional Vision for Education.
- Büyükoztürk Ş, Kılıç-Çakmak E, Akgün ÖE, Karadeniz Ş, Demirel F (2012). *Bilimsel Araştırma Yöntemleri*. Pegem A Yayıncılık, Ankara.
- Carless D (2005). Prospects for the Implementation of Assessment for Learning. *Assessment in Education* 12(1): 39-54.
- Çalık S (2007). Sınıf Öğretmenlerinin Yenilenen İlköğretim Programlarının Ölçme ve Değerlendirme Süreci Hakkındaki Düşünceleri Üzerine Bir Araştırma. 16. Ulusal Eğitim Bilimleri Kongresi, Tokat: Gaziosmanpaşa Üniversitesi Eğitim Fakültesi.
- Dawn-Camacho D, Vickie C (2007). Standardized Testing: Does it Measure Student Preparation for College & Work? (ERIC Document Reproduction Service No. ED495251).
- Dođan M (2011). Student Teachers' Views about Assessment and Evaluation Methods in Mathematics. *Educ. Res. Rev.* 6(5):417-431.
- Drake C, Sherin MG (2006). Practicing Change: Curriculum Adaptation and Teacher Narrative in the Context of Mathematics Education Reform. *Curriculum Inquiry.* 36(2):153-187.
- Duru A, Korkmaz H. (2010). Teachers' views about a new mathematics curriculum and difficulties encountering curriculum change. *Hacettepe University J. Educ.* 38:67-81.
- Eraslan A (2013). Teachers' Reflections on the Implementation of the New Elementary School Mathematics Curriculum in Turkey. *Hacettepe University J. Educ.* 28(2):152-165.
- Erdal H (2007). 2005 İlköğretim Matematik Programı Ölçme Değerlendirme Kısımının İncelenmesi (Afyonkarahisar İli Örneđi). Yüksek Lisans Tezi, Afyon Kocatepe Üniversitesi, Sosyal Bilimler Enstitüsü, Afyonkarahisar.
- Firestone W, Mayrowetz D, Fairman J (1998). Performance-Based Assessment and Instructional Change: The Effects of Testing in Maine and Maryland. *Educ. Evaluat. Policy Anal.* 20(2):95-113.
- Garet MS, Mills VL (1995). Changes in Teaching Practices: The Effects of the Curriculum and Evaluation Standards. *The Mathematics Teacher.* 88(5):380-389.
- Galbal S, Keleciođlu H (2007). Öğretmenlerin Ölçme Değerlendirme Yöntemleri Hakkındaki Yeterlik Algıları Ve Karşılaştıkları Sorunlar. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi.* 33:135-145.
- Güneş G, Baki A (2011). Dördüncü Sınıf Matematik Dersi Öğretim Programının Uygulamasından Yansımalar. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi.* 41:192-205.
- Hayward L, Priestley M, Young M (2004). Ruffling the Calm of the Ocean Flor: Merging Practice, Policy and Research in Assessment in Scotland. *Oxford Rev. Educ.* 30(3):397-415.
- Karakuş F (2010). Ortaöğretim Matematik Dersi Öğretim Programında Yer Alan Alternatif Ölçme ve Değerlendirme Yaklaşımlarına Yönelik Öğretmen Görüşleri. *Türk Eğitim Bilimleri Dergisi.* 8(2):457-488.
- Keles, O. (2009). An investigation of elementary and mathematics teachers' views about the new elementary school mathematics curriculum. Unpublished master's thesis, Middle East Technical University, Ankara, Turkey.
- Mabry L, Poole J, Redmond L, Schultz A (2003). Local Impact of State Testing in Southwest Washington. *Education Policy Analysis Archives.* 11:22.
- McDonald B, Boud D (2003). The Impact of Self-Assessment on Achievement: The Effects of Self-Assessment Training on Performance in External Examinations. *Assessment Educ.* 10(2):209-220.
- Mercan FÇ (2013). Turkish Physics Teachers' Views About the 2007 Physics Teaching Program and Its Implementation. *Educ. Res. Rev.* 8(17):1559-1573.
- Ministry of National Education (2005). *Matematik Dersi Öğretim Programı ve Kılavuzu*, MEB Yayınları, Ankara.
- Miles MB, Huberman AM. (1994). *An Expanded Source Book: Qualitative Data Analysis*. (2nd Ed.) London: SAGE Publications.
- Morrison JA, Mcduffie AR, Akerson V (2003). Preservice Teachers' Development and Implementation of Science Performance Assessment Tasks, Annual Meeting of the American Educational Research Association, Chicago. Nisan.
- Nalbantođlu-Eyitmiş A (2007). Ortaöğretim Öğretmenlerinin Ölçme Değerlendirme Tekniklerini Etkin Kullanabilme Yeterliliklerinin Araştırılması (Kahramanmaraş Örneđi). *Yayınlanmamış Yüksek Lisans Tezi, Kahramanmaraş Sütçü İmam Üniversitesi, Kahramanmaraş.*
- National Council for Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School Mathematics*, Reston, VA.
- Patterson NT, Norwood KS (2004). A Case Study of Teacher Beliefs on Students' Beliefs about Multiple Representations. *Int. J. Sci. Mathematics Educ.* 2:5-23.

- Remillard J, Bryans M (2000). Negotiating a Relationship with New Curriculum Materials in an Urban Setting. Paper Presented At Annual Meeting of American Educational Research Association, New Orleans, L.A.
- Selvi K (2006). İlköğretim Programlarının Sınıf Öğretmeni Görüşlerine Dayalı Olarak Değerlendirilmesi. XV. Ulusal Eğitim Bilimleri Kongresi, Muğla Üniversitesi, Muğla.
- Simon M, Forgette-Giroux R (2000). Impact of a Content Selection Framework on Portfolio Assessment at the Classroom Level. *Assessment Educ.* 7(1):83–101.
- Stiggins R J (2002). Assessment Crisis: The Absence of Assessment for Learning. *Phi Delta Kappan.* 83(10):758-65.
- Üredi L. (2013). The Effect of Classroom Teachers' Attitudes toward Constructivist Approach on Their Level of Establishing a Constructivist Learning Environment: A Case of Mersin. *Educ. Res. Rev.* 8(11): 668-676.
- William D (2003). National Curriculum Assessment: How to Make it Better. *Res. Papers Educ.* 18(2):129-136.
- William D, Lee C, Harrison C, Black P (2004). Teachers Developing Assessment for Learning: Impact on Student Achievement. *Assessment Educ.* 11(1):49- 65.
- Yapıcı M, Leblebiciler NH (2007). Öğretmenlerin Yeni İlköğretim Programına İlişkin Görüşleri. *İlköğretim Online.* 6(3):480-490.
- Yıldırım A, Şimşek H (2013). Sosyal Bilimlerde Nitel Araştırma Yöntemleri. Seçkin Yayınevi, Ankara.
- Yılmaz T (2006). Yenilenen 5. Sınıf Matematik Programı Hakkında Öğretmen Görüşleri (Sakarya İli Örneği). Yüksek Lisans Tezi, Sakarya Üniversitesi, Sosyal Bilimler Enstitüsü, Sakarya.

Full Length Research Paper

The effect of concept mapping- guided discovery integrated teaching approach on Chemistry students' achievement and retention

Fatokun K.V.F.* and Eniayeju P. A.

Department STME, Faculty of Education, Nasarawa State University, Keffi, Nigeria.

Received 23 May, 2014; Accepted 11 November, 2014

This study investigates the effects of Concept Mapping-Guided Discovery Integrated Teaching Approach on the achievement and retention of chemistry students. The sample comprised 162 Senior Secondary two (SS 2) students drawn from two Science Schools in Nasarawa State, Central Nigeria with equivalent mean scores of 9.68 and 9.49 in their pre-test. Five instruments were developed, validated and used by the investigator for the study; they are namely; Chemistry Achievement Pre-Test (CAPE), Chemistry Achievement Post-Test (CAPO), Chemistry Achievement Retention Test (CART), Lesson Plans for the Control Group (LPCG) and the Lesson Plan for the Experimental Group (LPEG). Pre-test / post-test control group design was employed. Results of the Scheffe's test for multiple comparisons revealed that boys in the experimental group performed better than girls in the experimental group. The results of the t-test analysis of the retention test showed that the mean score of the experimental group was significantly better than that of the control group ($p < 0.05$). It is strongly recommended that chemistry teachers should be encouraged to adopt this method for teaching difficult concepts.

Key words: Integrated teaching approach, concept mapping- guided discovery, achievement, retention, scheffe's test.

INTRODUCTION

Chemistry is an important science subject taught at the secondary school level which has been posing a great threat to many students because of its nature. These are complexities due to its peculiar nomenclature, structures of compounds, series of chemical reactions/mechanism involved, chemical equations and the calculation associated with some topics/concepts. Some concepts are also abstract in nature thereby making their comprehension relatively difficult when compared with some other non-science concepts (Fatokun, 2006).

Different methods have been used in teaching Chemistry over the years at the secondary schools level but the effectiveness of any of these methods as measured by the performances of the students involved has not been really encouraging (Burns, 1999; Okebukola, 2005).

Results of students' performance in Chemistry for the past few years in Nigeria as obtained from the West African Examination Council (WAEC) Chief Examiner's report also revealed a decline and high failure rate.

*Corresponding author. E-mail: victfatokun@yahoo.com.

(About 38.17% of students passed at credit level in 2004, 36.43% passed at credit level in 2005, 40.36% passed in 2006 while less than 26% passed in 2009. The WAEC and National Examination Council (NECO) results released for chemistry in 2010 was also very poor with less than 22 % passes at credit level in both examinations) and nose-dived to below 20% in the recent years.

The question that comes to mind is this: "Is Chemistry really a difficult subject to teach and learn?" The burden of evidence revealed that most concepts in chemistry are indeed difficult to learn by most students (Johnstone and Otis, 2006). Around 1960, there were quite radical changes in emphasis in school chemistry education, with subsequent changes in many university courses. Considerable research was undertaken to explore the learning problems that students were experiencing. The common underlying trend became apparent as it relates to the way humans process new information. The secondary school knowledge of chemistry is often characterized by lack of coherence. Instead of having a well structured and integrated domain-specific knowledge structures, students consider the different concepts as isolated elements of knowledge. Most students do not possess a well founded basic framework in which newly acquired concepts can be integrated (Fatokun, 2012). This lack of integration is suspected to be the basis of students' difficulties concerning concept formation and application of acquired knowledge in exercises and practical work (Brandt et al 2001).

Okebukola (2005) itemized almost the entire concepts in the senior secondary school Chemistry syllabus as areas commonly found difficult to teach by graduate teachers. These concepts include nuclear chemistry, organic chemistry, rate of chemical reactions, chemical equilibrium, redox reactions and electrolysis. Fatokun (2006) therefore expressed that in order to surmount the student and teacher related problems afore listed, the onus therefore lies on the Chemistry teacher to have a good grasp of the subject matter and knows the appropriate means of communicating this, in order to be proficient in his pedagogical challenges. Olayiwola (2001) equally noted that the resourcefulness and effectiveness of the chemistry teacher is paramount in overcoming the so called 'difficult barriers' since he plays the major role in the implementation of the curriculum contents. Hence his effectiveness in the discharge of this duty determines the quality of products from school and invariably the level of development of the nation.

Ausubel's learning theory (Ausubel, 1968) suggests that hierarchical structures should be used in promoting understanding and recall. Ausubel and Novak worked extensively on cognitive structuring. Novak and his co-worker have developed the idea of concept maps as an exemplary learning/teaching strategy (Novak, 1981). Many other studies have also shown the utility of such

maps in diagnosing and in promoting meaningful learning since hierarchical organization have economic representation of important ideas and the relationship among them. It also facilitates the retrieval processes if it is properly adapted to the task domain. Bruner (1983, 1991) takes a different approach to learning. To Bruner learning is a process of discovery. This begins with problem- solving, a process analogous to teaching someone how to swim by throwing him into a deep pool of water. The assumption is that the learner will learn the necessary skills because he needs them to survive from drowning. This often requires an internal re-organization or "cognitive restructuring" of previously known ideas in order to accommodate the new experience. These two learning theories form the basic framework upon which this current study hung. Researchers have also shown that students understand and perform better when different teaching methods are blended or integrated together to enhance learning (Sisovic and Bojovic, 2000).

Oloyede and Adeoye (2009) carried out a study which compared the relative effectiveness of Guided Discovery and Concept Mapping teaching strategies on senior secondary school students' achievement in chemistry in Nigeria. Their result revealed that there is no significant difference in the mean score of students due to the method exposed to (either Guided Discovery or Concept Mapping).

From the studies conducted by Sisovic and Bojovic (2000) in Yugoslavia, the use of concept maps in combination with demonstration experiment for teaching chemistry was illustrated. At elaborate and systematic sessions, concept maps were combined with demonstration experiments to enable students apply their knowledge of concepts and their interrelations, as well as to formulate theoretical explanations for the observed changes they viewed or experienced.

The impact of concept mapping and visualization on the learning of secondary school chemistry students in Belgium was conducted by Brandt et al. (2001). The researchers sought to find the effect of concept mapping and visualization on students' learning by comparing the two approaches. There were 88 students involved in the study and they were divided into two equal groups. The findings revealed that there was a significant positive effect of extra attention to visualization on the learning achievement of students.

In this study, Concept Mapping and Guided discovery were combined to form the integrated approach which was investigated. Specifically, the effect of the approach on students' achievement and retention towards difficult chemical concepts was determined.

Research questions

The following research questions were raised for this study:

1 What is the effect of Concept Mapping-Guided Discovery Integrated Approach on students' achievement in chemistry?

2 Do boys and girls perform equally well when taught electrochemistry using Concept Mapping-Guided Discovery Integrated Approach?

3 Which group of students retains chemical concepts better when exposed to Concept Mapping-Guided Discovery Integrated Approach and Demonstration method?

Hypotheses

The following null hypotheses were formulated and tested:

H_{0 1}: There is no significant difference in the achievement of students exposed to Concept Mapping-Guided Discovery Integrated Approach and those taught using Demonstration Method.

H_{0 2}: There is no significant difference in the performance of boys and girls exposed to Concept Mapping-Guided Discovery Integrated Approach and those taught using Demonstration Method.

H_{0 3}: There is no significant difference in the level of chemical concept retained by students exposed to Concept Mapping – Guided Discovery Integrated Approach and those taught with Demonstration method.

METHODOLOGY

Population

All SS2 chemistry students in all the science secondary schools in Nasarawa State constituted the population for the study. There were 986 SS2 students in the entire population.

Sample

Stratified random sampling technique was employed to select a science school from each of the three educational zones in the state. Pre-test was conducted in the three selected schools in order to establish equivalence. GSSS Karu and GSSS Nasarawa-Eggon eventually participated in the study because of the equivalence of their pre-test mean scores which were 9.68 and 9.49 respectively. The t-test analyses showed that the groups were equivalent at 0.05 level of significance. The 162 sampled students were assigned to experimental and control group in each of the two schools.

Research design

Pretest-Posttest Control –Group Design was employed for the study.

Instruments: Five instruments were used for this study; they were developed by the investigator and validated by experts. They are namely;

Chemistry Achievement Pre-Test (CAPE): This was made up of 20 multiple choice objective test items which were selected from past UTME and SSCE questions on Electrolysis, Redox reaction

and Electrochemistry (selected topics for the study). The test items selected were distributed among the six intellectual levels of Bloom's taxonomy in the cognitive domain. The reliability index obtained for the achievement test using Kuder-Richardson method (KR-21) was 0.70.

Chemistry Achievement Post-Test: This consisted of 20 multiple choice objective test items and it was similar in content with the pretest. They were also drafted from past UTME and SSCE objective questions. The reliability index obtained for the achievement test using Kuder-Richardson method (KR-21) was 0.72. Equivalence of CATE and CAPO was established through t –test and the result revealed that there is no significant difference between CAPO and CAPE at 0.05 level of significance.

Chemistry Achievement Retention-Test (CART): This also consisted of 20 items structured objective test which was the same as the post test but the only difference was the serial rearrangement of the test items.

Lesson Plans for the Control Group (LPCG): These comprise five lesson plans on the selected topic for the study. It was to be used for teaching the control group using demonstration method for five consecutive weeks. The objectives for all the lessons in the Control group are the same as those of the Experimental group.

Lesson Plan for the Experimental Group (LPEG): These were sets of instructional guides designed only for the experimental group. There were five lesson guides on the selected topics for the study which was taught for five consecutive weeks. The experimental group used the integrated approach which is the combination of Concept Mapping and Guided Discovery approach (concept map together with sets of questions outlined to be answered and some activities to be carried out at different stages of each topic) that was appropriately blended together.

Procedure

The CAPE was first administered and used to determine the initial knowledge of the students on the selected topics and to select equivalent groups which participated in the study. For five weeks, the Experimental Group was taught electrochemistry using Concept Mapping-Guided Discovery Integrated Approach while the Control Group was taught the same set of topics using Demonstration Method. The Post Test was conducted immediately after the teaching and was used to determine the effectiveness of the two methods of teaching but particularly the effect of the treatment on the experimental group. Four weeks later, retention test (CART) which was to determine the amount of content material retained by the students after conducting the post test was administered.

RESULTS AND DISCUSSION

The result of the study is stated below; SPSS was used to obtain the data for all the statistical testing of the hypotheses.

Hypothesis 1

H_{0 1}: There is no significant difference in the achievement of students exposed to Concept Mapping-

Table 1. Means and standard deviations of post test scores for experimental and control groups in the schools.

School	Group	No. of students	Range of Scores	Mean Score	Std. Deviation	Std. Error
GSS KARU (School 1)	Experimental	40	12	13.80	3.08	0.49
	Control	40	6	11.45	1.45	0.23
GSS Nasarawa Eggon (School 2)	Experimental	40	7	14.75	1.81	0.29
	Control	42	9	9.25	1.86	0.29

Table 2a. Results of ANOVA of Post-Test Mean Scores for school 1.

School 1	Sum of squares	Df	Mean square	F-cal	F-crit	Decision
Between Groups	24.660	9	2.740	1.436	1.350	Significant
Within Groups	57.240	30	1.908			
Total	81.900	39				

Decision: Since $F_{\text{calculated}}$ is greater than the F_{critical} , we reject H_{01} .

Table 2b. Results of ANOVA of Post-Test Mean Scores for school 2.

School 2	Sum of Squares	Df	Mean Square	F-cal	F-crit	Decision
Between Groups	22.29	9	2.78	1.461	1.350	Significant
Within Groups	57.240	30	1.908			
Total	81.900	39				

Decision: Since $F_{\text{calculated}}$ is greater than the F_{critical} , we reject H_{01} .

Guided Discovery Integrated Approach and those taught using Demonstration Method.

From Tables 1 and 2, mean score of the groups are shown and used to answer the first research question. It is indicated from above that the experimental groups had higher means than the control group which implies that the Concept Mapping-Guided Discovery approach enhances achievement in Chemistry learning.

Using both F and t tests respectively, Tables 3 and 4 show that there is a significant difference at 5% level of confidence in the achievements of students in the control and experimental group. Those taught with Concept Mapping-Guided Discovery Integrated Approach achieve more than those taught with Demonstration method

Hypothesis 2

H_{02} : There is no significant difference in the performance of boys and girls when taught with Concept Mapping-Guided Discovery Integrated

Approach and those taught with Demonstration method.

Hence there is a significant difference in the performance of boys and girls when taught with Concept Mapping-Guided Discovery Integrated Approach and those taught with Demonstration Method.

Hypothesis 3

H_{03} : There is no significant difference in the level of chemical concepts retained by students exposed to Concept Mapping-Guided Discovery Integrated Approach and those taught with Demonstration method. Table 5 clearly shows that the experimental group had higher mean scores and better retention rate than those in the control group.

Since the calculated t-value is greater than the critical t-value, we reject the H_{03} . Hence there is a significant difference in the level of retention of chemical materials by students taught using the Concept Mapping-Guided Discovery Integrated Approach and those taught with the Demonstrated Method.

Table 3a. Result of t-test Analyses of Post – Test Mean Scores for school 1.

School 1 Groups	No of students	Mean Score	Standard deviation	t-cal	t-crit = $t_{0.05,78}$	Decision
Experimental	40	13.80	3.08	4.68	1.67	Significant
Control	40	11.45	1.45			

Since $t_{\text{calculated}}$ is greater than the t_{crit} , we reject H_{01} .

Table 3b. Result of t-test Analyses of Post – Test Mean Scores for school 2.

School 2 groups	No of students	Mean score	Standard deviation	t-cal	t-crit = $t_{0.05,80}$	Decision
Experimental	40	14.75	1.81	13.57	1.67	Significant
Control	42	9.25	1.86			

Since $t_{\text{calculated}}$ is greater than the t_{crit} , we reject H_{01} .

Table 4 a. Results of Scheffe's Test on Post test Mean Scores for School 1.

School1 Groups	Gender	N	Mean Score	Range of score	Standard deviation	$S_{\text{calculated}}$ -value	S_{critical} -value
Experimental	Male	21	$\bar{x}_1 = 15.14$	10	3.23	31.76	5.70
	Female	19	$\bar{x}_2 = 12.32$	13	2.14		
Control	Male	27	$\bar{x}_3 = 11.82$	13	1.44		
	Female	13	$\bar{x}_4 = 10.69$	11	1.18		

Since $S_{\text{calculated}}$ is greater than the S_{critical} , we reject H_{02} .

Table 4 b. Results of Scheffe's Test on Post test Mean Scores for School 2.

School 2 Groups	Gender	N	Mean Score	Range of score	Standard deviation	$S_{\text{calculated}}$ -value	S_{critical} -value
Experimental	Male	24	$\bar{x}_1 = 15.04$	9	1.78	49.70	5.70
	Female	16	$\bar{x}_2 = 14.31$	7	1.82		
Control	Male	22	$\bar{x}_3 = 8.86$	10	2.14		
	Female	20	$\bar{x}_4 = 9.90$	9	1.41		

Since $S_{\text{calculated}}$ is greater than the S_{critical} , we reject H_{02} .

CONCLUSION AND IMPLICATION OF THE STUDY

There is remarkable improvement in the achievement of students taught with the Concept Mapping–Guided Discovery Integrated Approach as compared to those taught with demonstration methods.

The effective implementation of the two teaching strategies as a new approach was responsible. Burner

asserted that students learn science best through discovery and Cascales et al. (2001) affirmed that concept Mapping should be used mostly in Teaching Chemistry. This is in agreement with Inekwe (2010) who concluded that new and novel teaching strategies often enhance learning and productivity.

It was discovered that a considerable gap still exist between the achievement of boys and girls when taught

Table 5. Results of the t-Test analyses for Content Retention by the Experimental and Control Group in Schools 1.

Group	No of students	Range of scores	Mean score	Standard deviation	t-cal	t-crit = $t_{0.05,78}$	Decision
Experimental	40	9	14.87	1.92	4.68	1.67	Significant
Control	40	12	11.45	1.45			

Since $t_{\text{calculated}}$ is greater than the t_{crit} , we reject H_0 .

under the same condition particularly when taught using Concept Mapping – Guided Discovery Integrated Approach with the boys performing better than their female counterparts. There is still a margin between the performance of boys and girls despite all efforts to bridge the gender gap, although there is an appreciable improvement as compared to the past decades. This result supports the outcomes of earlier studies by Olaleye and Ajileye (2004), Oloyede and Adeoye (2009) and Fatokun and Idagboyi (2010). Students exposed to the Integrated Approach retain the knowledge of chemical concepts gained during teaching better than those taught using Demonstration method. This result is consistent with the finding of Oloyede and Adeoye (2009) where they reported and established that both Guided Discovery and Concept Mapping are effective teaching methods when used independently since in the current study, the two teaching methods were blended together, it is expected that students' retention would improve considerably and it did.

The implication of the above is that Concept Mapping – Guided Discovery Integrated Approach is an effective teaching method for learning difficult chemical concept/topics. Chemistry content is better retained when this approach is employed because it adopts problem based learning (an integral part of guided discovery method), that enhances cognitive restructuring and linkage of ideas to existing knowledge structure (Fatokun and Fatokun, 2013). It is therefore recommended that Chemistry educators get acquainted with and adopt this novel approach of teaching/learning chemistry.

Conflict of Interests

The author has not declared any conflict of interests.

REFERENCES

- Ausubel DP (1968). *Educational Psychology: A cognitive view*. Holt, Reinhart and Winston.
- Brandt LE, Helleman J, Heerman J, Couwenberg L, Volckaert IL, Morisse H (2001). The impact of concept mapping and visualization on the learning of secondary school chemistry students. *Int. J. Sci. Educ.* 23(12): 1303.

- Bruner J (1983). Education as Social Invention. *J. Soc. Issues* 39:129-141.
- Bruner J (1991). The Narrative Construction of Reality. *Crit. Inquiry* 18(1): 1-21.
- Burns RA (1999). *Fundamentals of Chemistry* (3rd ed.) New Jersey. Prentice Hall Inc.
- Cascales JA, Solano E, Leon G (2001). The Use of concept maps in the teaching of Introductory Chemistry in Engineering School. *Int. Conf. Eng. Educ. SS B5*: 21-26.
- Fatokun VKF (2006). Application of computer aided instruction to the teaching of mole Concept in chemistry at the secondary school. *J. Educ. Stud.* 12(1): 169 -174
- Fatokun VKF (2012). The Effect of Concept Mapping- Guided Discovery Integrated Teaching Approach on Chemistry Students' Learning Style, Achievement and Retention Unpublished Ph.D Thesis Nasarawa State University, Keffi.
- Fatokun JO, Fatokun KVF (2013). Problem-Based Learning (PBL): An approach for integrating acquired knowledge in Mathematics and Chemistry for effective classroom delivery. *Educ. Res. Rev.* 8(11): 663-667.
- Fatokun KVF, Idagboyi IA (2010). Gender disparity and parental Influence on Secondary School students' Achievement in Science in Nasaraw State. *J. Res. Natl Dev.* 8(2): 8-12.
- Inekwe OI, Zakariya A (2010). The effect of metacognitive teaching strategies on students with low Mathematics achievement in Secondary Schools. *Nig. J. Professional Teach.* 1(5): 14-21.
- Johnstone AH, Otis KH (2006). Concept Mapping in problem based learning: a cautionary tale. *Chem. Educ. Res. Practice*, 7(2):84-95.
- Novak JD (1981). The use of Concept mapping, Gowin's V mapping instructional strategies in Junior High School Science. *Learning how to learn project*. Hhaca, NY.
- Okebukola P (2005). The race against obsolescence. STAN Memorial Lecture series. No 17: 28 -30. Delivered at the Annual STAN Conference, Jos.
- Olaleye FO, Ajileye LI (2004). Gender disparities in Educational opportunities in Nigeria. *J. Contemp. issues Educ.* 5(2): 15-32.
- Olaiyiwola MA (2001). Tackling the problem of difficult concept in Chemistry; A presented paper during STAN National Chemistry Workshop held at Lokoja, Nigeria.
- Oloyede OI, Adeoye FA (2009). Comparative Effect of the Guided Discovery (GD) and Concept Mapping Teaching Strategies on Senior Secondary School Students (SSSS) Chemistry Achievement in Nigeria. *Eurasian J. Phys. Chem. Educ.* 2: 86-92.
- Sisovic D, Bojovic S (2000). The use of Concept Maps at different stages of Chemistry teaching. *Chem. Educ. Res. Pract. Eur.* 1: 135-144.

Full Length Research Paper

Who are 'non-traditional students'? A systematic review of published definitions in research on mental health of tertiary students

Ethel Chung* and Deborah Turnbull

School of Psychology, The University of Adelaide, South Australia.

Received 26 September, 2014; Accepted 17 November, 2014

The term 'non-traditional students' is commonly used in higher education research and yet its definition has been unclear. This study systematically reviewed 45 definitions of 'non-traditional student' in mental health research conducted within the higher education context using a standardised data extraction and appraisal tool. Findings suggested a wide range of variations on how this term was defined. Thirteen different categories of meaning have been used, including age, multiple roles, mode of study, gap in studies, commuter status, being demographically 'different' from the norm, sex, admission pathway, enrolment in 'non-traditional' programs, being 'disadvantaged', disability and trauma, ethnicity, and having a previous degree. Different combinations of categories were mentioned in the reviewed definitions and wide variations existed within each category of meaning. The term 'non-traditional student' does not currently represent a functional category in communicating a distinct concept. Future research should improve the clarity and consistency in which it is defined.

Key words: Definition; non-traditional student; systematic review; tertiary education.

INTRODUCTION

For many years students have typically entered university directly from secondary school, studying on campus, full-time, and from high socioeconomic backgrounds (Bradley et al., 2008; Choy, 2002). However, in the past two decades, the higher education sector in many industrialised countries has gone through significant transformation from elite to mass access, characterised by a marked increase in student numbers and diversity (Devlin, 2010). Students who do not conform to the traditional privileged image of university students are increasingly the norm (Bradley et al., 2008; Altbach et al., 2009; Higher Education Funding Council for England,

2013). In Australia, about 17% of domestic university students commencing in 2012 were from a low socio-economic background, representing a 9.1% increase from 2011 (Department of Industry, 2012).

The term 'non-traditional students' is commonly used in education research and policy-making to refer to those with socio-demographic characteristics that differ from traditional participants in higher education. In an era of increasing student diversity, such terminology may promote an awareness for researchers to explore issues particularly relevant to the growing number of students who arrive on campus via widening participation

*Corresponding author. E-mail: ethel.chung@adelaide.edu.au.

initiatives, leading to evidence-based policies and practices which support their well being and achievement (Kim et al., 2010). Research proposes that 'non-traditional students' are likely to face unique concerns which impact on their educational and mental health needs (Adebayo, 2006). For instance, students who have family or work responsibilities may face a higher load of external demands in comparison to 'traditional students' (Gilardi and Guglielmetti, 2011). Strategies to reduce conflict between work and study are therefore paramount for their success (Adebayo, 2006; Adebayo et al., 2008). Nevertheless, many have questioned the usefulness of the term 'non-traditional students' in research examining the experience of students from diverse backgrounds (Kim et al., 2010; Greenland, 1993; Smit, 2012). In particular, inconsistent definitions used in research have led to little agreement regarding who 'non-traditional students' are (Hughes, 1983; Kim et al., 2010; Johnson and Nussbaum, 2012). This may also risk generalising characteristics of some groups of students to others, due to the use of a single "umbrella term" to refer to diverse groups which may potentially have very different needs (Smit, 2012).

Reviewing the range of definitions used in research could lead to a clearer understanding of the term and the way in which it is applied. A previous article reviewed the definition of 'non-traditional students' in the education literature (Kim, 2002). However, this study was conducted more than a decade ago and focused on community colleges in the United States. Kim (2002) also did not mention methods used to select studies included in the review and how definitions were extracted and analysed.

The aim of the present study is to systematically review how the term 'non-traditional students' has been defined in mental health research conducted with higher education students. This area of interest was chosen because the mental health of university students has become a growing source of concern in recent years (Storrie et al., 2010; Dyrbye et al., 2010). Studies have shown that university students are more at-risk of mental distress compared to the age-matched general population (Leahy et al., 2010; Stallman, 2010), with the prevalence of severe mental distress within this population also on the rise (Gallagher, 2011; Benton et al., 2003; Collins and Mowbray, 2005). As the diversification of students' backgrounds increases, the mental health needs of university students are expected to evolve (Byrd and McKinney, 2012). Mental health research which considers student diversity issues is critical in guiding the development of initiatives which promote well-being among all students.

A clearer understanding of the meaning of 'non-traditional students' within the mental health literature would therefore assist the translation of research into practice.

In addition, the systematic review methodology was adopted because it is an increasingly recognised

approach in clarifying concepts or definitions (Oh et al., 2005; Frank et al., 2010; Wlodzimirow et al., 2012). The use of an explicit and auditable method to locate, assemble and evaluate the body of literature serves to reduce bias in the review process, leading to more reliable findings compared to traditional reviews (Hemingway and Brereton, 2009).

METHOD

Inclusion criteria

Type of studies

We included empirical quantitative and qualitative studies with primary data collection. Only peer-reviewed articles written in English were selected. Studies which were published from 1980 onwards were included to coincide with the emergence of influential research on 'non-traditional students' [Bean and Metzner 1985; Metzner and Bean, 1987].

Type of participants

The review included studies that dealt with students who were enrolled in any programs in any tertiary institutions (e.g. vocational institutions, universities and colleges). In addition, only studies in which participants were labelled as being 'non-traditional' were included.

Type of outcome measures

The review included studies which consisted of any quantitative or qualitative outcome measures broadly related to the topic of pedagogy and mental health/ distress.

Search strategy

An initial scoping exercise was conducted to develop a list of keywords appropriate for database searches. In collaboration with an experienced university librarian, the following keywords were developed: "*Non-traditional student*/ learner*/ undergraduate**", "*Non traditional student*/ learner*/ undergraduate**" and "*Nontraditional student*/ learner*/ undergraduate**".

Six electronic databases (Scopus, PsycInfo, ERIC, Education Research Complete, AEI, and Sociological Abstracts) were searched using the identified keywords. From the scoping search, it was clear that there existed numerous variations of the term 'non-traditional students' in the literature; e.g. 'non traditional male students' (Smith, 2006); 'non-traditional community college students' (Miller et al., 2005). To ensure that these variations were sufficiently captured, we utilised the proximity search feature of each database. Using this function enabled the detection of word strings that contained up to three words between the term 'non-traditional/ non traditional/ non traditional' and 'student*/ learner*/ undergraduate*'.

The primary reviewer (E.C.) screened the title and abstract of the search results. Duplicated citations were removed and citations were then selected based on relevance to the inclusion criteria. Full manuscripts of all selected citations were then retrieved. Articles which did not fulfil the inclusion criteria, based on information provided in the full manuscript, were then removed. The reference lists of all resulting articles were hand-searched to identify relevant articles which were not listed electronically.

In order to ensure reliability of the article selection process, the primary reviewer randomly selected 10% of all potentially eligible articles, and two reviewers (D.T. and A.C.H.) independently screened the title and abstract to assess their relevance to the inclusion criteria. Discrepancies of findings between the primary reviewer and the independent reviewers were discussed in a face-to-face meeting and resolved by consensus.

Review methods

The primary reviewer used a standardised data extraction and critical appraisal tool (referred to as 'the tool' hereafter) to extract information, and to evaluate definitions within all included studies. The tool was developed by adapting the Qualitative Assessment and Review Instrument (QARI) data extraction tool, and Narrative, Opinion and Text Assessment and Review Instrument (NOTARI) critical appraisal tool from the Joanna Briggs Institute (2011), as well as findings from a background literature search.

To ensure the reliability of the tool, the same two independent reviewers applied the tool to a selection of 10 articles (different from the articles used for checking reliability of articles selection), which were randomly selected by the primary reviewer. Discrepancies in findings were discussed in a face-to-face meeting and modifications were proposed. The primary reviewer then made changes based on recommendations. The revised tool was applied to a new selection of 10 articles by the same two independent reviewers. Discrepancies in findings were resolved by consensus among the two reviewers, and further changes to the tool were proposed. These changes were made by the primary reviewer, and the final version of the tool was developed (see Appendix 1).

This final tool was divided into two parts. The purpose of the first part was to extract background information about the studies (e.g. study method, country in which the study was conducted), as well as definitions of 'non-traditional students'. The present review differentiated two types of definitions used in the literature, namely, general definitions and working definitions. General definitions referred to broad defining statements in relation to previous research. Working definitions, which were the focus of the present review, were defined as statements made in the background or methods sections for the explicit purpose of the study. To facilitate the identification of categories involved in each working definition (e.g. age, sex, mode of study), a checklist containing common defining criteria of 'non-traditional students' identified in the scoping literature review was also included.

The second part of the tool assessed how well the term 'non-traditional students' was defined in each article based on three criteria as follows: whether a working definition of 'non-traditional students' in reference to the study sample could be clearly identified; whether the working definition identified was sufficiently clear and unambiguous, to a standard which would enable study replication; and whether the definition was referenced from the extant literature and any incongruence with it logically explained.

RESULTS

We identified 2155 unique records for initial relevancy screening by title and abstract. In total, 49 sources satisfied all inclusion criteria and form the basis of the systematic review (Figure 1). Of these records, all were published in journal article format except one being a book chapter. Most of the articles ($N=28$, 57.1%) were published from 2000 onwards; of these, 10 were published in the past 5 years. The majority of the 49 relevant records originated from the United States ($N=37$,

75.5%) while the others were from the United Kingdom ($N=7$, 14.3%), Canada ($N=2$, 4.1%), Nigeria ($N=2$, 4.1%) and Taiwan ($N=1$, 2%). The majority ($N=45$, 92%) of the studies were conducted in universities and colleges, among the remaining articles, two were conducted in community colleges, and two did not specify the type of institution. The studies were conducted among undergraduates ($N=34$, 69.4%), postgraduates ($N=4$, 8.2%), students undertaking a university introductory module ($N=1$, 2%), and the remainder did not specify the year level of participants ($N=11$, 22%). While most of the articles did not target students from a specific discipline ($N=27$, 55.1%), others were conducted within a particular disciplinary context. These disciplines included: Business, Computer technology, Education, Law, Mathematics, Nursing, Occupational therapy, Psychology, and Social work.

Four out of the 49 relevant records did not contain a working definition for 'non-traditional students'. Of the remaining 45 records, working definitions were as short as four words and as long as 258 words. Twenty out of 45 definitions were explicitly referenced from other authors' work, whilst 22 definitions did not include a reference, and three definitions were only partly referenced (Table 1).

Categories included in working definitions

Thirteen categories of meaning were identified in the extracted definitions (Table 2). The majority of these included only one category (19 out of 45), two categories were included in 14 out of 45 articles, and the remainder contained three or more categories. The following sections provide further details into how 'non-traditional students' were defined by these categories.

Age

Most definitions (35 out of 45) included the category of age. 'Non-traditional students' were commonly referred to as being older than a specific age; however, one article defined this student group in terms of being younger (Christie, 2009). The cut-off point most frequently adopted was that of 25 years (Bell, 2003; Carney-Crompton and Tan, 2002; Hemby, 1997; Mello, 2004; San et al., 2004; Elliott, 1990; Myers and Mobley, 2004; Norris, 2011; Sweet and Moen, 2007; Villella and Hu, 1991; Backels and Meashey, 1997; Hudson et al., 2008; Bennett et al., 2007; Quimby and O'Brien, 2006; Yarbrough and Schaffer, 1990; Waltman, 1997; Hemby, 1998; Christie, 2009; Keith, 2007). However, 9 other cut-off points were also used, including 20 (Kohler Giancola et al., 2009), 21 (Bitner, 1994), 22 (Morris et al., 2003), 23 (Arbuckle and Gale, 1996; Home, 1997; Query et al., 1992), 24 (Macari et al., 2006; Dill and Henley, 1998; Chartrand, 1992; Pierceall and Keim, 2007; Adebayo,

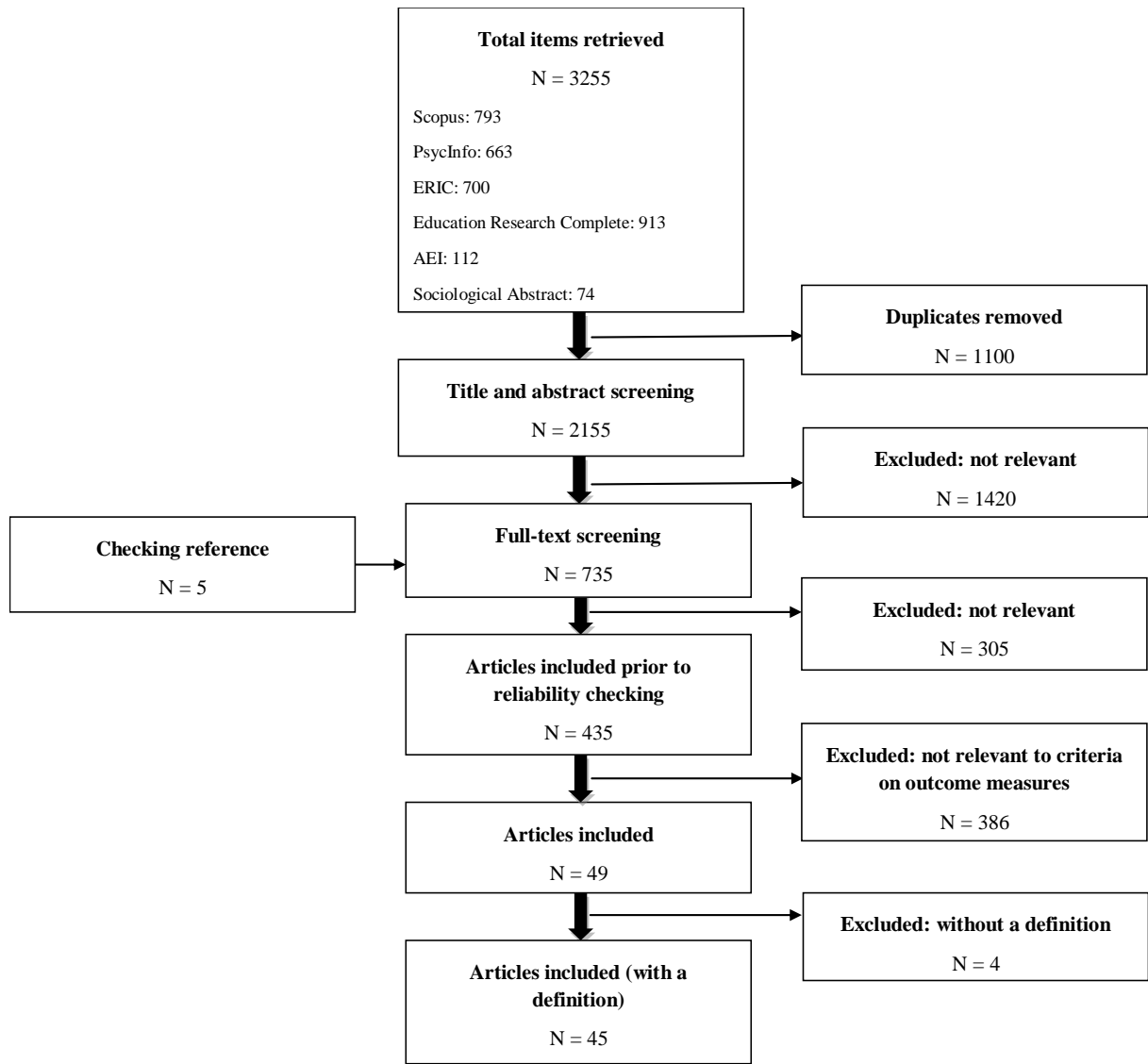


Figure 1. Flow chart of selection of articles.

2006), 28 (Bye et al., 2007), 30 (DeGregoria, 1987), 40 (Hollis-Sawyer, 2011), and 50 years (Hooper and Traupmann, 1983).

Multiple roles

In 18 definitions, 'non-traditional students' were referred to as individuals holding life roles in addition to that of student. Three sub-categories of role were commonly found, including spouse/ partner, employee/ worker, and parent/ carer of a dependent. Eight out of 18 of definitions mentioned all three sub-categories, while five mentioned a single sub-category, and the remainder included two sub-categories. Only one definition specified the duration in which these roles were held (i.e. at least one year) (Dill and Henley, 1998).

Fifteen definitions referred to 'non-traditional students' as 'employees' or 'workers' (Chartrand, 1990; Home, 1997; Hudson et al., 2008; Query et al., 1992; Dill and Henley, 1998; Adebayo, 2006; Fortune, 1987; Morris et al., 2003; Macari et al., 2006; Mello, 2004; Kirby et al., 2004), and/ or being 'financially independent' (Hemby, 1997, 1998; Macari et al., 2006; Waltman, 1997). Only a small proportion of these studies provided details regarding the nature of work, for instance, 'non-traditional students' were defined as those who worked full-time (Macari et al., 2006), or either part-time or full-time (Adebayo, 2006; Home, 1997; Mello, 2004). Furthermore, the definition of part-time or full-time work was only provided in two articles. One definition specified that full-time work constituted 35 or more hours per week (Macari et al., 2006), whereas another suggested that part-time work meant at least nine hours of work a week (Home,

Table 1. Verbatim definitions extracted from selected articles.

	Author	Year	Working definition	Referenced
1	Adebayo	2006	"Nontraditional students, as used in this context, refer to part-time/full-time student-workers ages 24 and older and working on a part-time or full-time basis" (p.126)	Yes
2	Arbuckle	1996	"[T]he cutoff between the traditional age and the nontraditional age student is 23" (p.23)	No
3	Backels	2008	"25 years of age or older" (p.46)	Yes
4	Bell	2003	"[T]wenty-five and older" (p.158)	No
5	Bennett	2007	"Nontraditional students were 25 year-old or older who did not immediately pursue college following high school graduation" (p.155)	No
6	Bitner	1994	"Subjects were defined as traditional students if they were under 21 years of age and single without children. All other subjects were considered nontraditional" (p.36)	No
7	Bye	2007	"[N]ontraditional students are defined as those aged 28 and older, for whom the undergraduate experience is not necessarily age normative" (p.141)	No
8	Carney-Crompton	2002	"25 years of age or older" (p.140)	Yes
9	Chang	2007	"[A]ttended the evening programmes and had at least one year between high school and college" (p.350)	No
10	Chartrand	1990	"Nontraditional undergraduate student was defined as someone who held two or more major life roles (i.e., employee, partner, or parent) in addition to the student role at the beginning of the quarter" (p.68)	Yes
11	Chartrand	1992	"Nontraditional undergraduate students were defined, consistent with extant research, as being at least 24 years of age, living off-campus, and enrolled either on a part-time or a full-time basis" (p.195)	Yes
12	Christie	2008	"[S]tudents from non-traditional pathways" (p.569) "[N]on-traditional students who entered an 'elite' Scottish university directly from further education colleges" (p.567) "[A]ged 25 years or younger at the time of entering university" (p.125)	No
13	Christie	2009	"[Y]oung people from disadvantaged backgrounds, and from a relatively under-researched location, who had actively chosen to study at elite universities" (p.126)	Partial
14	DeGregoria	1987	"The term refers to students who have entered or returned to college after a hiatus in their formal education. It usually describes that student who enters or returns to college after age 22; however, some surveys, including this one, utilize age 30+ in defining the nontraditional student" (p.38)	No
15	Dill	1998	"24 years old or older and had spent at least 1 year in a nonacademic role, such as housewife or employee, between high school or their last college experience and their present enrollment in college" (p.27)	Partial
16	Elliot	1990	"over 25 years of age" (p.161)	No
17	Everly	1994	"[H]aving previously completed a baccalaureate degree" (p.1023)	No
18	Fortune	1987	"[S]pouses, parents, and workers" (p.81)	No
19	Hansen	1999	"[B]eyond traditional school age (i.e., beyond the mid-20s), ethnic minorities, women with dependent children, underprepared students and other special groups who have historically been underrepresented in post secondary education" (p.192) "[S]tudents who are physically or learning challenged and those with psychiatric histories. Another neglected group included those who postpone college because of substance abuse problems, or other issues such as childhood sexual or physical abuse which may have affected their development and overall readiness for college" (p.192)	Yes
20	Hemby	1997	"[S]tudents who are 25 years old or older or who have assumed at least one of the social roles characteristic of adult status, including (a) being primarily financially self-supporting; (b) acting as a primary caregiver for a relative(s); or (c) being married and living with spouse, or being divorced or widowed and not living with parents or receiving primary financial support from others." (p.29)	Yes

Table 1. Cont'd.

21	Hemby	1998	"[S]tudents who were 25 years old or older or who had assumed at least one of the social roles characteristic of adult status, including (a) being primarily financially self-supporting; (b) acting as a primary caregiver for a relative(s); or (c) being married and living with spouse, or being divorced or widowed and not living with parents or receiving primary financial support from others" (p.305)	Yes
22	Hollis-Sawyer	2011	"The designation of "age 40 and older" reflects the operational definition of a relatively older nontraditional learner on a typical college campus" (p.294)	No
23	Home	1997	"[A]t least 23 years old, enrolled as part- or full-time students, employed at least nine hours a week, and carrying parental or caregiving responsibilities. Caregivers were defined as women providing informal care to a relative (child or adult) with physical, intellectual, emotional, or learning disabilities" (p.337)	No
24	Hooper	1983	"Returning women students over 50" (p.233)	No
25	Hudson	2008	"[S]tudent 25 years old and older adults who return to school full- or part-time while maintaining responsibilities such as employment, family, and other responsibilities of adult life" (p.106)	Yes
26	Johnson	2012	"84 subjects with the average age of 27.3 years (SD = 7.8), 80% having taken time off from school, approximately 60% having been married, and approximately 30% with parental responsibilities. They were deemed the nontraditional student cluster" (p.48)	Yes
27	Keith	2007	"25 years or older" (Procedure, para 1)	No
28	Kirby	2004	"[S]tudents in a nontraditional, degree-granting weekend college program for working adults" (p.67)	No
29	Kohler Giancola	2009	"[W]hose ages ranged from 20 to 56 years" (p.250)	No
30	Leathwood	2003	"Many of the participants in this study would be regarded as 'non-traditional' students, i.e. those students who are the focus of widening participation policy initiatives." (p.597)	Yes
31	Macari	2005	"In 1996, Horn, writing for the National Center for Educational Statistics (NCES) defined nontraditional students as those who fall into any of the following seven categories: (a) those who delayed enrollment into college, that is, those who did not enroll in college immediately after high school, (b) part-time students, defined as students attending school less than 12 credits a semester or 10 credits a quarter, (c) financially independent students. [The federal government and most colleges and universities define this as any student 24 years and older, however, Horn states that those who do not rely on parents or others for financial support, regardless of age, should be considered financially independent], (d) those who work full-time, defined as working 35 or more hours per week outside of the home, (e) those with dependents other than a spouse including children or other relatives such as a parent or grandparent, (f) single parents, or those who are responsible for more than 50% of their child's upbringing and, (g) those who did not receive a standard high school diploma including those with a high school equivalency degree or who have taken the GED (NCES, 1996). Horn further categorizes nontraditional students by suggesting that the student who faces one of these seven nontraditional characteristics be considered minimally nontraditional, students ascribing to two or three nontraditional characteristics be considered moderately nontraditional, and students who possess four or more of the nontraditional characteristics be considered highly nontraditional. It is this more inclusive definition and description of the nontraditional student that was used in this study." (p.285)	Yes
32	Mello	2004	"[W]ork full- or part-time, have family responsibilities, are over 25 and have delayed enrollment" (p.264)	Yes

Table 1. Cont'd.

33	Menks	1987	"[T]hose who had children less than 18 years old who were living with them while they were enrolled in an occupational therapy curriculum" (p.21)	No
34	Metzner	1987	"Commuter, part-time" (p.15) "Part-time students were defined as students enrolled for less than 12 credit hours." (p.21)	Yes
35	Morris	2003	"Nontraditional college students were defined as 22 years of age or older and as having more multiple roles (i.e. parents, spouses, employees)" (Method, para 1)	No
36	Myers	2004	"[A]ge 25 years and over" (p.41)	No
37	Norris	2011	"[O]lder undergraduates, also known as "nontraditional undergraduates" are defined as college students aged twenty-five and older" (p.176)	Yes
38	Pierceall	2007	"24 years of age or older" (p.708)	Yes
39	Query	1992	"[O]lder than the traditional 17-22 year-old group, enrolled part-time, and employed" (p.84)	No
40	Quimby	2006	"Nontraditional undergraduate students were defined, consistent with extant research, as being at least 25 years of age, off-campus residents, and part-time or full-time students." (p.452)	Partial
41	San Miguel Bauman	2004	"Students were considered nontraditional if they were age 25 or older" (p.14)	Yes
42	Sweet	2007	"[T]hose who enrolled in school at age 25 or later with a gap in school of at least two years after age 22" (p.238)	Yes
43	Villella	1991	"[T]hose who are older (25 years and older), or attend college on a part-time basis, or commute to school, or a combination of these characteristics" (p.334)	Yes
44	Waltman	1997	"Non-traditional students were defined as students 25 years or older or those students who had assumed at least two of the social roles characteristic of adult status such as marriage, parenthood, and financial independence." (p.172)	Yes
45	Yarbrough	1990	"[O]ver the age of 25 who were either returning to school to complete Baccalaureate degrees, teacher certification requirements, or were enrolled in the university for the first time." (p.82)	No

et al., 2006), whereas another suggested that part-time work meant at least nine hours of work a week (Home, 1997).

'Non-traditional students' were defined as being 'married' (Hemby, 1997, 1998; Johnson and Nussbaum, 2012; Waltman, 1997), 'partners' (Chartrand, 1990), 'spouses' (Fortune, 1987; Morris et al., 2003), or not 'single' (Bitner, 1994). In contrast, 'non-traditional students' were also referred to as being 'divorced' or 'widowed' (Hemby, 1997, 1998)

'Non-traditional students' were referred to as being 'parents' (Johnson and Nussbaum, 2012; Chartrand, 1990; Fortune, 1987; Morris et al., 2003; Waltman, 1997), 'with dependents' (Hansen, 1999; Macari et al., 2006), 'with children' (Bitner, 1994), 'caregivers' (Hemby, 1997, 1998; Home, 1997), or having 'family responsibilities' (Hudson et al., 2008; Mello, 2004). One definition specified that 'non-traditional students' were responsible for 'more than 50% of their child's upbringing' (Macari et al., 2006). Three articles provided further description about the characteristics of dependents. A dependent was variously described as a child (Menks and Tupper, 1987), either a child or adult (Home, 1997), or either a

child or adult but excluding a spouse (Macari et al., 2006). In addition, a dependent could be related to (Macari et al., 2006; Home, 1997) or simply living with the carer (Menks and Tupper, 1987). A dependent was also defined as having a physical, intellectual, emotional, or learning disability (Home, 1997).

Mode of study

Eight articles included mode of study in the definition of 'non-traditional students'. Half of these articles referred to 'non-traditional students' as students enrolled part-time (Macari et al., 2006; Query et al., 1992; Metzner and Bean, 1987; Villella and Hu, 1991). In contrast, four articles suggested that non-traditional students' status could be applied to those enrolled either part-time or full-time (Quimby and O'Brien, 2006; Hudson et al., 2008; Chartrand, 1992; Adebayo, 2006).

Gap in studies

Seven articles defined 'non-traditional students' as those

Table 2. Cont'd.

33	Menks	1987		X			
34	Metzner	1987			X		X
35	Morris	2003	X	X			
36	Myers	2004	X				
37	Norris	2011	X				
38	Pierceall	2007	X				
39	Query	1992	X	X	X		
40	Quimby	2006	X		X		X
41	San Miguel Bauman	2004	X				
42	Sweet	2007	X				X
43	Villella	1991	X		X		X
44	Waltman	1997	X	X			
45	Yarbrough	1990	X				X

who had taken time off from formal studies (Mello, 2004; Johnson and Nussbaum, 2012; Bennett et al., 2007; Chang, 2007; Sweet and Moen, 2007; Yarbrough and Schaffer, 1990; DeGregoria, 1987). Three definitions specified the timing in which the break in study occurred, such as between high school and university (Bennett et al., 2007; Chang, 2007), or 'after the age of 22' (Sweet and Moen, 2007). In addition, inconsistencies were found in the duration of the gap in studies. One article defined 'non-traditional students' as those with at least a one year gap in studies (Chang, 2007), while another suggested at least two years away from studies (Sweet and Moen, 2007).

Commuter status

Four articles defined 'non-traditional students' as those who did not live on campus (Metzner and Bean, 1987; Villella and Hu, 1991; Chartrand, 1992; Quimby and O'Brien, 2006).

Being demographically 'different' from the norm

Three definitions referred to 'non-traditional students' as being 'different' demographically when compared to the normative student. 'Non-traditional students' were described as being 'historically underrepresented' (Hansen, 1999), 'the focus of widening participation policy initiatives' (Leathwood and O'Connell, 2003) and not being 'age normative' (Bye et al., 2007).

Sex

Three articles referred to 'non-traditional students' as being women (Hansen, 1999; Home, 1997; Hooper and Traupmann, 1983).

Admission pathway

Two articles defined 'non-traditional students' as those who did not follow a normative admission

pathway to universities, including students entering university through a 'further education college' (Christie et al., 2008) and those who did not receive 'a standard high school diploma' (Macari et al., 2006).

Enrolment in 'non-traditional' programs

Two articles associated 'non-traditional students' status with the type of program in which they were enrolled, such as 'evening programmes' (Chang, 2007) and 'weekend college program' (Kirby et al., 2004).

Being 'disadvantaged'

Two articles referred to 'non-traditional students' as being 'disadvantaged' in some aspects of their lives.

In this context they were described as being 'underprepared' (Hansen, 1999) and 'from

disadvantaged backgrounds' (Christie, 2009). However, in these two instances, no further explanation was provided.

Ethnicity

In one article, 'non-traditional students' were defined as being from 'ethnic minorities' (Hansen, 1999). However, no further elaboration was made in terms of what this meant.

Disability and trauma

Only one article included physical, psychiatric or learning disabilities in the definition of 'non-traditional students' (Hansen, 1999). Furthermore, this article also included experiences of substance misuse, sexual or physical abuse in the definition.

Having a previous degree

'Non-traditional students' were referred to as those having had 'previously completed a baccalaureate degree' (Everly et al., 1994).

'Non-traditional students' as a continuum

The majority of articles conceptualised 'non-traditional students' as a categorical variable, whereby students were dichotomised into either a 'non-traditional' or 'traditional' group, depending on whether their characteristics met the defining criteria chosen by the authors. On the contrary, one article conceptualised 'non-traditional students' as a continuous variable (Macari et al., 2006). Using a scale developed by Horn (1996), Macari et al. (2006) deemed students to be minimally, moderately or highly non-traditional based on the number of criteria met. The 'non-traditional' criteria were those characteristics which have been shown to be associated with university attrition in previous research, including delayed enrolment and part-time students.

DISCUSSION

There has been a longstanding concern within the field of higher education regarding the lack of consistency in the way the term 'non-traditional students' has been defined in research (Greenland, 1993; Hughes, 1983; Kim et al., 2010). Confirming this problem, the present review shows that the term 'non-traditional students' encompasses a broad range of definitional categories within mental health research conducted in higher education settings.

We found that students have been classified as 'non-traditional' based on 13 categories related to their demographic and educational background, such as age, multiple roles and admission pathway. This study also demonstrates wide variation within each category of meaning, for instance, multiple cut-off ages have been used. Furthermore, there were also differences in the approach in which this term was defined. Although 'non-traditional students' was predominantly conceptualised as a dichotomous variable, one study referred to it as a continuum.

In addition to the lack of consistency in categories involved in the definition of 'non-traditional students', this review demonstrates other problems which may further limit the usefulness of this already ambiguous term. First, around 9% of articles which fulfilled the inclusion criteria did not provide a working definition for 'non-traditional students'. It was therefore impossible for the reader to identify the group of students under study. Second, the sources of definitions were often unreferenced or partially referenced and it was unclear how the authors arrived at their method for categorising 'non-traditional students'. Third, definitions were not always clearly described to a standard permitting replication. In particular, generalised labels such as 'disadvantaged' (Christie, 2009) and 'underprepared' (Hansen, 1999), were mentioned in definitions of 'non-traditional students' without further explanation of their meanings. These limitations are likely to render findings incomparable, regarding the mental health status of students from diverse backgrounds. Future research should therefore address these problems and work towards greater clarity and consistency in which this term is used.

Achieving a consensus definition for 'non-traditional students' is a complex task. One of the challenges suggested by other researchers was the lack of an agreed upon purpose for which the term is used (Greenland, 1993). The origin of the term 'non-traditional students' can be traced back to post-World War II, where changes in political, economic and societal contexts have led to diversification of students' demographics in higher education (Ogren, 2003). The label 'non-traditional students' served to denote students who were "new to higher education and that colleges and universities traditionally have not served people like them", thereby guiding the establishment of policies to meet their needs (Ogren, 2003). However, some groups of students who were once thought of as 'non-traditional' have significantly increased in numbers and are quickly becoming 'traditional' (Bell, 2012; Greenland, 1993). For instance, while a large number of studies included in the present review defined 'non-traditional students' as those over 25 years of age, this group of students represents around 40% of all enrolled undergraduates in the United States in 2013 and a rise of 20% is expected by 2020 (National Center For Education Statistics, 2012; Snyder and Dillow, 2012). Similar trends regarding the changing age profile

of university students are also evident in Australia, where the average age of students in 2011 was 26 years 11 months (Australian Council for Educational Research, 2013). Furthermore, recent figures show that 61% of Australian undergraduate students engaged in some form of employment as their primary source of income (Australian Bureau of Statistics, 2013a). Likewise, around 70% of American undergraduates are in paid employment (Davis, 2012). Our findings suggest that despite societal changes, endorsement of common definitions of 'non-traditional students' (e.g. age, multiple roles and mode of study) has not seemed to vary significantly since the 1980s. This indicates that the use of the term 'non-traditional students' today does not necessarily reflect 'under representedness' as suggested by its historical origin and serves little value in communicating a distinct concept. It is recommended that researchers re-examine the purposes for categorising 'non-traditional' status in the contemporary context of educational practice and research. For instance, does 'non-traditional' refer to having characteristics which are uncommon among the majority of students? Or does it refer to having characteristics which predispose university students to non-completion of their educational degree/program? A more consistent definition of 'non-traditional students' better aligned with this purpose can then be developed, taking into account on-going changes in student demographics as well as progress of higher education systems in responding to these changes.

As shown in the findings, 'non-traditional students' is a fluid concept within the literature and its meaning is likely to vary depending on the societal, geographical and systemic context in which the research is conducted. The authors therefore would not attempt to propose another definition of 'non-traditional students'. However, there is still a practical need for nuanced approaches in classifying 'non-traditional students' which consider a broad range of student characteristics (Kim et al., 2010). Given current difficulties in identifying a consistent researcher-assigned definition for 'non-traditional students', a student-centred approach of definition, which involves eliciting students' self-beliefs about whether they are 'non-traditional' and why, may be a promising alternative. The benefits of this approach are that it reduces the need for researchers to predefine the term, and it minimises the problem of overlapping 'traditional' and 'non-traditional' characteristics. It is common for 'non-traditional students' to present some characteristics which are typically 'traditional'. Kim et al. (2010) argued that many students under the age of 25, who are often considered as 'traditional', have work and family responsibilities. On the contrary, some older students do not have these responsibilities. Self-definition represents a means to categorise students with overlapping characteristics of student status. We identified only one study that has adopted the student-centred definition (Kim et al., 2010) and therefore more research is needed

to compare its usefulness in drawing meaningful conclusion with that of traditional approaches. This will ultimately contribute to the progress of research concerning student diversity in higher education.

Another contribution of the present study is that it documents the adaptation and application of a tool originally developed for systematically reviewing empirical health research (Joanna Briggs Institute, 2011). Research in any discipline often requires the clarification of key concepts under study. However, it has been critiqued that this process is sometimes overlooked by researchers, leading to methodological problems (Baldwin, 2008). The systematic review methodology has been increasingly used in reviewing definitions but no published tool for this purpose currently exists. This study offers a data extraction and appraisal tool for systematic review of definitions which can be adopted and refined by future research.

The current study has a number of limitations. First, it only included peer-reviewed literature and not grey literature (e.g. government reports, conference proceedings). Future studies may seek to review grey literature to gain a clearer understanding of how this concept is used more broadly. Furthermore, the scope of the search was confined to studies of mental health. For instance, a number of studies relating to academic achievement, attrition or attitude towards education of 'non-traditional students' were excluded (Munro, 2011; Devlin, 1996). The present study therefore cannot be taken as an exhaustive review of all published definitions of the term 'non-traditional students'. Future studies which review definitions used in the broader education literature would complement the findings of this study.

In conclusion, this study represents the first systematic review of the definitions of 'non-traditional students' within mental health research conducted within a higher education setting. It provides a summary of criteria adopted in existing definitions which can be a useful resource to facilitate communication among those working with students, including educators, mental health professionals, and policymakers. It might also stimulate discussions about more consistent definitions of 'non-traditional students', which would ultimately identify a common approach for research seeking to understand the needs of this diverse student group.

Conflict of Interests

The author(s) have not declared any conflict of interests.

REFERENCE

- Adebayo DO (2006). Workload, social support, and work-school conflict among nigerian nontraditional students. *J. Career Devel.* 33(2):125-141.
- Adebayo DO, Sunmola AM, Udegbe IB (2008). Subjective wellbeing, work-school conflict and proactive coping among Nigerian non-

- traditional students. *Career Devel. Int.* 13(5):440-455.
- Altbach P, Reisberg L, Rumbley L (2009). Trends in Global Higher Education: Tracking an Academic Revolution. UNESCO 2009 World Conference on Higher Education. Paris, France: United Nations Educational, Scientific and Cultural Organization (UNESCO).
- Arbuckle J, Gale D (1996). A Comparison of the Psychosocial Developmental Levels of Traditional Freshman and Nonfreshman Students: Are They Really Different? *NACADA J.* 16(1):21-27.
- Australian Bureau of Statistics (2013a). Hitting the books: Characteristics of higher education students. Canberra: Australian Bureau of Statistics.
- Australian Council for Educational Research (2013). University numbers growing fast, Indigenous even faster. <http://www.acer.edu.au/enews/2012/09/university-numbers-growing-fast-indigenous-even-faster>. Accessed 29 October 2013.
- Backels S, Meashey LE (1997). Anxiety, depression and the 4.0: Brief therapy with high-achieving, nontraditional female students. *J. College Student Psychotherapy*, 12(1):45-56, doi:10.1300/J035v12n01_05.
- Baldwin MA (2008). Concept analysis as a method of inquiry. *Nurse researcher*. 15(2):49-58.
- Bean JP, Metzner, BS (1985). A Conceptual Model of Nontraditional Undergraduate Student Attrition. *Rev. Educ. Res.* 55(4):485-540.
- Bell JA (2003). Statistics Anxiety: The Nontraditional Student. *Educ.* 124(1):157-162.
- Bell S (2012). Nontraditional Students Are the New Majority. <http://lj.libraryjournal.com/>. Accessed October 23 2013.
- Bennett S, Evans T, Riedle J (2007). Comparing Academic Motivation and Accomplishments Among Traditional, Nontraditional, and Distance Education College Students. *Psi Chi J. Undergraduate Res.* 12(4):154-161.
- Benton SA, Robertson JM, Tseng WC, Newton FB, Benton SL (2003). Changes in counseling center client problems across 13 years. *Professional Psychology: Res. Practice*, 34(1):66-72.
- Bitner J (1994). A Comparison of Math Anxiety in Traditional and Nontraditional Developmental College Students. *Research and Teaching in Developmental Educ.* 10(2):35-43.
- Bradley D, Noonan P, Nugent H, Scales B (2008). Review of Australian Higher Education - Final Report. The Australian Government Department of Education, Employment and Workplace Relations.
- Bye D, Pushkar D, Conway M (2007). Motivation, Interest, and Positive Affect in Traditional and Nontraditional Undergraduate Students. *Adult Education Quarterly: J. Res. Theory* 57(2):141-158, doi:10.1177/0741713606294235
- Byrd DR, McKinney KJ (2012). Individual, interpersonal, and institutional level factors associated with the mental health of college students. *J. Am. College Health.* 60(3):185-193.
- Carney-Crompton S, Tan J (2002). Support Systems, Psychological Functioning, and Academic Performance of Nontraditional Female Students. *Adult Educ. Q.* 52(2):140-154, doi:10.1177/0741713602052002005
- Chang H (2007). Psychological Distress and Help-Seeking among Taiwanese College Students: Role of Gender and Student Status. *Bri. J. Guidance Counsell.* 35(3):347-355.
- Chartrand JM (1990). A Causal Analysis to Predict the Personal and Academic Adjustment of Nontraditional Students. *J. Counsel. Psychol.* 37(1):65-73, doi:10.1037/0022-0167.37.1.65
- Chartrand JM (1992). An Empirical Test of a Model of Nontraditional Student Adjustment. *J. Counsel. Psychol.* 39(2):193-202.
- Choy S (2002). Nontraditional undergraduates. Washington DC: National Center for Education Statistics.
- Christie H (2009). Emotional Journeys: Young People and Transitions to University. *Bri. J. Sociol. Educ.* 30(2):123-136, doi:10.1080/01425690802700123.
- Christie H, Tett L, Cree VE, Hounsell J, McCune V (2008). "A Real Rollercoaster of Confidence and Emotions": Learning to Be a University Student. *Stud. Higher Educ.* 33(5):567-581, doi:10.1080/03075070802373040.
- Collins ME, Mowbray CT (2005). Higher Education and Psychiatric Disabilities: National Survey of Campus Disability Services. *Am. J. Orthopsychiatry*, 75(2):304-315. doi:10.1037/0002-9432.75.2.304.
- Davis J (2012). School enrollment and work status: 2011. American Community Survey Briefs: U.S. Census Bureau.
- DeGregoria B (1987). Counseling the Nontraditional Italian-American Student. *Community Rev.* 8(1):38-41.
- Department of Industry (2012). Statistics Publications: Summary of the 2012 full year higher education student statistics. Australian Government Department of Industry.
- Devlin M (1996). Older and wiser?: A comparison of the learning and study strategies of mature age and younger teacher education students. *Higher Educ. Res. Devel.* 15(1):51-60.
- Devlin M (2010). Non-traditional university student achievement: Theory, policy and practice in Australia. Paper presented at the 13th Pacific Rim First Year in Higher Education Conference 2010,
- Dill PL, Henley TB (1998). Stressors of College: A Comparison of Traditional and Nontraditional Students. *J. Psychology: Interdisciplinary Appl.* 132(1):25-32.
- Dyrbye LN, Power DV, Stanford Massie F, Eacker A, Harper W, Thomas MR (2010). Factors associated with resilience to and recovery from burnout: A prospective, multi-institutional study of US medical students. *Medical Educ.* 44(10):1016-1026.
- Elliott JC (1990). Affect and Mathematics Achievement of Nontraditional College Students. *J. Res. Mathematics Educ.* 21(2):160-165.
- Everly JS, Poff DW, Lamport N, Hamant C (1994). Perceived stressors and coping strategies of occupational therapy students. *Am. J. Occupational Therapy.* 48(11):1022-1028.
- Fortune, A. E. (1987). Multiple Roles, Stress and Well-Being among MSW Students. *J. Social Work Educ.* 23(3):81-90.
- Frank JR, Mungroo, R., Ahmad Y, Wang M, De Rossi S, Horsley T (2010). Toward a definition of competency-based education in medicine: A systematic review of published definitions. *Medical Teach.* 32(8): 631-637.
- Gallagher RP (2011). National Survey of Counseling Center Directors. American College Counseling Association.
- Gilardi S, Guglielmetti C (2011). University life of non-traditional students: Engagement styles and impact on attrition. *J. Higher Educ.* 82(1):33-53.
- Greenland, A. (1993). It's time to get rid of nontraditional students (the label, not the people)! *Contemporary Educ.* 64(3):183-186.
- Hansen DG (1999). Key factors that differentiate nontraditional from traditional students. In Y. M. Jenkins (Ed.), *Using Smart Source Parsing Diversity in college settings: Directives for helping professionals* (pp. 191-199). New York: Taylor & Frances/Routledge.
- Hemby VK (1997). Effects of Keyboarding Skill on Self-Reported Computer Anxiety among Traditional versus Nontraditional College Students. *Delta Pi Epsilon J.* 39(1):24-38.
- Hemby VK (1998). Self-Directedness in Nontraditional College Students: A Behavioral Factor in Computer Anxiety? *Computers in Hum. Behavior*, 14(2):303-319.
- Hemingway P, Brereton N (2009). What is a systematic review. What is. Higher Education Funding Council for England (2013). Trends in young participation in higher education. HEFCE.
- Hollis-Sawyer L (2011). A Math-Related Decrement Stereotype Threat Reaction among Older Nontraditional College Learners. *Educ. Gerontol.* 37(4):292-306.
- Home AM (1997). Learning the hard way: role strain, stress, role demands, and support in multiple-role women students. *J. Social Work Educ.* 33(2):335-346.
- Hooper JO, Traupmann JA (1983). Older women, the student role and mental health. *Educ. Gerontol.* 9(2-3):233-242.
- Horn L (1996). Nontraditional undergraduates, trends in enrollment from 1986 to 1992 and persistence and attainment among 1989-90 beginning postsecondary students. Washington, DC: U.S. Department of Education, NCES.
- Hudson R, Towey J, Shinar O (2008). Depression and Racial/Ethnic Variations within a Diverse Nontraditional College Sample. *College Student J.* 42(1):103-114.
- Hughes R (1983). The Non-Traditional Student in Higher Education: A Synthesis of the Literature. *NASPA J.* 20(3):51-64.
- Joanna Briggs Institute (2011). *Joanna Briggs Institute Reviewers' Manual*. Adelaide: The University of Adelaide.
- Johnson ML, Nussbaum E (2012). Achievement goals and coping strategies: Identifying the traditional/nontraditional students who use them. *J. College Student Devel.* 53(1):41-54.

- Keith PM (2007). Barriers and Nontraditional Students' Use of Academic and Social Services. *College Student J.* 41(4):1123-1127.
- Kim KA (2002). ERIC Review: Exploring the Meaning of 'Nontraditional' at the Community College. *Community College Rev.* 30(1):74.
- Kim KA, Sax LJ, Lee JJ, Hagedorn LS (2010). Redefining nontraditional students: Exploring the self-perceptions of community college students. *Community College J. Res. Practice.* 34(5):402-422.
- Kirby PG, Biever JL, Martinez IG, Gómez JP (2004). Adults Returning to School: The Impact on Family and Work. *J. Psychol. Interdisciplinary Appl.* 138(1):65-76.
- Kohler Giancola J, Grawitch MJ, Borchert D (2009). Dealing with the Stress of College: A Model for Adult Students. *Adult Education Quarterly: J. Res. Theory.* 59(3):246-263.
- Leahy CM, Peterson RF, Wilson IG, Newbury JW, Tonkin AL, Turnbull D (2010). Distress levels and self-reported treatment rates for medicine, law, psychology and mechanical engineering tertiary students: cross-sectional study. *Australian & New Zealand Journal of Psychiatry.* 44(7):608-615.
- Leathwood C, O'Connell P. (2003). 'It's a struggle': The construction of the 'new student' in higher education. *J. Educ. Policy.* 18(6):597-615.
- Macari DP, Maples MF, D'Andrea L (2006). A comparative study of Psychosocial development in nontraditional and traditional college students. *Journal of College Student Retention: Research, Theory Practice.* 7(3):283-302. doi:10.2190/BV5H-3630-18CU-6C3B
- Mello R (2004). Teaching at the border of despair and hope: supporting the education of non-traditional working class student teachers. [Article]. *Westminster Studies Educ.*, 27(2):263-285.
- Menks FA, Tupper LC (1987). Role conflict in occupational therapy student parents. *The American journal of occupational therapy. : official publication of the Am. Occupational Therapy Association.* 41(1): 21-27.
- Metzner BS, Bean JP (1987). The Estimation of a Conceptual Model of Nontraditional Undergraduate Student Attrition. *Res. Higher Educ.* 27(1): 15-38, doi:10.1007/BF00992303.
- Miller MT, Pope ML, Steinmann TD (2005). A Profile of Contemporary Community College Student Involvement, Technology Use, and Reliance on Selected College Life Skills. *College Student J.* 39(3):596-603.
- Morris EA, Brooks PR, May JL (2003). The relationship between achievement goal orientation and coping style: traditional vs. nontraditional college students. [Article]. *College Student Journal.* 37(1), 3+.
- Munro L (2011). 'Go boldly, dream large!': The challenges confronting non-traditional students at university. *Austr. J. Educ.* 55(2):115-131.
- Myers JE, Mobley A (2004). Wellness of Undergraduates: Comparisons of Traditional and Nontraditional Students. *J. College Counsel.* 7(1):40-49.
- National Center For Education Statistics (2012). Advance release of selected 2012 digest tables. http://nces.ed.gov/programs/digest/2012menu_tables.asp. Accessed 23 October 2013.
- Norris DR (2011). Interactions that trigger self-labeling: The case of older undergraduates. *Symbolic Interaction.* 34(2):173-197.
- Ogren CA (2003). Rethinking the "nontraditional" student from a historical perspective: State normal schools in the late nineteenth and early twentieth centuries. *J. Higher Educ.* 74(6):640-664.
- Oh H, Rizo C, Enkin M, Jadad A (2005). What Is eHealth: A Systematic Review of Published Definitions. Gunther Eysenbach; Centre for Global eHealth Innovation, Toronto, Canada.
- Pierceall EA, Keim MC (2007). Stress and Coping Strategies among Community College Students. *Community College J. Res. Practice.* 31(9):703-712.
- Query JL, Parry D, Flint LJ (1992). The relationship among social support, communication competence, and cognitive depression for nontraditional students. *J. Appl. Communic. Res.* 20(1):78-94.
- Quimby JL, O'Brien KM (2006). Predictors of Well-Being among Nontraditional Female Students with Children. *J. Counsel. Devel.* 84(4):451-460, doi:10.1002/j.1556-6678.2006.tb00429.x.
- San Miguel Bauman S, Wang N, DeLeon CW, Kafentzis J, Zavala-Lopez M, Lindsey MS (2004). Nontraditional Students' Service Needs and Social Support Resources: A Pilot Study. *J. College Counsel.* 7(1):13-17.
- Smit R (2012). Towards a clearer understanding of student disadvantage in higher education: Problematising deficit thinking. *Higher Educ. Res. Devel.* 31(3):369-380.
- Smith JS (2006) Exploring the challenges for nontraditional male students transitioning into a nursing program. *J. Nursing Educ.* 45(7):263-270.
- Snyder TD Dillow SA (2012) *Digest of Education Statistics 2011.* Washington, DC: National Center for Education Statistics.
- Stallman HM (2010). Psychological distress in university students: A comparison with general population data. *Australian Psychologist.* 45(4), 249-257.
- Storrie K Ahern K Tuckett A (2010). A systematic review: Students with mental health problems—A growing problem. *Int. J. Nursing Practice.* 16(1):1-6.
- Sweet S Moen P (2007) Integrating educational careers in work and family. *Community, Work Family.* 10(2):231-250.
- Villella EF, Hu M (1991) A Factor Analysis of Variables Affecting the Retention Decision of Nontraditional College Students. *NASPA J.* 28(4):334-341.
- Waltman PA (1997) Comparison of Traditional and Non-traditional Baccalaureate Nursing Students on Selected Components of Meichenbaum and Butler's Model of Test Anxiety. *J.Nurs. Educ.* 36(4):171-179.
- Wlodzimirow KA Eslami S Abu-Hanna A Nieuwoudt M Chamuleau, RAFM (2012). Systematic review: Acute liver failure - One disease, more than 40 definitions. *Alimentary Pharmacology and Therapeutics.* 35(11): 1245-1256.
- Yarbrough DW Schaffer JL(1990) A comparison of school-related anxiety experienced by nontraditional versus traditional students. *Colle. Stud. J.* 24(1):81-90.

Appendix 1. Data extraction and critical appraisal tool. Critical Appraisal Tool for a systematic review of the definitions of ‘non-traditional students’ in tertiary education. Part 1. Background information (Mark as many as applied for each item).

**1. First author Year
Title Name of Publication**

2. Source Journal article Others: _____
 Book chapter

3. Study method Quantitative Qualitative
 Mixed method study

4. Country in which study was conducted

5. Type of tertiary education institution in which study was conducted University/ College Unspecified
 Community College Others: _____
 Vocational institution

6. Year level of participants Undergraduate Unspecified
 Diploma/ Certificate Others: _____
 Postgraduate

7. Discipline of participants Discipline specific Non-discipline specific
Insert discipline here:

8. General definition³ Yes No
Insert verbatim definition and page number here:
³*Broad defining statements in relation to previous research, but not so that one can readily infer that it applies to current study.*

9. Working Definition⁴ Yes No
Insert verbatim definition and page number here:
⁴*Statements made in background or methods section, for the purposes of the current study (or words to that effect), that a specific definition has been applied.*

10. Categories included in working definition **Use ‘(NV)’ to indicate non-verbatim responses (if any). Skip to Part 2 if no definition can be extracted.*

<input type="checkbox"/> Age	<input type="checkbox"/> Mode of study (Part time/ Full time)
<input type="checkbox"/> Being demographically ‘different’ from norm	<input type="checkbox"/> Multiple roles
<input type="checkbox"/> Cultural or ethnic background	<input type="checkbox"/> Parent
<input type="checkbox"/> Indigenous b/g	<input type="checkbox"/> Spouse
<input type="checkbox"/> Other minority b/g	<input type="checkbox"/> Employee
<input type="checkbox"/> Not specified	<input type="checkbox"/> Other role _____
<input type="checkbox"/> Disability	<input type="checkbox"/> Not specified
<input type="checkbox"/> Enrolment in a ‘nontraditional’ program	<input type="checkbox"/> Non-campus resident (i.e. commuter)
<input type="checkbox"/> ‘First in family’ to enter tertiary instit.	<input type="checkbox"/> ‘Nontraditional’ admission pathway
<input type="checkbox"/> One parent not entered	<input type="checkbox"/> Required academic support
<input type="checkbox"/> Both parents not entered	<input type="checkbox"/> Rural/ remote geographical b/g
<input type="checkbox"/> Not specified	<input type="checkbox"/> Sex
<input type="checkbox"/> Having previous degree(s)	<input type="checkbox"/> Other characteristics:
<input type="checkbox"/> Life experience	
<input type="checkbox"/> Low socioeconomic status	
<input type="checkbox"/> Method of categorising SES:	

Method of categorising SES not specified

Part 2. Quality of working definitions .

1. Is the working definition identified?
- Yes, explicit statement made in reference to the study sample
 - No, only general statements made (End of appraisal)
 - No reference to a definition at all (End of appraisal)

Comment:

2. Is the working definition clear and unambiguous enough for study replication?
- Yes
 - No

Comment:

3. Is the working definition referenced from the extant literature and any incongruency with it logically explained?
- Yes
 - Unclear
 - No

Comment:

Full Length Research Paper

Individual literacy activities with hearing-impaired children in the preschool period

H. Pelin Karasu

Anadolu University, Turkey.

Received 28 May, 2014; Accepted 13 November, 2014

The ability to recognize sight words, phonological awareness, syntax, semantics, and pragmatic skills begins to develop during the preschool period, and is important for formal reading education. The purpose of this study was to define individualized studies that support the development of literacy skills among hearing-impaired preschool children. A qualitative case study methodology was used in this study. The evaluation of the study data, teacher interviews, participant observations, documents, individualized reading video records, and instructional conversation and individualized reading assessments were performed using a researcher journal. Collected data were analyzed by means of a content analysis and a descriptive analysis. The study results showed that within the context of literacy preparation activities, conversations and individualized readings were performed every day with each child. Instructional conversations were performed using story books, sequential pictures, and single-card pictures within the scope of the subjects covered in class. During individualized reading activities, matching-completion-sequencing activities and big books prepared during group classes were used. The children's individual participation in conversations was evaluated based on their ability to describe events, to understand and answer questions, and to fulfill communication goals. During the evaluation of individualized reading activities, it was observed that the children's skills in recognizing words, in matching writing to a picture or other writing, in reading words and sentences, and in expressing their meanings were assessed. Individual conversations and reading activities constitute an important part of literacy preparation activities organized for hearing-impaired preschool children. The systematic application of these activities allows for the identification of the children's strengths and weaknesses, and contributes to the development of language skills according to their individual needs.

Key words: Hearing-impaired child, literacy activities, individual conversations, individualized reading, preschool period.

INTRODUCTION

An individual's literacy skills are based upon his/her knowledge regarding the sound, syntax, meanings, and

uses of language, which are acquired through the development of speaking and listening skills. Hearing-

E-mail: hpkarasu@anadolu.edu.tr

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

impaired school age children encounter various problems such as insufficiency in phonological awareness and syntax, difficulties in identifying words, limited vocabulary, slow rate of reading, and limited strategies for understanding what they read (Kelly, 2003). The extent to which such difficulties are experienced is closely associated with whether measures were taken at an early stage, and also to the availability of the educational environments tailored to the child's needs. The development of decoding and reading comprehension skills during formal reading education is directly related with the development of skills pertaining to the recognition of letter shapes within words, of the sight words, of the relationships between letters and sounds, and of the meanings of words and sentences. Phonological awareness, which begins to develop during the preschool period and occupies an important place in formal reading education, refers to the ability to distinguish phonemes (the smallest constituents of spoken sounds), and the sounds and syllables that constitute words (Ambruster et al., 2006). Phonological awareness forms the basis of phonological decoding or phonic development, which are important at the beginning of formal reading education (National Reading Panel, 2000). Phonological decoding encompasses the ability to identify relationships between spoken and written language, while phonics refers to the ability to identify relationships between sounds in spoken language and letters in written language. Phonological awareness and phonological decoding skills describe the processing and interpretation of auditory information. Due to their hearing loss, it is believed that hearing-impaired children experience difficulties during these processes, and that these difficulties affect their ability to acquire and develop reading skills. However, as a result of developments in hearing aid technologies, the administration of cochlear implants at younger ages, and early education programs applied during preschool education, the level of phonological skill development among hearing-impaired children is currently similar to that of their normal-hearing coevals (Geers, 2002; Girgin, 2012). Language-based reading and writing instructions, applied to hearing-impaired children to support their phonological skills, provides them the opportunity to jointly perform spoken and written language activities, to continuously engage in written interactions, and to acquire new experiences. Just as these opportunities could encompass group activities, such as reading or telling stories to the classroom, writing a book, labeling or naming objects, play activities or making music, it could also include individualized activities (Heilman et al., 2002). In this study, such activities were evaluated by examining the importance of literacy preparation activities administered through individualized studies to hearing-impaired preschool children.

Individualized activities have an important place in the education of children with special needs. By taking into consideration the individual needs and the individual learning speeds of children, individualized activities allow

instructors to support children in areas where they need assistance. Activities performed for hearing-impaired children in individualized environments can be conducted as *individualized reading (IR)* activities. The objective of these activities is to develop children's language and communication skills, and to support their *instructional conversation (IC)* and literacy skills (Clark, 2007).

The literature reveals that the majority of studies on conversations with hearing-impaired students evaluated their verbal and nonverbal turns and utterances (Coates and Sutton-Spence, 2001; Llyod et al., 2001; Mahon, 2009), and addressed their conversational breakdowns and repair strategies (Most, 2002; Toe et al., 2007). Lertsukprasert and Cheewareunroj's (2010) study was one of the conversation studies conducted on hearing-impaired preschool children. In this study, the effect of individual and group conversations on language skills was evaluated among hearing-impaired children receiving auditory/oral education. The results of the study demonstrated an improvement in the children's listening, understanding, and speaking skills (Lertsukprasert and Cheewareunroj, 2010). In another study, the conversation skills of hearing-impaired preschool children and normal-hearing preschool children were compared, and the skills of the hearing-impaired children was found to be similar to those of their normal-hearing coevals (Duncan, 1999). In Turkey, two *IC* studies have been conducted to date on hearing-impaired children. In the first study of Tüfekçioğlu (1998), *IC* was used to assess whether any differences existed in language use among hearing-impaired students in different educational environments. Based on the study results, an improvement was identified in the spoken language of students receiving education with the natural auditory/oral approach. In the other study (Gürgür et al., 2012), an assessment of teacher adequacy in *IC* was performed with a hearing-impaired school age child. Various publications emphasize the importance of literacy preparation programs provided to hearing-impaired children prior to formal reading education, and of *IRs* planned according to children's individual needs (Girgin, 2005; Kargin and Akçamete, 1991; Schirmer, 2000; Williams, 2004). However, a review of the literature revealed no studies regarding *IRs* for hearing-impaired preschool children. The results of this study are significant in that they present a program for *IC* and *IR* activities implemented for hearing-impaired preschool children. *IC* occupies an important place in the acquisition and development of skills regarding the phonetic characteristics, vocabulary, syntax, meaning, and use of a language, which constitute the basis of literacy skills. The development of spoken language skills, which also has positive effects on the development of literacy, is supported through *ICs*. In this context, the fact that this study was conducted at the Education and Research Center for Hearing Impaired Children (İÇEM) is significant in that it sets a precedent for individualized activities performed in an educational

Table 1. The educational and audiological information of the preschool second grade students.

Student no	Calendar Age (Months)	Degree of hearing loss (dBHL)	Hearing Technology Usage		Hearing Technology Age (Months)	CI Age (Ay)	Starting age of education at İÇEM (Months)
			right	left			
1	49	121	CI	HA	18	27	35
2	49	70	CI	HA	25	33	33
3	53	108	CI	HA	3	37	39
4	52	99	CI	HA	17	25	39
5	49	119	CI	HA	21	29	36
6	58	104	CI	HA	26	36	44
7	51	109	CI	HA	8	18	38
8	59	88	CI	HA	30	44	45
9	54	103	CI	HA	35	42	52
10	49	105	CI	HA	6	25	47

environment that emphasizes hearing and oral communication. *IR* provides important opportunities for phonological awareness, for emphasizing the communicative purpose of written language, and for comprehension strategies. We believe that the results of this study will contribute to the planning and implementation of individualized activities conducted with hearing-impaired preschool children. In addition, the results of this study will also serve to emphasize hearing-impaired children's need for *IC* and *IR* activities. The aim of this study was to define and describe the characteristics of educational programs that support the development of literacy skills among hearing-impaired preschool children, and which are implemented through individualized activities. In accordance with this aim, answers were sought to the following questions: (1) Which individualized activities were implemented? And (2) How was the *IR* performed?

METHODOLOGY

Study design

In this study, a qualitative case study methodology was used to thoroughly evaluate the characteristics of activities that support the development of literacy skills among preschool hearing-impaired children, and which are implemented through individualized activities. A case study is a method of inquiry in which a program, event, activity, process, or one or more individuals are thoroughly evaluated (Creswell, 2005).

Educational environment in which the study was conducted

This study was conducted at the preschool second grade of İÇEM, which is part of Anadolu University. At İÇEM, the natural auditory/oral approach and full daytime education is provided to students with hearing impairment. Hearing loss is identified by the audiology clinic, and family education is provided following device implantation to children. Preschool education, which commences from the age of three, continues for three years; elementary,

secondary, and high school education are provided afterwards by the same institution. In addition to group activities performed at all levels, individualized activities are also conducted.

İÇEM preschool second grade. The preschool second grade consisted of two adjacent classrooms, one larger and the other smaller. Group activities were performed in the larger classroom, while individualized activities were performed in the smaller classroom. The smaller classroom in which individualized studies were performed contained a table and chair on which the teacher and students sat. There is sound insulation in both classes. The boards on the wall of the large and small classrooms had pictures regarding concepts (seasons, colors, numbers, birthdays, and students' and teachers' names), posters prepared with the children, tables, and drawings on them.

Participants

The participants of this study were two teachers who conducted preschool second grade activities and individualized activities during the 2012-2013 academic year at İÇEM, the researcher, and ten hearing-impaired students. The teachers were graduates of the Division of Education of Individuals with Hearing Impairments. One of the teachers had nine years of experience working with hearing-impaired preschool children, while the other had four years of experience. In practice, one of the teachers performed the group activities, while the other performed individualized activities with the children. The researcher has been studying the development of literacy skills in hearing-impaired children for 19 years, and conducted individualized reading studies with preschool second grade during the 2012-2013 academic year. The educational and audiological information of the preschool second grade students is provided in Table 1.

As can be seen in Table 1, the calendar age of the children varied between 49 months (4;1) and 59 months (4;11). One of the children had moderate hearing loss (41-70 dBHL), one had severe hearing loss (71-95 dBHL), and eight had profound hearing loss (96 dBHL and above). For the children, the starting age of education at İÇEM varied between 33 and 52 months. Parental permission to participate in this research was obtained from all students.

Research instruments

The study data were collected by means of teacher interviews,

Table 2. Implementation program of the individualized activities.

Time	Group activities	Individualized activities	No of children participating in the activities
08.50-09.00	Calendar study	IC	1
09.00-09.30	Literacy preparation activities	IC	3
09.30-10.30	Free plays/matching-completion-sequencing activities	IC	6
11.00-11.30	Mathematics preparation activities	IR	3
11.30-12.00	Music, nursery rhyme and sequence-rule plays	IR	3
12.00-12.30	Drawing	IR	3
12.30-12.40	Preparations to go home	IR	1

IC=instructional conversation, IR=individualized reading.

participant observations, documents, the records of the validity and reliability committee, *IR* video records, *IC* and *IR* evaluations, and the researcher journal. Through teacher interviews, information regarding the preschool second grade program and activities were obtained, the literacy preparation courses were evaluated, audiological information pertaining to the students was collected, and the *IC* and *IR* evaluations were reviewed. *IRs* were performed by recording observations onto the researcher journal, and the obtained data were monitored by the validity and reliability committee.

Data collection and analysis

Study data were collected during the first semester of the 2012-2013 academic year, between September 17, 2012 and January 25, 2013. Every day the *IC* activities performed by the classroom teachers were recorded, and the informal evaluations performed by the teachers were noted. The *IR* activities were performed every day by the researcher and the classroom teachers, and the necessary records of these activities were made; these records were then evaluated by the validity and reliability committee. The study data were analyzed by descriptive analysis, which are commonly used in qualitative case studies (Yıldırım and Şimşek, 2011).

Validity-reliability

Within the scope of validity-reliability, study processes were monitored by two specialists experienced in the education of hearing-impaired students. During the validity meetings, the materials used during the *IC* and *IR* activities, the duration of the activities, the records of the evaluations that were performed, and the techniques used during the *IR* activities were all verified. The study report was provided to the class teachers for reading, and their opinions were noted.

RESULTS

The study results are presented below within the context

of the study questions.

Which individualized activities were implemented?

With the context of the individualized activities conducted at the preschool second grade of İÇEM, *IC* and *IR* activities were performed every day with each child. The implementation program of the individualized activities is provided in Table 2.

As can be seen in Table 2, *ICs* were performed every day between 08.50 and 10.30 with every child, and *IR* activities were completed between 11.00 and 12.40. One of the teachers implemented the group activities, while the other conducted *IC* and *IR* activities in the smaller classroom. The duration of individualized activities was 10 to 15 min for each child (Llyod et al., 2001). When the *IC* and *IR* records were reviewed, it was observed that the children participated in at least 75 *IC* and 80 *IR* activities during the first semester of the 2012-2013 academic year. It was observed that *IC* and *IR* activities were conducted on a daily basis with every child who attended the school. Planned and systematic *IC* and *IR* activities are known to have positive effects on the development of spoken language skills and literacy skills among hearing-impaired children (Clark, 2007).

IC. Instructional conversations are conversations performed by the teacher with a student on subjects covered in class with the aid of sequential pictures, story books, and single-card event pictures. By presenting a common subject that can be discussed between the teacher and student, these materials allow the initiation and continuation of interactions between the two (Tüfekçioğlu, 1998). The preschool second grade subjects covered during the first semester of the 2012-2013 academic year, and the materials used during *ICs*

Table 3. Subject covered in preschool second grade, and materials used during ICs.

Subjects	Story book	Sequential pictures	Single-card picture
Our Vacation and School	Yellow Ball Begins School Buddy Learns How to Swim Yumurcak's Mouth	The Girl Who Goes to School Service	The Seaside The Schoolyard The Park
Our Sense Organs	Yumurcak's Nose Caner and the Kitten	The Flower and the Bee The Dog In The Garden	The Farm The Animals In The Garden
Sounds	Yumurcak's Ear	The Bird	
The Sacrificial Holiday and 29 October	Mine Goes On Holiday	The Girl Who Ate Candy The Ceremony The Balloon-seller	The Holiday Trip Republic Day
The Autumn	Ece and Cem: Welcoming Autumn	The Child Who Got Wet In the Rain	The Autumn The Rain
Our Home and Rooms	Pussycat Takes a Bath	The Broken Glass The Child Who Cut His Hand	The Living Room The Bathroom
Breakfast	Ercan and Ebru and the Egg	The Egg The Child Who Prepared Breakfast The Child Who Did Not Like Breakfast	Breakfast The Kitchen
Baking	Gülenay And The Cats Elif Makes Pizza	The Patisserie Popping Corn The Gift	Cookies The Station
Vehicles	The Bottle in the Sea	The Boatman Bathroom Toilet Habits	Traffic The Bathroom
The Cleanliness Of Our Bodies	Mine Cuts Her Nails Mine Goes Uses The Restroom	Washing Hands Brushing Teeth	
The Winter	Tobi's Winter Adventure Pınar the Little Doctor	The Sledge Making a Snowman	The Winter Winter Sports

are provided in Table 3.

As can be seen in Table 3, a total of 11 subjects were covered at the preschool second grade during the first semester of the 2012-2013 academic year. Within the context of the curriculum web, these subjects form the basis of the group activities conducted in class (Beaty and Pratt, 2003). *IC* materials were selected according to these subjects. During *ICs*, the use of materials parallel to the subjects covered in class enabled the children to make use of the words and linguistic structures employed during group interactions (Clark, 2007). During *ICs*, story books, sequential pictures and single-card pictures related to the subjects covered in class were used according to a particular sequence. The different types of materials used in conversation enabled the children to describe the events, to identify the relationship between different events, to make predictions, to list the events in a particular order, and to use language within various contexts (Cole and Flexer, 2007). For example; each one

of the story books, sequence pictures and single-card pictures regarding the subject "Our Sense Organs" described a different event. In other words, the characters, the time and the location of each event were different.

During *IC* activities, children are provided the opportunity to use various words and language structures regarding their senses of sight, hearing, smell, touch and taste when describing events relating to a certain subject. At the same time, children are also given during these activities the opportunity to employ strategies that are important for the development of their literacy skills, such as making inferences when describing events, making predictions, answering questions, and summarizing.

Following the *IC*, the teacher recorded the child's participation in an evaluation log, which was transferred from preschool first grade, and was prepared separately for each child. These evaluations recorded the words, sentences, and repetitions used by the child; the answers he/she provided to the questions; the predictions he/she

Table 4. Materials Used during IRs.

Matching-completion-sequencing activities
Colors, names of friends and teachers, seasons, days, months, shapes, poster of the head, names of toys, names of colors and fruits, breakfast items 1, breakfast items 2, rooms in the house, names of colors and shapes
Big Books
The books entitled: The Head, Autumn, The Home, Breakfast, Animals and Cleanliness.

made; and the relationships she identified between different events. The post-*IC* evaluation performed with student number 7 on September 25, 2012 is provided below in Example 1:

Example 1

The sequential pictures entitled “The Girl Who Goes to School” were viewed. The student showed mutual interest and established eye contact. The student understood basic questions, such as “What is Ece doing?”, “Where is Ece going?” The student replied to the question with intelligible, one or two-word answers, such as “sleeping” or “drinking tea.” The student used the present tense suffix by himself. The student could repeat two-word sentences, such as “eats cake” or “going [to] school.” The student had difficulties predicting the course of events and in determining cause and effect relationships.

In Example 1, joint attention, turn taking, and signaling of intention were assessed during post-*IC* evaluation. These elements are the communicative behaviors that constitute the basis of a conversation’s sustainability (Clark, 2007; Cole and Flexer, 2007). Furthermore, during the evaluations, the answers provided to the questions, the number of words used, the use of suffixes, and the recurring linguistic structures were also considered. During the conversations, evaluating the answers and predictions, the relationship identified between different events, and the number of words and proper syntax use within sentences was important for determining the level of the activities to be prepared according to the individual’s requirements, and also for ensuring diversity in these activities (Cole and Flexer, 2007).

IR individualized readings are activities in which the teacher uses reading material of the appropriate level, and provides assistance through reading strategies in case the child has difficulties. In this study, matching-completion-sequencing activities and big books prepared in group classes were used during *IR* activities. The materials used during *IRs* are listed in Table 4:

Matching activities were performed by using picture-writings and written cards. In this activity, there were written words on each picture, and only cards with these words could be matched with this picture-writing (only cards with the names of friends written on them could be matched with picture-writings that have these friends’

pictures, with their names written under it). Completion activities included completing the pieces of the whole, and associating words regarding these pieces with a particular writing (The poster of the head: the eyes, ears, nose, and mouth). Sequencing studies consisted of describing the sequence of concepts with a certain order (such as days, months, and seasons), and associating them with certain words. The materials employed in these activities were first used with illustrated hints; these hints were removed after the child read and described the writing on these materials. The matching-completion-sequencing activities were first introduced during the group classes. Each week after they were performed within the group, these activities were employed during individualized reading activities performed with each child. These activities ensured that the children showed interest in the writings, remembered the words more easily, expressed their meanings with less difficulty, and developed an awareness regarding these words and the shapes of letters that formed them (Heilman et al., 2002).

Another material used in *IR* was the big book. The big books were based on the Language Experience Approach, and prepared during group activities. They were books in which teachers noted the children’s feelings and thoughts. The beginning of each big book had a cover page with the book’s name of the book and date of writing. Other pages contained pictures regarding the subject, and, beneath the pictures within the book, notes of the sentences uttered by the students. Immediately after they were completed, the big books were read with each child during the *IRs*. The big books continued to be read throughout the semester, once every two weeks within the group, and also during the individualized activities. These recurrent reading activities not only contributed to the development of the children’s ability to infer meanings, but also enabled them to learn language structures and language-related cues (Cooper, 1997).

During *IRs*, the children’s participation was recorded onto the reading evaluation logs. At the end of the academic year, these evaluations will be transferred to the classes in which the children will pursue their education. These evaluations assessed whether the child recognized the writing beneath the pictures, whether he/she could match the cards with these writings, whether he/she knew the meaning of the words that were read, and whether he/she could read the writing without

its associated picture. With the big books, an evaluation was performed on whether the child could read the sentences beneath the picture, and whether he/she could describe the meaning of these sentences and words. For example, the big book entitled "Breakfast," prepared during the group activity on December 7, 2012, was read together with student number 2 in one of the individualized reading activities. The evaluation performed following this reading is provided below in Example 2:

Example 2

When the student saw the cover of the book, he read its title, but was unable to read the date. The student was able to read the sentences "Umut drinks milk," "Türkan eats bread," and "Mustafa eats olives" by looking at the pictures. Regarding the sentences on the pages, the student understood and correctly answered the questions "What is Umut doing?", "When does he drink milk?", "What is Türkan eating?", "What is Mustafa eating?", "When does he have breakfast?" However, the student could not read the sentence "Mother is cooking sausage." The student could describe what he saw on the pictures; after I read the sentence, the student was able to repeat it intelligibly.

As can be seen in Example 2, the extent to which the child could read the sentences on the big book, along with sentences that could not be read, were noted during these evaluations. Whether the child understood the sentences and words was verified by asking questions. Just as this evaluation approach provided information regarding the current performance of the child, it also allowed his/her later reading performance to be monitored (Fields et al., 2004).

How were the IRs performed?

During IRs, matching-completion-sequencing activities and big books were employed as follows:

Matching-completion-sequencing activities. The teacher showed the first picture by mentioning the name of the activity to be read, and asked the child read the word beneath the picture. If the child could not read the word, the teacher read the word him/herself and waited for the child to repeat it. Each picture that was shown was then placed sequentially in front of the child. After completing the picture cards, the teacher provided matching cards to the child, one by one, and asked the child to match each word on these cards with the words beneath the pictures. When the child had difficulties or was unable to match the cards, the teacher showed the length, first letter and last letter of the word written on the card, and waited for the child to match the writing to the correct word. After completing the matching process, the teacher read the

words on the cards, and asked the student to show which word he/she just read. If the child performed the matching process without difficulty, the pictures were removed from the table, and the child was asked to only read the writings on the matching cards. Provided below is the record of the IR regarding "color" performed with student number 8 on September 25, 2012 (Researcher journal, p. 8).

Example 3

The child recognized every color that was shown, and pronounced their names correctly and intelligibly. The child attempted to match the cards by placing them under the writings. The child initially held the matching cards with the writings upside down. The child was shown how the cards should be held. As an example, the "white" matching card was placed one by one below each color; the child was then asked to indicate whether the writing on the card and the writing beneath the color were the same, and attention was drawn to the first and last letters of the words. Then, by looking at each one of the letters, it was shown that the "white" card and the writing beneath the white color were the same. Following this example, the child looked at the first and last letter of the words when matching the cards, showed these words with his finger, and performed the matching correctly. When asked to distinguish colors by listening to their names, the child was able to show the cards associated with every color that was read. The pictures were then removed from the table, and the child was asked to only read the writings on the matching cards. The child was able to read the "orange" card, but unable to read the names of the remaining colors.

As can be seen in Example 3, during the matching activities, the child was asked to read the name of the colors, to associate the writings with the ones on the color cards, to distinguish color names by listening to them being read, and to read color names out loud without seeing the color cards. In case the child had difficulties in matching the word card with the corresponding writing, the child was shown the direction of the writing, the length of the word, the letters in the word, and the first and last letters of the word in order to provide the child with a model for the use of sight word strategies, which begin to develop in children during the preschool period.

Matching cards were also used during sequencing activities with concepts such as seasons, days and months; in addition, children were also asked to list the seasons, days, and months without looking at any clues (Researcher journal, p. 19, October 4, 2012).

Individualized big book reading. Individualized big book reading activities were started from the cover of the book, and the child was asked to read the sentences written below the pictures on the pages. The words and suffixes that the child could not read were read by the teacher,

and the children were asked to repeat these words. Whether the child understood the sentence was verified by asking questions regarding the meaning of the sentence and words. Provided below is the record of the reading activity carried out with the big book entitled "Home", performed with student number 2 on September 25, 2012 (Researcher's Journal, p. 66):

Example 4

The cover of the book was shown by saying "Today we are going to read a class book with you." The question "What is the name of the book?" was asked by showing the writing on the cover. The student was able to read the word "home" on the cover. By showing the date on the cover, the question "When did you prepare this book?" was asked. From the date "November 27, 2012, Tuesday", the student was able to read the words "November 2012 Tuesday," but unable to read the number "27." After I read the full date myself, the student was repeated it correctly. The first page of the book was opened, and the writing beneath the picture was shown. By showing the child in the picture, the student said, "There is Miray." To the question "What is Miray doing?" the student replied "Looking at the television." To the question "Where is he sitting?", the student replied "He is sitting in the salon." By showing the writing beneath the picture, the question "What is written here?" was asked. By showing each word within the sentence with his finger, the student read the word "Miray is watching television." To the question "What does television mean?" the student replied by showing the television on the picture and replying "There is television at home." To the question "Do you watch television?", the student again replied by saying "There is television at home." To the question "Do you watch television at home?", the student again replied by saying "I watch." After I said the sentence "I watch television" myself, the student was repeated the sentence correctly. Following this, the student said "one" by showing the page number of the right lower corner of the page. I said "Yes, this is the first page," and we moved on to the next page...

In Example 4, it can be seen that the reading activity was started by reading the title date of the book, which was written on the cover. The teacher asked the student to read the sentence beneath the picture. In case the child showed interest in the picture, questions were asked regarding the event or scene within the picture. Talking about the picture enabled the children to identify the relationship between the writing and the event by allowing them to provide a description of these events (Fields et al., 2004). In example 4, it is possible to see that the child had difficulties answering some of the question regarding the event, and that he attempted to provide examples from his own life. In this case, the teacher took the child's contribution into account, and asked the question once again based on the child's

sentence. Following this, it was observed that child was able to answer the question as necessary. Understanding questions and answering them correctly is one of the areas in which hearing-impaired children experience difficulties during the development of their language and academic skills. Reasons for this difficulty experienced by the children may include the difficult syntax structure of the questions that are asked; the student not knowing the meaning of the words within the questions; or the difficulty level of the answers for these questions (Schirmer and McGough, 2005).

DISCUSSION

In this study, answers were sought to the questions regarding the methods used in individualized studies with hearing-impaired children, and on how *IR* activities were conducted.

Which individualized activities were implemented?

In this study, it was observed that at İÇEM, *IC*, and *IR* activities were performed with preschool second grade hearing-impaired children. *IC* enables the children to understand the questions, to give answers to these questions, and to share their own experiences and thoughts (Llyod et al., 2001). Furthermore, *IC* also occupies an important place in the ability to recognize phonological elements and in the development of syntax, semantics, and pragmatic skills, all of which play an important role in the development of literacy skills. During *ICs*, the teacher: a) asked questions that prompted the child to think and use language; b) encouraged the child to participate; c) listened to their contribution and participation; d) further expanded the scope of their participation; e) made corrections where necessary; f) allowed to use new words; and g) shared his/her thoughts on the subject with the child (Beaty and Pratt, 2003). There is a mutual interaction between literacy and the development of spoken language. Just as the development of spoken language affects children's literacy skills, the development of literacy skills also contributes to children's continuously developing spoken language skills (Heilman et al., 2002). *ICs* performed regularly and every day with hearing-impaired children according to pre-determined goals enable these children to use language in various contexts and to acquire new language experiences, thus contributing to the development of their listening and speaking skills along with their literacy skills. The study results indicated that *IC* activities were performed on a daily basis with each child, and that the subjects covered during the *IC* activities were parallel to the subjects covered in class. As described earlier, there are various advantages associated with conducting *IC* activities parallel to the subjects covered in class. One of

these advantages is that it ensures that *IC* activities effectively reinforce the words and language structures used during group interactions. Another advantage is that it provides children the opportunity to use newly-learned words and language structures in different contexts (Clark, 2007). Hearing-impaired children often experience difficulties when speaking about a single subject, when expressing their thoughts, and when initiating and/or continuing a conversation. Planned and systematic *IC* activities play an important role in minimizing these difficulties. Planned and systematic *IC* activities necessitate the use of various materials that contribute to the development of the children's spoken language. The use of materials during *IC* activities enables hearing-impaired children to focus on a single subject when speaking, to continue a conversation, and to associate events with their own experiences (Tüfekçioğlu, 1998). The study results indicated that during *IC* activities, the instructors used story books, sequence pictures, and single-card pictures whose subjects were parallel to the subjects covered in class. These materials presented different events in various contexts, and provided hearing-impaired children the opportunity to use their spoken language in different contexts (Cole and Flexer, 2007). In other words, these different types of materials provided many different opportunities for the development of the children's abilities to describe the events, to identify the relations between the characters and the events, to describe the location and time, to make predictions, and to make inferences. These opportunities not only contributed to the development of the children's spoken language skills, but also allowed the children to form the basis of their strategies for reading comprehension, which is essential for the development of their literacy skills.

Literacy activities performed during the preschool period aim to prepare children for their formal reading education. In this context, the preschool period represents the time when children establish the foundations of their word recognition and comprehension skills, which occupy an important place in formal reading education. *IRs* identify areas in which the children need reading assistance, and provide support in these areas through individual activities. According to the children's needs, *IR* supports the use of clues regarding sight words, phonemic and phonological awareness, syntax, and semantics. Furthermore, *IR* allows an evaluation of the child's skills in recognizing words (based on the shape of words and letters), as well as his/her skills in describing the meaning of words and sentences (Fields et al., 2004).

The study results indicated that *IC* activities were performed on a daily basis with each child. The matching-completion-sequencing activities performed during the *IR* activities served not only to increase the children's awareness regarding the meaning of the words, but also allowed them to develop an awareness regarding the shape of the words. In this study, another type of material

used during *IR* activities was the big books, which were prepared during group classes. Big books represent books that are prepared based on the children's language and learning experiences; they are considered to be the most meaningful type of reading material from the children's standpoint. Big books contribute significantly to children's word recognition strategies, and also to the development of their reading comprehension skills (Browne, 1996).

In this study, it was observed that the participation of children to *IC* and *IR* activities was regularly evaluated. Informal evaluations were recorded by the classroom teachers. Such evaluations allowed teachers to identify the needs of the children by observing their performance, and to thereby prepare activities that were suitable for their level. The evaluations performed after *IC* activities focused on the development observed in the children's communicative behaviors, on the compatibility of the sentences they formed with the rules of syntax, on the diversity of words they used, on the extent to which they were able to understand and answer the questions, on their ability to understand events, and on their ability to make predictions and inferences. The evaluations performed after *IR* activities focused on the children's awareness regarding the shape of words, their use of word recognition strategies, their ability to benefit from visual cues, their comprehension skills, and the answers they provided to the questions. These aspects considered during the evaluations represented important criteria for identifying the areas in which the children needed improvement for the development of their spoken language and literacy skills (Fields, Groth and Spangler, 2004).

How were the IRs performed?

Children cannot benefit from literacy activities that do not reflect their own speaking and listening skills. For this reason, during literacy preparation activities, it is important for writings to be used within contexts that are meaningful and relevant for the children (Heilman et al., 2002). In this study, it was observed that matching-completion-sequencing activities, as well as big books prepared in group classes, were used during *IR* activities. Matching-completion-sequencing activities, as well as the big books prepared with the children's own participation, are important materials for reflecting the children's own language experiences and knowledge (Cooper, 1997). *IRs* are important for identifying and supporting the children's individual needs. The study results indicated that the reading materials used during *IR* activities were previously shared with the children within the context of the group activities performed in class. The conduct of preschool *IR* activities using materials previously shared within groups ensures among the children the fostering of positive attitudes towards literacy, the recognition and

identification of word forms, the sharing of words' and sentences' meanings with one another, and the association of the writings with their own experiences (Fields et al., 2004). In addition, planning the *IR* activities accordingly allowed the children to utilize the experience they acquired in their groups, and to develop their skills in the areas where they needed improvement. This approach also allowed the individual performance of the children to be assessed.

In preschool *IR* activities, children are not expected to decode words or sentences. The attention given by the children to the shape of words and letters, the association they make between writings and spoken language, and their ability to infer meanings by using clues within the pictures forms the basis of their phonological decoding skills, which occupies an important place in formal reading education. The study results indicated that various word recognition strategies were employed during the matching-completion-sequencing activities applied within the context of *IR* activities. The development of word recognition strategies begins during the preschool period, and serves to prepare children for their formal reading education. During the *IR* activities, children were made to pay attention to the length of words, the shape of the letters forming the words, the first and last letters of words, and also the meaning of the words. These approaches supported the development of the children's word recognition skills (Heilman et al., 2002). In this study, it was observed that the teachers emphasized the shape/formal characteristics of the words during big book reading activities, and that they asked the children to describe the events they read and to provide the meaning of the words and sentences in the book. During *IRs*, the meaning of words and sentences should be stressed in order to emphasize the communicative purpose of the writings. This is because the ultimate purpose of reading is comprehension. For this reason, children should be asked to describe what they have read, and must, when necessary, share the meaning of the words and sentences they have read by using pictures (Beaty and Pratt, 2003; Fields et al., 2004).

The ability of understand and answer question begins to develop during the preschool period, and serves as a basis for the development and evaluation of reading comprehension skills during formal reading education. In this study, it was observed that during *IR* activities, the teachers made use of questions when sharing or teaching the meanings of words, and that they focused on the children's ability to understand and answer questions. Hearing-impaired children are known to experience difficulties in understanding and answering questions due to the limited vocabulary they possess, their limited experiences regarding events, and the complex syntax structure of sentences involving questions (Schirmer and McGough, 2005). Studies on school age hearing-impaired students report that while these students experience difficulties in answering questions relating to

the texts they read, they are nevertheless able to correctly understand and answer questions that are asked according to their language level (Dowaliby, 1992; Girgin, 2006; Schirmer and Woolsey, 1997). Commencing educational activities at an early age is of great importance for the development of reading skills in hearing-impaired children (Schirmer, 2000). For this reason, activities performed during the preschool period to increase hearing-impaired children's ability to understand and answer questions relating to a text will also contribute to the later development of these abilities during their formal education.

CONCLUSION AND RECOMMENDATIONS

In conclusion, it was observed in this study that *IC* and *IR* activities were systematically employed during the individualized activities that were performed at the preschool second grade of İÇEM in order to support the development of hearing-impaired children's language and literacy skills. Due to their loss of hearing, hearing-impaired children experience delays in the development of their language skills in comparison to normally hearing children. To minimize this delay, it is necessary to simultaneously employ various early intervention approaches. Early intervention approaches for hearing-impaired children are based on early diagnosis, early education, and the supporting of the children's language and academic skills in educational environments. In this context, the *IC* and *IR* activities administered together with group activities during preschool education serve to effectively identify and support the areas in which hearing-impaired children need assistance for the development of their spoken language and literacy skills.

Based on the study results, we can make the following recommendations regarding the implementation of these activities; based on an evaluation of the *IC* and *IR* activities, various literacy preparation activities could then be implemented. By assessing the effect of these activities on the development of spoken language and literacy skills in hearing-impaired children, it will be possible to take effective decisions regarding educational practices. For future studies, it is possible to recommend the monitoring of development in literacy skills among hearing-impaired children taking part in preschool literacy preparation activities, as well as an evaluation of the relationship between the listening and speaking skills and the literacy skills of these children. In addition, *IC* and *IR* activities organized for school age hearing-impaired students may allow a thorough evaluation of the strategies used by these students when participating in such activities.

Conflict of Interests

The author has not declared any conflict of interests.

ACKNOWLEDGEMENT

This study was supported by Anadolu University Scientific Research Projects Commission under the grant no: 1210E154

REFERENCES

- Ambruster B, Lehr E, Osborn J (2006). Put reading first: The research building blocks for teaching children to read. National Institute for Literacy web-site: <http://lincs.ed.gov/publications/pdf/PRFbooklet.pdf>.
- Beaty JJ, Pratt L (2003). Early literacy in preschool and kindergarten. New Jersey: Pearson Education, Inc.
- Browne A (1996). Developing language and literacy 3-8. London: Paul Chapman Publishing Ltd.
- Clark M (2007). A practical guide to quality interaction with children who have a hearing loss. Oxfordshire: Plural Publishing, Inc.
- Coates J, Sutton-Spence R (2001). Turn-taking patterns in deaf conversation. *J Sociolinguistics*. 5(4): 507-29.
- Cole EB, Flexer C (2007). Children with hearing loss developing listening and talking. Oxfordshire: Plural Publishing, Inc.
- Cooper JD (1997). Literacy: Helping children construct meaning (3rd ed.). Boston: Houghton Mifflin Company.
- Creswell JW (2005). Educational research: Planning, conducting, and evaluating quantitative and qualitative research (2nd ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.
- Dowaliby FJ (1992). The effects of adjunct questions in prose for deaf and hearing students at different reading levels. *American Annals of the Deaf*. 137: 338-344.
- Duncan J (1999). Conversational skills of children with hearing loss and children with normal hearing in an integrated setting. *Volta Review*. 101(4): 193-211.
- Fields MV, Groth LA, Spangler KL (2004). Let's begin reading right (5th ed.). New Jersey: Pearson Education, Inc.
- Geers AE (2002). Factors affecting the development of speech, language, and literacy in children with early cochlear implantation. *American Speech-Language-Hearing Association*. 33: 172-183.
- Girgin Ü (2005). İşitme engelli çocuklarda bireyselleştirilmiş okuma eğitimi [Individualized reading instruction for hearing impaired children]. *The Turkish Online J Educ. Technol.-TOJET*. 4(3): 143-150.
- Girgin Ü (2006). Evaluation of Turkish hearing impaired students' reading comprehension with the miscue analysis inventory. *Int. J Special Educ*. 21(3): 68-84.
- Girgin Ü (2012). Phonic-based sentence method for students with hearing impairment: A case study from Turkey. Saarbrücken: LAP Lambert Academic Publishing.
- Gürgür H, Girgin Ü, Uzuner Y (2012). İşitme engelli bir öğrenci ile gerçekleştirilen bire bir söyleşilerde öğretmen yeterliliklerinin incelenmesi [The examination of teacher competencies in one-to-one conversations with a hearing impaired student]. *Türk Eğitim Bilimleri Dergisi*. 10(3): 507-39.
- Heilman AW, Blair TR, Rupley WH (2002). Principles and practices of teaching reading (10th ed.). New Jersey: Merrill/Prentice Hall.
- Kargin T, Akçamete G (1991). Bireyselleştirilmiş eğitim programı, işitme engelliler ve okuma [Individualized education program, hearing impaired people and reading]. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*. 24(1): 151-160.
- Kelly LP (2003). Considerations for designing practice for deaf readers. *J Deaf Studies and Deaf Education*. 8: 171-186.
- Lertsukprasert K, Cheewareunroj W (2010). Listening and speaking ability of Thai deaf children in preschool aural rehabilitation program. *J. Med Assoc Thai*. 93(4): 474-80.
- Llyod J, Lieven E, Arnold P (2001). Oral conversations between hearing-impaired children and their normally hearing peers and teachers. *First Language*. 21: 83-107.
- Mahon M (2009). Interactions between a deaf child for whom English is an additional language and his specialist teacher in the first year at school: Combining words and gestures. *Clinical Linguistics & Phonetics*. 23(8): 611-29.
- Most T (2002). The use of repair strategies by children with and without hearing impairment. *Language, Speech, and Hearing Services in Schools*. 33: 112-123.
- National Reading Panel. (2000). Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. Washington, DC: National Institute of Child Health and Human Development. http://www.nichd.nih.gov/publications/nrp/upload/smallbook_pdf.pdf
- Schirmer BR, Woolsey L (1997). Effect of teacher questions on the reading comprehension of deaf children. *J Deaf Studies and Deaf Education*. 2(1): 47-56.
- Schirmer BR (2000). Language and literacy development in children who are deaf (2nd ed.). Boston: Allyn and Bacon, Inc.
- Schirmer BR, McGough SM (2005). Teaching reading to children who are deaf: Do the conclusions of the National Reading Panel apply? *Review of Educational Research*. 75(1): 83-117.
- Toe D, Beattie R, Barr M (2007). The development of pragmatic skills in children who are severely and profoundly deaf. *Deafness and Education International*. 9(2): 101-117.
- Tüfekçioğlu U (1998). Farklı eğitim ortamlarındaki işitme engelli öğrencilerin konuşma dillerinin incelenmesi [Evaluation of the spoken languages of hearing-impaired students in different educational environments] Eskişehir: Eğitim Sağlık ve Bilimsel Araştırma Çalışmaları Vakfı Yayınları.
- Williams C (2004). Emergent literacy of deaf children. *Journal of Deaf Studies and Deaf Education*. 9(4): 352-365.
- Yıldırım A, Şimşek H (2011). Sosyal bilimlerde nitel araştırma yöntemleri (8. baskı). [Qualitative research methods in social science, 8th ed.] Ankara: Seçkin Yayıncılık.

Full Length Research Paper

Medicine for somewhere: The emergence of place in medical education

Brian M. Ross^{1*}, Kim Daynard^{1,2} and David Greenwood²

¹Northern Ontario School of Medicine, Lakehead University, Thunder Bay, Ontario, Canada.

²Faculty of Education, Lakehead University, Thunder Bay, Ontario, Canada.

Received 29 September, 2014; Accepted 27 October, 2014

Until recently medical education has been largely silent on those aspects of the physician's life, both professional and unprofessional, that differ from place to place. This has contributed to health inequity through an undersupply of health care workers to many communities. A growing movement for social accountability in medical education has made consideration of place an emergent topic in the field. We describe the history of place in medical education, consider how our own institution has attempted to construct a place-based education program, and suggest how the wider place-based education literature can inform the construction of place-sensitive medical education curricula.

Key words: Social accountability, medical education, place-based education, community-based education, health.

INTRODUCTION

In 2005, the town of Geraldton announced it was losing six out of the seven physicians it employed (Canadian Broadcasting Corporation, 2005). The implications for the town's medical service were dire and there was a fear that the local hospital would close with inevitably detrimental effects on the health of the inhabitants. This exodus occurred despite the municipality offering well above average salaries in an attempt to recruit and retain medical staff. The news report cited Geraldton's location—a small town in the hinterlands of Northwest Ontario—as the major cause of the difficulties the town was facing. Such a story, common for those locations outside of major population centres, shows one significant way that place plays an important role in

health and healthcare. As the people of Geraldton know, some places make difficult destinations for recruiting and retaining doctors. This serious truth is a familiar story in popular culture, as seen in the television series *Northern Exposure* and *Hard Rock Medical*, and in the film *Seducing Doctor Lewis* as well as its recent remake, *The Grand Seduction*. The institutions where we work—Lakehead University and the Northern Ontario School of Medicine—have an explicit mission to serve places like Geraldton. In this paper, we advance the view that medical education has to be place-based--it has to be for somewhere--and this place-based pedagogical intention has the potential to impact physician recruitment and retention, as well as the well-being of people in remote

*Corresponding author. E-mail: bross@nosm.ca. Tel. 807 766 7394.

and isolated communities.

Place in medical education

Health has been defined in many ways including an absence of infirmity and disease as well as a state of well-being (World Health Organisation, 2006). It can be measured in many ways including in terms of personal satisfaction, longevity, or the prevalence of morbidity and mortality arising from various diseases. Whatever one's understanding of health it is clear that there is a large variation in health between populations for varied lifestyle, social, economic and biological reasons, the so-called determinants of health (World Health Organisation, 2011). This variance led to the emergence of the concept of health inequity, defined as differences in health that are unnecessary, avoidable, unfair or unjust (Whitehead, 1992). The reduction of health inequity has been deemed a major priority by such bodies as the World Health Organisation (1978) as described in the organisation's *Health for All* initiative made in response to the so-called Declaration of Alma-Ata which states "the need for urgent action by all governments, all health and development workers, and the world community to protect and promote the health of all the people of the world". Indeed, the Global Forum for Health Research (1999), a partner of the World Health Organisation, stated in their 10/90 report on health research, which directly addressed health care deficiencies, that: "Good health is a way out of poverty. It results in a greater sense of well-being and contributes to increased social and economic productivity. The impact of ill health on productivity affects not only the poor, but societies and economies as well" (Global Forum for Health Research, 1999, p. 23). This is particularly evident in rural areas of the world, with the declaration of the Second Rural Health Congress in South Africa concluding "since the great majority of poor people of the world live in rural areas, we pledge ourselves to this global initiative to achieve health for all rural people by the year 2020" (WONCA, 2001, p. 17).

Health inequity can be related to many factors including socioeconomic status, ethnicity and age, but also to geography (country or region within a country). Where one lives is a major determinant of health. Although insufficient physical infrastructure is sometimes evident in some locations, the most important factor influencing the impact of place on health is the availability of competent healthcare practitioners (Strasser, 2003). Given that the supply of physicians, and other health practitioners is a modifiable factor, a significant effort is being put into increasing physician supply to so-called 'underserved' populations as a means to decrease health inequity. The

fact that such populations are predominantly defined by where they are located means that such supply issues are inextricably linked to place.

Although the role of place in health has been extensively studied, discussed and written about in journals such as *Health and Place*, the role played by professional medical education has not been given much attention. Historically, this is partly due to the Flexner Report of 1910 in which he advocated for changes he believed would result in doctors better prepared to address the health-care needs of society. This included requiring all medical schools in the US to incorporate a two year classroom based training in the sciences followed by a 'clerkship' taking place in a teaching hospital allied to the medical school. This occurred in response to medical schools of that time having variable quality and programs and was a largely successful attempt to standardise medical education (Flexner, 1910). A consequence, however, was that students had little experience of what medical practice was like outside of the university and the large urban hospital and, not surprisingly, had little interest in practicing in different settings. Moreover, standardization, although certainly increasing overall educational quality in teaching the core disciplines of medicine, has the effect of making training more homogenous in that it minimises the significance of local diversity and needs. Indeed, the Flexner Report followed the logic that standardizing high quality medical education would ensure high quality physicians, and that society would benefit. This logic continues to dominate how medical education is delivered on a worldwide scale. Moreover, while the connection between medical education and the improved health of society is implicitly made by Flexner; as has been pointed out frequently by advocates of socially accountable medical education, the connection between good education and good health outcomes is neither guaranteed, nor even likely in certain situations (Boelen, 2004). In essence, efforts to produce high quality physicians alone do not assure suitable or adequate health-care outcomes for all. Put simply, the assumption that good education of health professionals ultimately leads to good health of society is based on faulty logic (Boelen, 2004). Moreover, the unintended consequences of the Flexner Report may have been to isolate the institution of medical education from the living environment of patients (Boelen and Woollard, 2009). As a result, the Flexner Report led to the creation of standards, evaluation methods and measurement tools in support of producing clinically proficient physicians who did not understand the importance of practice context; in other words, they do not understand the health needs of communities. Critiquing Flexner, and in support of social accountability, Charles Boelen has said: "People's health

needs need to be taken as a starting, and not as an end point” (Boelen, 2002, p. 593). As such, although not explicitly stated, a purely Flexnerian organisation of medical education has a very narrow conception of place implicitly embedded in it - the large hospital in the urban centre - a focus which may well cause it to perpetuate health inequities. Indeed, the expectation of homogeneity of learning experiences via a ‘tick box’ of clinical interactions set in similar settings could be viewed as being inherently anti-place being unresponsive to the situated nature of living in specific places. Moreover, a noted consequence of the Flexner tradition of medical education is the challenge of accessing medical education, and for some more than others. Competitive access, potentially biased, science-based admission standards, high costs, and an elitist association with medical schools have traditionally worked to restrict the possibility of pursuing medical school to the most affluent in society (Dhalla et al., 2002). A significant problem frequently identified with this reality is that the population demographics most needing accessible, relevant health care are not reflected in the training of health-care providers (Boelen, 2002).

The Flexner model has been challenged in recent years, due to a growing trend to treat patients in small community clinics rather than in large hospitals (Habbick and Leeder, 1996; Hays, 2007). Much of the driver for this change is that the patient base which medical students need to access as part of their education has increasingly been located outside of large hospitals in varied community settings, a trend which has been driven by a variety of factors including a desire to reduce healthcare costs and to enhance patient well-being (Hays, 2007). The gradual exodus of medical training from the large tertiary care hospitals has a long history. Early pioneers recognised that clinical training that takes place exclusively within the teaching hospital setting is inadequate to prepare the trainees for future practice. As discussed above, this is of particular importance to those locations that lack sufficient and qualified practitioners. Such a move from hospital to community for at least some of the clinical training had been instituted by a number of schools including Western Reserve University in the 1950s (Ham et al., 1962), with more programs being added over the next 3 decades (Gelhorn and Scheuer, 1978). Widespread adoption, however, has been slow. One of the first regulatory bodies to mandate a move out of the hospitals was the General Medical Council in the UK which put forth this recommendation, along with many others, in its report *Tomorrows Doctors* (General Medical Council, 1993). This change towards learning in the context of future practice has subsequently been promoted by other governing authorities

including those in Canada and elsewhere (Health Canada, 2001; American Board of Internal Medicine Foundation et al., 2002; Frank et al., 1996; World Health Organisation, 1996). Whether these changes suggest any major shift in how medical students view their practice and its relation to place-based contexts, however, remains an open question.

Another movement in medical education is proving to be a major driver of change towards more place-contextualised programs: the movement for social accountability. The notion of social accountability means that the medical education program should directly aim to improve the health of the local community (Boelen and Heck, 1995; Boelen and Woollard, 2009; Global Health Education Consortium, 2010). It is formally described as “The obligation [of medical schools] to direct their education, research and service activities towards addressing the priority health concerns of the community, region, and or nation they have the mandate to serve. The priority health concerns are to be identified jointly by governments, healthcare organizations, health professionals, and the public” (Boelen and Heck, 1995, p. 3). The terms social accountability and social responsibility tend to be used interchangeably in the literature although they have been usefully defined and differentiated in the context of medical education by Boelen and Woollard (2011). Social accountability is at one end of a continuum of social action, with social responsibility being at the other, and social responsiveness being a half-way point (Boelen and Woollard, 2011). Specifically, social responsibility has been defined as social needs being described implicitly, institutional objectives being determined internally by faculty, programs being community-oriented but not necessarily based outside the school, medical graduates being good practitioners, and the program being evaluated in terms of processes with the ultimate assessors of success being internal. Social responsiveness goes further with social needs being explicitly described, curriculum being inspired by data and not just by the views of those inside the school, programs being community-based, and success being measured externally by means of achieved outcomes. Finally, social accountability anticipates societal needs, has programs which are not just community-located but fully contextualised, and is evaluated on actual impact on health and health care as determined by the broader community (Boelen and Woollard, 2011). The movement is fundamentally about change with both the graduates of the program” etc. and the programs themselves being seen as transformative agents for the betterment of health and healthcare for all members of a particular community (Shor, 1980; Woollard, 2006; Gibbs, 2011; Larkins et al., 2011; Murray et al., 2012). Social accountability, therefore,

has embedded at its core the concept of community situated in a particular place; social accountability aims to decrease health inequity within that locality. This place-based movement presents a major challenge to the traditional Flexner model of medical education.

The need and benefits for the inclusion of place in medical education

One common sense rationale for 'place-based' medical training is that the competencies required to practice and live successfully differs from place to place and region to region depending on cultural and community context and other environmental factors (Nelson, 2008). In such a scheme, medical education becomes more than learning the knowledge and skills of medical practice in general, a way to practice medicine anywhere, but a contextualised experience which explicitly prepares the student to appreciate the significance of place and to practice medicine somewhere in particular. As such, the recruitment and retention of physicians for a particular place is benefited by community-based training, especially when that training takes place in the future practice context. Specifically, the aim of such training is to create both a professional identity as a place-situated physician, such as a rural doctor, but also to create a specific cultural/geographic identity associated with where each program is located (Hanlon et al., 2010). In other words, such a program should aim to create a localised, place-specific professional identity. Such identity creation is key to having the students choose to practice in underserved areas and to retain them in that location. In contrast, as in rural isolated communities like Geraldton, mentioned above, post-training economic incentives, while having some success in recruiting physicians to underserved areas have not resulted in the longer-term commitment which is necessary for retention (Barer and Stoddart, 1999; Sempowski, 2004).

So what are the effects on medical education when training is moved from the hospital to the clinic? This has certainly been extensively studied from the point of view of developing a range of clinical skills. Training medical students in community settings has been suggested to have a number of pedagogical advantages over that located within the traditional teaching hospital. These include creating more appropriate knowledge, skills and attitudes relevant to the actual future practice context, deepening the understanding of health needs and services, creating a more patient-centred perspective, enhancing inter-professionalism (i.e. collaborative practice with other health professionals), broadening the range of learning opportunities available, spreading the

teaching load over a larger number of teachers, developing cultural competency, and gaining an increased recognition of the social causes of illness (Habbick and Leeder, 1996; Hays, 2007). Moreover, students taught in community settings report that they spend less time waiting for teachers and teaching opportunities, while at the same time being taught by a small faculty group whom they get to know well (Johnston and Booan, 2000). In the early years of training, students who engage in community experiences also become more confident in using their classroom gained clinical skills while developing greater empathy for their patients (Dornan et al., 2006). It is notable when reading such literature, however, the one aspect of the educational experience that is not considered is the actual community in which the placement takes place. While there is mention of patients in community, attitudes required to practice in that context (such as rural), and relationships with other professionals and hence the health care system in the community, these relate to professional activities and socialisation (Dornan et al., 2006). Such findings therefore concern themselves with one of the two aspects of identity identified as important for the development of a rural physician's professional identity. The other aspect, geographic identity (Hanlon et al., 2010), has been largely ignored along with the knowledge, skills, relationships and attitudes required to live successfully in place as physicians. Given that in under-served areas, as has been discussed, the very goal of social accountability in medical education is to enhance the health of the community predominantly through increasing the recruitment and retention to certain areas; this may be viewed as something of a deficiency (Strasser and Neusy, 2010). Indeed, if one considers the taxonomy of Boelen and Woolard (2011), medical education devoid of an understanding of place may well be socially responsible, or even socially responsive, but without being fully contextualised, can it ever be socially accountable? A lack of research on the subject does not mean that the contextualisation does not occur, but it does suggest it forms part of the 'hidden curriculum' (Eisner, 1985) and is largely ignored by medical educators.

That is not to say that the topic has not been considered at all, particularly with regard to rural medical practice and education. For example, in a report on the development of the Northern Medical Program, a rural medical program situated at the University of Northern British Columbia in Prince George, the efforts of the physicians involved were suggested to be drawn from a high level of place-based social capital present in the geographic area of the program (Hanlon et al., 2010). A strong sense of community had formed in two ways, firstly within the profession, but also with the wider

population and with the place itself. Such a physician group therefore provides a good example of the desired endpoint of the medical program itself; namely, physicians having a strong identity as rural practitioners situated within a particular place. The authors concluded, however, that this social network had formed under prolonged periods of adversity caused by a scarcity of healthcare resources, both funding and physical infrastructure, but chiefly a lack of healthcare workers (Hanlon et al., 2010). From an educational standpoint, it is unclear how, or even if, similar results can be achieved by other medical education programs. The example of the Northern Medical Program does, however, illustrate that professional identity building and socialisation in a generic manner is unlikely” etc. to be sufficient to enhance rural recruitment and retention; there must also be a place-related component.

The Northern Ontario School of Medicine as an example of emphasising place in medical education

Within Canada (the country where we work and live), the idea of social accountability has been proposed as a guiding principle for Canadian medical schools (Health Canada, 2001) and is viewed as a key progressive driving force by those leading the development of medical education (Association of Faculties of Medicine of Canada, 2010). Along with a small number of other medical schools situated outside of Canada (Training for Health Equity Network, 2014), the Northern Ontario School of Medicine (NOSM) is recognised as being at the leading edge of this movement (Strasser et al., 2009). Opening its doors in 2005, NOSM is Canada’s newest medical school in over 35 years, and it is the first medical school in Canada to be established with an explicit social accountability mandate (Strasser et al., 2009). It is the medical school of two universities, Laurentian and Lakehead, both located in the Northern region of the province of Ontario, in Sudbury and Thunder Bay respectively—over 1000 kilometres apart. Northern Ontario is a vast region covering approximately 800,000 square kilometers. It is mostly sparsely populated and comprises two larger centres with populations in the 100,000 range, small rural towns, and remote, isolated and ‘fly in’ small communities, many of which are inhabited by mainly Aboriginal Canadians. The health of Northern Ontarians is generally worse than people in the rest of the province and in Canada as a whole, having a decreased life expectancy, increased infant mortality, and higher prevalence of mortality and morbidity resulting from a variety of conditions and situations including diabetes, cardiovascular disease, addiction, mental illness suicide, and workplace accidents (Ministry of

Health and Long Term Care, 2011). Moreover, compared to the average for the region, the health of Aboriginal and Francophone persons are, on most measures, worse than the regional average (Canadian Institute for Health Information, 2006). It is such statistics along with a ‘grassroots’ political movement arising from within Northern Ontario that convinced the provincial government that a medical school was required that specifically addressed the healthcare needs of the disparate peoples of the region with an aim of improving their health (Strasser and Lanphear, 2008). Indeed, the mandate of social accountability forms the ideological core of NOSM and is written into the Letters Patent, which provides the legal basis for the establishment of the school (Strasser and Lanphear, 2008). Put simply NOSM, as stated in its visioning statement, is about ‘Education and Research for a Healthier North,’ with a mission of ‘increasing the number of physicians and health professionals with the leadership, knowledge and skills to practice in Northern Ontario’ (Northern Ontario School of Medicine, 2010). These statements clearly articulate that the school aims to develop and deliver medical education for a particular locale, Northern Ontario, and that, by implication, social accountability is closely, and perhaps inextricably, linked with responsiveness to place.

Once founded, NOSM’s purpose has been focused on achieving its deceptively simple aim of better health for a region. The nature of the region in which the school is located naturally led to a focus on rurality; indeed, the originally proposed name for the institution was the Northern Rural Medical School (NORMS Liaison Council, 2000). The strategies employed by the school (summarised in Table 1) therefore fell in line with rural medical education in general, these being (i) to select students who have grown up and/or lived in a rural community, (ii) ensure learners have a positive educational experiences in rural communities during their undergraduate medical education, and (iii) receive clinical training in rural communities during their post-graduate training as residents. These general aims are only meaningful when considered in the context of place, in this case rural places, but are likely generalizable to other types of communities. NOSM addresses all three factors in its various programs (Tesson et al., 2009), these being Undergraduate Medical Education (UME), the MD degree program, and Postgraduate Medical Education (the training of ‘residents’ in family medicine or one of many medical specialties and sub-specialties), Continuing Medical Education which includes professional development for existing physicians, and allied health professional training such as the Physician Assistant Program and the Dietetic Internship Program. As mentioned above, NOSM was founded with an explicit social accountability mandate

Table 1. Place-related aspects of the NOSM MD program.

Element	Description
Governance structures	The school is founded on an explicit social-accountability mandate, which dictates that the goal of the school is to enhance health for all the peoples of northern Ontario. The governance structures implement this mandate by including community representatives within its administrative and academic governance structures.
Community engagement	Regular community visits along with formalized processes for community feedback are key accountability mechanisms
Admissions	A demographic scoring system selects students who were raised and have family in the region or in rural locations elsewhere in Canada. This results in enrolment of students having existing desired place-identities.
Orientation	At intake learners take part in a week long orientation during which they visit many of the communities which the school serves to demonstrate experientially the school's mission
Case Based Learning (CBL)	Place-contextualised case-based small group session concerning professionalism, population and social health, and northern and rural health occurring in years 1 and 2. The first CBL of each teaching module in year 2 involves a community exploration using statistical data available online.
Topic oriented session (TOS)	Place-contextualised problem-based small group session which examines a medical problem in a realistic community setting primarily aimed at learning about the medical sciences occurring in years 1 and 2.
Community and Interprofessional Learning (CIL)	A weekly afternoon community placement occurring during the first two years of the program taking place in both physician offices and in other settings related to healthcare. The aim is to allow students to the experience the continuum of the health care system.
Integrated community experience (ICE)	Month long placements occurring in years 1 and 2 during which students live and learn in Aboriginal or small rural communities. The regular academic curriculum, organised around body systems, continues uninterrupted but is supplemented by cultural and clinical learning blocks as well as the learners own explorations as temporary members of each community.
Comprehensive community clerkship (CCC)	A nine-month long placement taking place during year 3 in a small town setting during which students are assigned to a family medicine practice. In this context they learn about both primary care and the specialities. This is in contrast to the 'rotations' in teaching hospitals which comprise year 3 of most other medical programs.
Service learning	Predominantly student-initiated projects involving working with community agencies involved in providing services related to health. The student learns both about the community body but also how to go about forming and working in partnerships for the purposes of community betterment. Students are asked to reflect on the project and present a progress report to faculty advisors and to the community agency.
Northern and rural health assignment	In the first two years students write essays on various medical topic and competencies using a lens of healthcare as it occur in northern Ontario with the aim of developing place-contextualized medical knowledge complementing that obtained while engaged in placements.

to serve the peoples of Northern Ontario. The importance and uniqueness of such an institutional underpinning cannot be over-emphasised, since such a mission mandated that medical education must be about meeting the needs of a particular place in terms of health. Furthermore, its mission contained within it an implicit democratization of the institution to include those outside of NOSM in decision making, to turn the institution's focus outward rather than inward, and ultimately to transfer power from the established professional power structures to those in the wider community. In our opinion, this neither happened by decanal decree nor by a few senate motions, but was instead deliberately embedded within the school's entire governance and decision-making structures.

Like most university-level educational institutions, NOSM employs a 'bicameral' governance structure with academic and administrative arms led by the university senates and the NOSM board of directors respectively. Both the faculty council of NOSM and its board seeks to represent and embody the views of the ethnic, cultural, linguistic and geographic diversity of the region. For example, NOSM has a requirement to have both Aboriginal and Francophone academics amongst its members and to represent the wide breadth of constituencies which make up Northern Ontario. Additionally, the Board, via the Dean, convenes a regular series of formal meetings with citizen-staffed groups including the Aboriginal and Francophone reference groups which are populated by members of these minority communities who hold leadership positions. As such, the desires of the community are both articulated in the mission and given voice within the governance of NOSM, thereby ensuring that resources are allocated in an appropriate manner and programs focus on community need rather than that of those within NOSM's boardrooms and classrooms.

From these place-responsive foundations the operational aspects of the school were articulated in a manner consistent with the school's mission. The student selection process utilises the 'Multiple Mini Interview', argued to be a more equitable means to assess incoming students from a variety of cultural and socio-economic backgrounds (Moreau et al., 2006), uses interviewers and reviewers drawn from within the communities served while demographic weighting heavily favours learners who have grown up in Northern Ontario and whose immediate family also lives close by (Northern Ontario School of Medicine, 2013). These attributes are thought to enhance the prospects of graduates staying to practice medicine in the served area. Those accepting offers of admission then take part in an orientation week that occurs in small communities throughout the region as

well as the main campuses in Thunder Bay in Sudbury. This is done to demonstrate experientially that the mission of the school lies in places outside the classroom, but also to solidify partnerships with the communities that are essential to delivering the teaching model, with both admissions and orientation being part of a continuous process of community engagement. Indeed, without such engagement the goal of the school to have learners move through a holistic progression of place-contextualised educational experiences would not be possible.

Traditionally the first two years of undergraduate medical education are spent in classroom learning and this is partially true of NOSM. However, even when in the classroom the use of problem- and case-based learning allows the use of 'paper' scenarios set in Northern communities with characters typical of those to be found therein. In addition, various parts of the pro-grams are spent in community settings around the region. The first of these, Community and Inter-professional Learning (CIL), begins in the first few weeks of year 1. Occurring one afternoon per week, students learn in a variety of healthcare-related settings in the community organised around themes such as mental health or children's health. This includes visits to physicians' offices, social and health-related community-based agencies, and political and advocacy groups. Through CIL, students become familiar with the healthcare system in the region, understand what happens to patients when they leave the doctor's office, and are encouraged to reflect on how the various competencies required by a physician are utilised to work with members of the wider community to provide optimal patient care. Furthermore, students have the opportunity from the beginning of their medical education to build the relationships and support networks essential to working effectively and sustainably in the wider regional healthcare system (Hanlon et al., 2011).

Also within the first two years of the MD program all NOSM learners take part in three off-campus community placements, which last four weeks each. The number of communities taking part in these placements numbers over 90 and the school commits significant resources to building the partnerships required to successfully implement such a highly distributed program. The first of the three placements takes place at the end of first year and is located in an Aboriginal community. The communities are located across the region and range from those within towns and cities to extremely remote 'fly in' communities. The primary objective of the placement is one of a cultural familiarisation and dialogue that aims to teach, extend and reinforce knowledge about the history, geography, culture, beliefs and underlying epistemology of the community. This is accomplished by inviting the

community to schedule cultural events and interactions for students, rather than arranging them from within the institution. In this way each community determines what it is learners need to learn and necessarily results in rather different experiences for each learner. From a medical education perspective, the placement gives learners an appreciation of what life is like for those who live in these places with a view to understanding the factors which determine community health, as well as to develop the skills required to be effective providers of healthcare in such contexts and, it is hoped, the desire to practice in such places. In addition, students can also gain knowledge of traditional medical practices about which they may have limited or no experience of, and that are largely absent from within medical education curricula—but which may be important practices in the lives of many of their future patients. In the second year of the MD program, there are two off-campus placements that take place in small communities situated outside the main centres of Thunder Bay and Sudbury. These placements are mainly concerned with providing students with clinical experiences that help learners discern the nature of small town and rural medical practice under the tutelage of teachers who embody the mission of the school. It is hoped that these early clinical experiences in a small town settings will assist in the development of the cognitive, conative and affective attributes necessary for medical students to later return to alleviate the physician shortage in these underserved communities. It is not by accident that the first taste of actual clinical work that learners have is in the type of community that it is desired that they subsequently work in; this is part of the process of identity formation. Indeed, medical students are not located in large tertiary-care teaching hospitals until the final stage of their education, the fourth year, with the intent that the students see rural practice as normal and large hospital practice as the alternative. This is the opposite of what the traditional Flexnerian model dictates. The second year placements are built upon in the program's third year during which learners are placed in a family physicians' office located in a smaller rural town. Such a placement is not unique to NOSM, having been pioneered by Flinders University in Australia (Worley et al., 2006), although at NOSM it is not an optional stream for interested students, but rather a compulsory component of the course. The nine month longitudinal experience, termed the comprehensive community clerkship (CCC), is a means to teach students how to be effective physicians in a rural context. This offers advantages over traditional rotations. The CCC, while set in a primary care setting, is actually a means to learn about the medical specialities such as psychiatry and obstetrics as per the traditional discipline-focussed

rotations, but which offers benefits to learners such as getting to know their teachers well, meeting patients multiple times as time progresses, establishing a continuity of care, and seeing themselves as part of 'the team'—the latter also being an important part of identity formation. In short, NOSM provides an example of medical education that infuses place-consciousness and social accountability into its foundational structures and processes.

Place-based education as a wider educational movement

What is occurring in medical education can be viewed as part of a wider educational movement concerning place. Experiences with place in the broader field of education (Gruenewald, 2003a, 2003b) may well be applicable to medical education and helpful as the medical schools struggle to change a century old tradition of "placelessness" (Relph, 1976) in their educational practices using what is, for them, a new ideological framework involving unfamiliar teaching methods. For example, medicine is not the only profession that seeks to prepare its practitioners for work in rural isolated communities. Teacher education, specifically, indigenous teacher education, may provide a helpful model, as this field has for decades attempted to describe and practice pedagogies that would prepare culturally-responsive teachers ready to work with Indigenous learners and communities. The Guidelines for Preparing Culturally Responsive Teachers for Alaska's Schools is one resource guide that has influenced not only the literature of place-based education, but that has also been adopted by the State of Alaska (and other states) as part of the accountability framework for all of its teachers (Barnhardt, 2008). These comprehensive guidelines include standards for philosophy, learning theory, diversity, content, instruction and assessment, learning environments, family and community involvement, and professional growth. To provide a relevant example, teachers need to demonstrate that they can 'engage in extended experiences that involve the development of observation and listening skills associated with the traditional learning ways of native people' and 'understand the significance of the role of cultural identity in providing a strong foundation for all social, emotional, intellectual and spiritual development and demonstrate the ability to build on that understanding in their teaching' among a long list of outcomes associated with culturally responsive teaching (Alaska Native Knowledge Network, 2014). The power of such guidelines is that they legitimize immersive experiences in culture and place as an essential component of

professional training. While such place-conscious teacher education models could benefit the further development of place-conscious medical training, the emergence of social accountability models in medical education potentially offers a powerful challenge to all fields of professional training to become more place-based. In the remainder of this section we will explore aspects of place-conscious theory and practice from a broader literature and consider its relevance to medical education for somewhere.

One's relationship with place has been termed a 'sense of place' (Jorgensen and Stedman, 2001), comprising an important part of personal identity and having cognitive, affective and conative components (Canter, 1991). Anthropologists Feld and Basso (1996) prefer the plural "senses" of place to signify the diversity of the person-place relationship, and Basso (1996) proposes the transitive construction of "sensing" places, emphasizing that developing sense(s) of place is an active and changing process. Sense of place has been described in a variety of ways including rootedness, attachment, topophilia, insideness and place identity (Altman and Low, 1992; Proshansky et al., 1983; Relph, 1976; Rowles, 1983; Tuan, 1974, 1977, 1980; Twigger-Ross and Uzzell, 1996). Some degree of relatedness between ways of describing relationships to place is likely although, in the opinion of some authors, this is rather poorly understood (Kaltenborn, 1998). Quantitative studies using instruments designed to measure different aspects of a sense of place suggest the usefulness of delineating place relationships into subcategories as an aid to analysis (Jorgensen and Stedman, 2001, 2006). One such schema separates the sense of place into three components: identity, attachment and dependence (Bonnes and Secchiaroli, 1995; Jorgensen and Stedman, 2006), key themes in NOSM's goal of enhancing recruitment and retention. Place identity is symbolic (Harmon et al., 2005) and involves "personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals and behavioural tendencies and skill relevant to this environment" (Proshansky, 1978, p. 155). Place attachment, on the other hand, is an affective relationship which describes the positive bond between the person and place which can go beyond cognition and preference (Kyle et al., 2003; Riley, 1992). This can involve functional and emotional attachment to a particular place (Williams and Vaske, 2003), and can involve more than the environmental habitat, but also socio-cultural factors involving the history, culture and language of a place (Stokowski, 2002). Finally, place dependence (Stokols and Shumaker, 1981) has been defined as "the opportunities a setting provides for goal and activity

needs" (Harmon et al., 2005, p. 149), the strength of dependence being assessed by comparison to other places. Put another way, place dependence concerns "the importance of a place in providing features and conditions that support specific goals or desired activities" (Williams and Vaske, 2003, p. 831).

Applied to medical education, we would argue that the ideal sense of place outcome from involvement in a socially accountable medical education program is a physician situated in a particular place (place identity), who possesses a strong emotional bond to that locale (place attachment), and who views that location as the best place to obtain medical training and in which to base a future practice of medicine (place dependence). In terms of identity, such place-based descriptions subsume both the geographic and cultural, two of the many forms of identity (Fearon, 1999), with the overall place sense incorporating both personal and professional aspects. Such an outcome may form a useful basis for analysing students' experiences of discrete curriculum elements to determine the impact of the activity on achieving this particular sense of place. While it is presently unclear as to what the essential features of a place-based medical education should be, it seems likely that it would be advantageous for a program to be deliberate in including appropriate place experiences. This may involve more than simply providing medical training in a particular community setting, or teaching place-situated living skills, but rather requires a place-focused conceptual framework for education.

In two widely cited theoretical articles on place-based education, Gruenewald (2003a, 2003b) proposes an educational framework called a 'critical pedagogy of place' and outlines 'dimensions of a place-conscious education'. Gruenewald's (2003a) critical pedagogy of place has two major goals: re-inhabitation and decolonization. Briefly, re-inhabitation means learning to live well with others in a particular place, and decolonization means healing from or 'undoing' social injustice and ecological harm. It is easy to map these broad educational aims onto a medical education model for social accountability, which likewise aims to redress (i.e., decolonize) historical inequities in health and health care. Gruenewald (2003b) also argues that there are several distinct dimensions of place, which constitute the foundations of a place-conscious education: the perceptual, the sociological, the political, the ideological, and the ecological. Unlike much of the 'sense of place' literature, these dimensions of place explicitly seek to name how sociological or political experience, such as privilege or marginalization, impact one's relationship to place and its inhabitants. Again, this seems especially relevant to a medical education program that seeks to recruit and

retain what is considered a privileged class of professionals (i.e., physicians), to work with an economically, culturally, and environmentally challenged rural populations in rural, isolated, largely Aboriginal, communities.

In the general education context, both in schools and universities, place-based, place-conscious, and place-responsive education have in the last two decades become a vibrant, if marginalized, movement in education reform (Barnhardt, 2005; Greenwood, 2013; Gruenewald and Smith, 2008; Smith and Sobel, 2010). As at NOSM, one of the challenges facing place-based educators generally is the challenge of aligning the goals of place-consciousness with the entrenched accountability systems that govern particular disciplines and are focused on specific achievement outcomes within these disciplines. Re-inhabitation and decolonization, for example, may be noble educational goals, but these are difficult to assess in accountability systems not designed to measure them. Gruenewald (2005) argued that if place-based education is to become a more significant part of the general educational curriculum, new accountability structures will be needed that embrace place-consciousness and what it can achieve as key educational outcomes. In this regard, the social accountability model current in medical education may help to problematize accountability systems in education that do not currently factor community well-being into their practices. This is particularly relevant to medical education which is highly regulated and governed through the requirement to adhere to a long list of accreditation standards (Liaison Committee on Medical Education, 2013). These standards do not currently incorporate ideas of social accountability and place into them and can actually be viewed as working against such objectives. The need for students to have similar experiences across different placement sites, for example, articulates the philosophy of placeless educational homogeneity that is at odds with social accountability. The Liaison Committee for Medical Education (the North American medical education accreditation body) Standard ED-8 states “The curriculum of a medical education program must include comparable educational experiences and equivalent methods of assessment across all instructional sites within a given discipline” (Liaison Committee on Medical Education, 2013). Although such requirements can be seen to be met by agreeing on the same educational outcomes that the placement desires to achieve (Liaison Committee on Medical Education, 2013), the aim of the standard appears to be to ‘work around’ place differences that have been imposed on a Flexnerian model of education, rather than to embrace them as a necessary part of socially accountable medical

training. Indeed, if fully place-contextualised socially accountable medical training is to be attained, the ideological underpinnings expressed in such language need to be radically altered. Such thinking can also be applied to the national licensing exams for Canadian physicians, which does not currently assess the role of place in medicine at all, thereby creating a degree of tension with the governing authorities and the frequent questioning, particularly by students, of whether topics like northern health or rural health are really of importance.

Thankfully, the tide is changing as we described in the opening sections, with the Canadian Faculties of Medical Education determining that aligning medical education to community needs is, as the report is called, ‘the future of medical education in Canada’ giving hope that the accreditation standard and licensing exams will eventually support rather than be indifferent to, or even hinder, what the NOSM and similar medical schools are trying to achieve (Association of Faculties of Medicine of Canada, 2010). In general, therefore, the social accountability movement in medicine is at the vanguard of rethinking the purpose and outcome of professional education in a way that is responsive to place.

Issue and implications for place-conscious medical education

As anthropologist Clifford Geertz (1996) commented, ‘No one lives in the world in general’ (p. 259). One could argue that place-consciousness is unimportant in medical education (and other professions) since one never knows where one will wind up practicing. Yet the point of experientially rich and sustained experiences with place is not only for students to learn about and connect with a particular place, but also to learn about the importance of place-connection for themselves, and their future patients, wherever their future practice leads. That is, place-based education does not equate with a limited applicability of learning and lesser ability to practice if the graduate decides to practice elsewhere. Instead place-based education includes within it the attainment of transferable knowledge of how place affects what we do and how we do it, including the practice of medicine (Smith and Sobel, 2004). In other words, place-based medical education contains within it a skill: that of being able to discern the role of place and to adapt to different contexts. In this sense, education for *somewhere* is also education for *anywhere*, and we argue that the converse of this, because of its inherent placelessness, cannot be true. To be clear, we propose that embracing place in medical education is not only better for the communities

in which the learners will practice due to it assisting with recruitment and retention, but that this philosophy of medical education results in better trained graduates who will be more effective doctors in *any* context because of their awareness of the role place plays in medicine. The fact that NOSM graduates are highly sought after by post-graduate residency programs (for example see Northern Ontario School of Medicine, 2012) suggests that those outside of the school may share this viewpoint.

Place-conscious medical curricula

To conclude, we briefly discuss a curriculum framework for place-conscious medical education that is responsive to the needs of place and community. The place-based education and related educational literature describes many curricular practices that would be appropriate for such a program, including placements, service learning, and so forth. However, building place into medical education requires a holistic approach that integrates place and community into the curriculum. Medical education curricula are traditionally informed by a variety of sources including accreditation standards, learning objectives defined by licensing bodies, and the interests of the medical school's leadership and teaching faculty. Social accountability adds another facet to the curriculum; in this model the needs of the communities served by the medical school become central to the curricular goals and are informed by the public, governments, health care organisations and health care professionals (Boelen, 2002). As we have argued, bringing place into a system of medical education, which has been largely placeless in nature, can be achieved by embracing social accountability. What the curricula should contain in terms of outcomes, objectives, activities and accountability structures is much less clear. We will therefore offer some general comments, guidance towards establishing place-based medical curricula, and finally give some suggestions as to the activities that could be engaged in.

In general, designers of place-based medical curricula must investigate how particular places or types of places intersect with both the practice of medicine and the lives of medical practitioners. This should be done with the aim of developing the professional and place identities described by Hanlon et al. (2010), as well as place-attachment and dependence. The learning of place-specific clinical skills (as opposed to the generic placeless medicine currently favoured) is of great importance given that it is recognized that the required competencies of, for example, a rural doctor are not the same as those practicing in other contexts. For example, generalism and interprofessionalism are thought to be of much

greater importance for small town practice that they are for those working in large urban centres (Strasser, 2003). Such place-specific skills are indeed key to successful and sustained rural practice described by Hancock et al. (2009). However as we have described above, and authors such as Hancock et al. (2009) emphasize, familiarity with place and community is also key. Specifically, many studies have shown that recruitment and retention into rural communities is highly dependent on the physician interacting successfully with the wider community, with factors such as appreciation for the service provided and support by the community, connection to place and a sense of belonging, physical and recreational assets, social networks, and overall familiarity with a place, being of importance (Cameron et al., 2012; Cutchin, 1997, 2000; Wade et al., 2007). Similarly, a decision to leave a rural practice was found to be heavily influenced by community satisfaction as well as the amount of personal time available and the ability to meet professional goals (Pathman et al., 1998). In their developmental model of how physicians choose a practice location, Hancock and colleagues view familiarity with rural settings, followed by place integration both professionally and personally, and community participation, as key elements in whether or not a rural community is chosen (Hancock et al., 2009). However, since we know that recruitment and retention of doctors is dependent upon both the quality of their personal life and their community ties, as well as their medical practice, learning to live in place is as important as the gaining of the required clinical competencies.

What can be said with some certainty is that a medical learner who is confined to the inside of a particular office, clinic or hospital, is experiencing only a very limited and small part of that community, at most a subset of the healthcare professional community, and will gain little exposure to the wider place. The form of place-consciousness which results from such a program of education may therefore bear little resemblance to the desired outcome of a learner who is committed to a particular locale and who has the necessary skills, knowledge and attitudes to work *and* live effectively in that community, or in a community having similar attributes. As such, more is required in a medical curriculum than clinical training for a student to become successfully situated in a particular place as a physician; the learner must become a competent citizen as well as a competent physician. The latter may not be immediately obvious to medical educators given that one might suppose that learning to live in a place is something with which all learners already have experience. Indeed, at NOSM we give priority at the time of admission to students who live and were raised locally and it is often heard from them

that they already know about the placement communities and that only clinical experiences are important to them (B. Ross, unpublished observations). Our relationships to places necessarily change, however, as our role in such a place changes, whether this be our transition from childhood to adulthood or from non-physician to physician, a process that has been well described (Canter, 1991). Specifically the medical learner needs to learn how to change their behaviour to suit their new role if they are to live contentedly in a particular context. This is particularly true of small town practice in which a physician's patients are also their friends and neighbours. In this regard learners should also be exposed to situations in which they can learn about how physicians interact with non-physicians outside of medical practice, and the expectations of professional behaviour when participating in wider community life. The skepticism over the significance of wider community learning that is expressed by some medical learners is predicable considering that most of their previous educational experiences in schools and universities are largely decontextualized and placeless in both structure and process (Gruenewald, 2003a). Such skepticism or resistance also emphasizes the need to explicitly include, in both curriculum and assessment tools, learning objectives that address the non-clinical aspects of physician life rather than relegating such learning to the 'hidden curriculum' (Stern and Papadakis, 2006).

So how can this be accomplished? We suggest that the aims of the medical curriculum, and the curriculum itself need to be conceptualized in a way that recognizes the inseparability of a twin role for physicians in remote areas: the role of place-conscious clinician and place-conscious citizen (Figure 1). We further suggest that both roles can be constructively explored by drawing on existing frameworks for place-conscious education, such as Gruenewald's critical pedagogy of place, which emphasizes perceptual, sociological, ideological, political, and ecological dimensions of place (2003a, 2003b). In terms of clinical roles, considering the influential CanMEDS (Frank et al., 1996) competencies (these being organized under the categories of medical scholar, advocate, communicator, manager, and collaborator), one could add such objectives as 'describe how the sociology of a place influences being an effective communicator', 'apply knowledge of the history of a place to establish effective collaboration with other health providers', or 'use knowledge of the local physical environment to develop practices which reduced morbidity and mortality'. The use of such a framework, while resulting in place-specific knowledge being gained, can itself also be seen as skill in itself, giving students the learning scaffolds needed to explore the relationship

between place(s) and medicine. Within clinical training, such objectives can be met using both contextualized problem-based learning in the classroom (cases set somewhere in particular with realistic descriptions of the healthcare system therein), and by experiential learning using a variety of placements taking place away from the main campus of the institution. The nature of curricula in each school will of course differ depending on the nature of the places within which they are located. We would argue that these details should be predominantly informed by the local knowledge already existing within clinical communities. This is unlikely to have been collated prior to the development of the program and so a sustained process of engagement must take place with local communities in order to make decisions about what the curriculum should contain. It should be noted that the appropriate community to be engaged regarding clinical education, while obviously including physicians and other health practitioners, should also, in our view, not be confined to 'experts' but also include those with local 'expertise' such as the users of the system (e.g. patients and caregivers) and also its governors and funders. Engagement is also vital for establishing the community-based learning sites which form the basis of place-based medical education with outreach to hospitals, clinics, offices as well as the allied health professions and social support agencies which form other vital parts of the healthcare system. Indeed, explicitly asking students to explore the links between the various system components to provide care (such as the CIL sessions which form part of the pre-clerkship years at NOSM) is of great use in allowing students to become familiar with the strengths and idiosyncrasies of the place-specific healthcare system they will enter.

The other strand of the curriculum, the education of place-conscious citizens capable of forming bonds with a place, also involves engagement with diverse communities, not just professional medical educators. This approach to teaching and learning differs from the traditional model of medical education which relies on professional bodies and institutional faculty and staff to determine curricular goals and outcomes, perhaps with a nod to student opinions. As such, a community engagement strategy necessarily requires a transfer of a degree of authority out of the institution, a process which may be resisted by existing power structures, and which makes the establishment of over-riding programs goals, such as social accountability (which inform institutional governance and operations) of such importance.

Although one may assume that such programmatic goals can only be met in community settings, familiarity with these places and communities can begin within the classroom in terms of providing the opportunity for

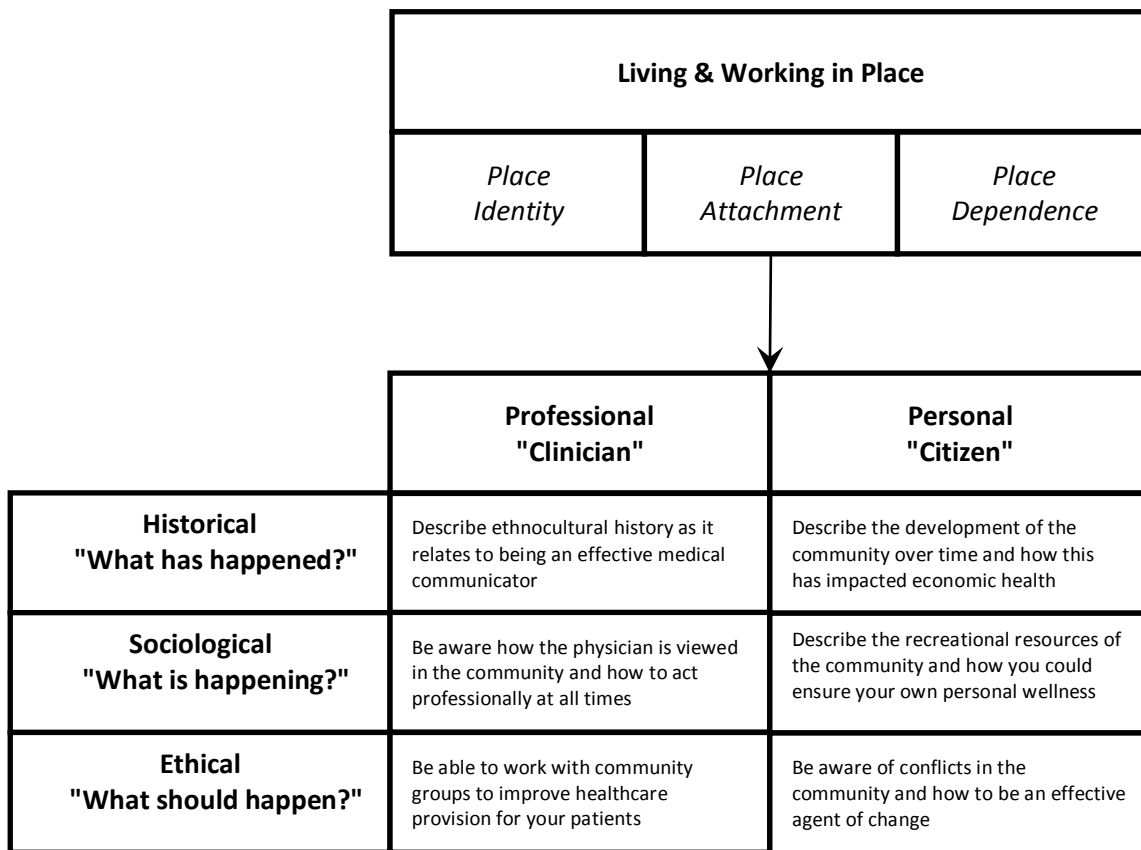


Figure 1. Curriculum framework for place-based medical education showing the combination of place-based critical pedagogy and the conceptualization of the physician as a clinician and citizen to generate curriculum objectives. An example is given for each of the resultant six curricular domains.

community explorations using online sources, as well as extra-curricular activities such as meeting and learning from community leaders, for example Aboriginal Elders, and participating in cultural experiences on campus such as sweat lodges.

Community-based educational experiences, conducted under the supervision and guidance of a community-based member of the medical school's teaching faculty, may be as simple as a requirement to attend various social or cultural events in the community, or more structured activities involving facilitated relationships with community partners, as well as time and space for individual and collective inquiry, reflection, and meaning-making. Again, a 'critical pedagogy of place' (Gruenewald, 2003a) may be effectively used to design curricula that examines how culture, environment, politics and economics impact how people live in any particular community. These curriculum concepts may be woven into a variety of activities used in place-based education

(Gruenewald, 2003b; Smith, 2002), such as service learning, various inquiry, advocacy, and outreach activities such as action research, youth mentorship, or partnering with or shadowing members of the placement community. Although such experiences can have a narrow medical focus, such as investigating and attempting to modify the various determinants of health in the community, wider engagement activities such as sports coaching are also appropriate. Indeed, such approaches can be used to promote the wider health of places, in terms of environmental health for example, over and above that which can be achieved through effective clinical practice. Medical learners can be encouraged by these curricular concepts to discover the complexities of the interactions between people and places, which at least partially determine the health of the individual, the human community, and the place itself. Importantly, the establishment of friendships between learners, or between learners and existing physicians, should also be

a valued component of the program in terms of building support networks and the 'social capital' described by Harmon et al. (2005), thereby requiring schools to consider the need to allow time for social interactions to actually take place. The clear articulation of the 'citizen' role of the program is vital and should not be aimed only at learners, but also the community clinical teachers who may otherwise choose to schedule all available time for clinical teaching believing that this is their only role as mentors (Dyrbye et al., 2009). This may be achieved by means of faculty development, the co-development (between teacher and student) of learning contracts which clearly define the expectations of the program as a whole and placements in particular, and classroom-based sessions occurring pre-placement. Such activities as these and those modeled at NOSM aim to inform students about community life and expected norms and behaviours for those who live and work there. Through clearly articulated requirements, students can be encouraged to participate in various community-situated activities during placement experiences, and the medical curriculum can, with appropriate community-based facilitators, help to debrief these place-based experiences to inform the education of both clinicians and citizens.

In summary, we have argued that to be truly responsive to communities, medical education must be rooted in place. By embracing place-based educational philosophies and practices, healthcare for somewhere can be achieved and with it, we earnestly hope improved health for those who inhabit that place and for the places themselves.

Conflict of Interests

The authors have not declared any conflict of interests.

REFERENCES

- Altman I, Low S (1992). Place attachment. New York, NY: Plenum Press. <http://dx.doi.org/10.1007/978-1-4684-8753-4>
- Alaska Native Knowledge Network. (2014). Alaska Standards for Culturally-Responsive Schools Anchorage, AK: Alaska Native Knowledge Network)
- American Board of Internal Medicine Foundation, American College of Physicians Foundation, & European Federation of Internal Medicine. (2002). Medical Professionalism in the New Millennium. A Physician Charter. *Ann. Int. Med.* 136:243–246. <http://dx.doi.org/10.7326/0003-4819-136-3-200202050-00012>
- Association of Faculties of Medicine of Canada. (2010). The future of medical education in Canada. Ottawa: AFMC.
- Barer ML, Stoddart GL (1999). Improving access to needed medical services in rural and remote Canadian communities. British Columbia, Canada: Centre for Health Services and Policy Research, University of British Columbia.
- Barnhardt R (2008). Indigenous knowledge systems and Alaska native ways of knowing. *Anthropol. Educ. Q.* 36:8-23. <http://dx.doi.org/10.1525/aeq.2005.36.1.008>
- Basso K (1996). *Wisdom sits in places*. Albuquerque: University of New Mexico Press.
- Boelen C, Heck J (1995). Defining and measuring the social accountability of medical schools. Geneva: World Health Organization.
- Boelen C (2002). A new paradigm for medical schools a century after Flexner's report. *Bull. World Health Organ.* 80(7):592–593.
- Boelen C. (2004). Building a socially accountable health professions school: towards unity for health. *Educ Health* 17(2): 223–231. <http://dx.doi.org/10.1080/13576280410001711049>
- Boelen C, Woollard B (2009). Social accountability and accreditation: a new frontier for educational institutions. *Med Educ* 43:887-894. <http://dx.doi.org/10.1111/j.1365-2923.2009.03413.x>
- Boelen C, Woollard B (2011). Social accountability: The extra leap to excellence for educational institutions. *Med. Teach.* 33:614-619. <http://dx.doi.org/10.3109/0142159X.2011.590248>
- Bonnes M, Secchiaroli G (1995). *Environmental Psychology: a psychosocial introduction*. London, UK: Sage.
- Cameron PJ, Este DC, Worthington CA (2012). Professional, personal and community: 3 domains of physician retention in rural communities. *Can. J. Rural Med.* 17(2):47-55.
- Health Canada (2001). *Social Accountability: A Vision for Canadian Medical Schools*. Ottawa, Canada: Health Canada.
- Canadian Institute for Health Information (2006). *How healthy are rural Canadians? An assessment of their health status and health determinants*. Ottawa, Canada: Canadian Institute for Health Information.
- Canter D (1991). Understanding, assessing, and acting in places: is an integrative framework possible. In Garling T, Evans G (eds.) *Environment, cognition, and action*. Oxford: Oxford University Press.
- Canadian Broadcasting Corporation (2005). *Small town losing 6 of 7 doctors*. Retrieved from <http://www.cbc.ca/news/canada/small-ontario-town-losing-6-of-7-doctors-1.526796> (accessed on October 22nd, 2014)
- Cutchin MP (1997). Community and self: concepts for rural physician integration and retention. *Soc. Sci. Med.* 44, 1661-1674. [http://dx.doi.org/10.1016/S0277-9536\(96\)00275-4](http://dx.doi.org/10.1016/S0277-9536(96)00275-4)
- Cutchin MP (2000). Retention of rural physicians: place integration and the triumph of habit. *Occup. Therap. J. Res.* 20 (Suppl 1): 106S-111S.
- Dhalla IA, Kwong JC, Streiner DL, Baddour RE, Waddell AE, Johnson IL (2002). Characteristics of first year students in Canadian medical schools. *Can. Med. Assoc. J.* 166: 1029-1035.
- Dornan T, Littlewood S, Margolis SA, Scherpbier A, Spencer J, Ypinazar V (2006). How can experience in clinical and community settings contribute to early medical education? A BEME systematic review. *Med. Educ.* 28:3-18.
- Dyrbye LN, Thomas MR, Harper W, Massie F, Power DV, Eacker A, Szydlo DW, Novotny PJ, Sloan JA, Shanafelt TD (2009). The learning environment and medical student burnout: a multicentre study. *Med. Educ.* 43(3):274-282. <http://dx.doi.org/10.1111/j.1365-2923.2008.03282.x>
- Eisner EW (1985). *The Educational Imagination*. New York: Macmillan.
- Fearon JD (1999). *What is identity (as we now use the word)?* Stanford, CA: Stanford University.
- Flexner A (1910). *Medical Education in the United States and Canada*. New York, NY, USA: Carnegie Foundation for Higher Education.
- Frank JR, Jabbour M, Tugwell P (1996). Skills for the new millennium: report of the societal needs working group, CanMEDS 2000 Project. *Ann. R. Coll. Phys. Surg. Can.*, 29:206-216.
- Feld S, Basso K (1996). *Senses of place*. Santa Fe, NM: School of American Research Press.
- Geertz C (1996). Afterward. In Feld S, Basso K (Eds.), *Senses of place* (pp. 259-262). Santa Fe, NM: School of American Research Press.
- Gelhorn A, Scheuer R. (1978). The experiment in medical education at the city college of New York. *J. Med. Educ.* 53: 574-582.

- General Medical Council (1993). *Tomorrow's Doctors*. London: General Medical Council.
- Gibbs T (2011). Sexy words but impotent curricula: Can social accountability be the change agent of the future? *Med. Teach.* 33: 605–607. <http://dx.doi.org/10.3109/0142159X.2011.590251>
- Global Forum for Health Research (1999). *The 10/90 report on health research*. Geneva: Global Forum for Health Research.
- Global Health Education Consortium (2010). *Global consensus for accountability for social accountability of medical schools*. South Africa: GCSA.
- Greenwood D (2013). A critical theory of place-conscious education. In Stevenson R, Brody M, Dillon J, Wals, AJ (Eds.), *International handbook of research on environmental education* (pp. 93-100). AERA/Routledge.
- Gruenewald DA (2003a). The best of both worlds: a critical pedagogy of place. *Educ. Res.* 32:3-12. <http://dx.doi.org/10.3102/0013189X032004003>
- Gruenewald DA (2003b). Foundations of place: a multidisciplinary framework for place conscious education. *Am. Educ. Res. J.* 40: 619-654. <http://dx.doi.org/10.3102/00028312040003619>
- Gruenewald DA (2005). Accountability and collaboration: Institutional barriers and strategic pathways for place-based education. *Eth. Place Environ.* 8: 261-283. <http://dx.doi.org/10.1080/13668790500348208>
- Gruenewald DA, Smith GA (2008). *Place-based education in the global age: Local diversity*. New York: Routledge.
- Habbick BF, Leeder SR (1996). Orienting medical education to community need: a review. *Med. Educ.*, 30:163–167. <http://dx.doi.org/10.1111/j.1365-2923.1996.tb00738.x>
- Ham TH (1962). Medical education at Western Reserve University: a progress report for the sixteen years, 1946-1962. *N. Engl. J. Med.*, 267: 868-874. <http://dx.doi.org/10.1056/NEJM196210252671707>
- Hancock C, Steinbach A, Nesbitt TS, Adler SR, Auerswald CL (2009). Why doctors choose small towns: a developmental model of rural physician recruitment and retention. *Soc. Sci. Med.* 69:1368-1376. <http://dx.doi.org/10.1016/j.socscimed.2009.08.002>
- Hanlon N, Halseth G, Snadden D (2010). "We can see a future here": place attachment, professional identity, and forms of capital mobilized to deliver medical education in an underserved area. *Health Place*, 16: 909-915. <http://dx.doi.org/10.1016/j.healthplace.2010.04.016>
- Harmon LK, Zinn HC, Gleason M. (2005). Place identity, place dependence, and place-based affect: examining their relationship to participation in educational and interpretive programs at Isle Royale National Park. *The 2005 George Wright Society Conference Proceedings*.
- Hays R (2007). Community-oriented medical education. *Teach Teach Educ.* 23:286-293. <http://dx.doi.org/10.1016/j.tate.2006.12.018>
- Johnston BT, Boohan M (2000). Basic clinical skills: Don't leave teaching to the teaching hospitals. *Med. Educ.* 34:692-699. <http://dx.doi.org/10.1046/j.1365-2923.2000.00631.x>
- Jorgensen BS, Stedman R (2001). Sense of place as an attitude: lakeshore property owners' attitudes toward their properties. *J. Environ. Psychol.* 21: 233–248. <http://dx.doi.org/10.1006/jevp.2001.0226>.
- Jorgensen BS, Stedman R (2006). A comparative analysis of predictors of sense of place dimensions: attachment to, dependence on, and identification with lakeshore properties. *J. Environ. Manage.* 79:316–327. <http://dx.doi.org/10.1016/j.jenvman.2005.08.003>
- Kaltenborn BP (1997). Nature of place attachment: a study among recreation homeowners in Southern Norway. *Leisure Sci.* 19: 175–189. <http://dx.doi.org/10.1080/01490409709512248>.
- Kyle G, Graefe A, Manning R, Bacon J (2003). An examination of the relationship between leisure activity involvement and place attachment among hikers along the Appalachian Trail. *J. Leis. Res.* 35: 249-273.
- Larkins S, Sen Gupta T, Evans R, Murray R, Preston R (2011). Addressing inequities in access to primary health care: lessons from the training of health care professionals from a regional medical school. *Aust. J. Prim. Health* 17:362–368. <http://dx.doi.org/10.1071/PY11040>.
- Liaison Committee on Medical Education (2014) *Functions and structure of a medical school*. Washington, DC: Liaison Committee on Medical Education Ministry of Health and Long Term Care (2011). *Rural and northern health care framework*. Toronto, Canada: Ministry of Health and Long Term Care.
- Moreau K, Reiter HI, Eva KW (2006). Comparison of Aboriginal and Non-Aboriginal Applicants for Admissions on the Multiple Mini-Interview using Aboriginal and Non-Aboriginal Interviewers. *Teach. Learn. Med.* 18:58-61. http://dx.doi.org/10.1207/s15328015tlm1801_12
- Murray RB, Larkins S, Russell H, Ewen S, Prideaux D (2012). Medical schools as agents of change: socially accountable medical education. *Med. J. Austr.* 196:1-5. <http://dx.doi.org/10.5694/mja11.11473>
- Nelson WA (2008). The challenges of rural health care. In Klugman CM, Dalinis PM (Eds.), *Ethical Issues in Rural Health Care*. (pages 34-59). Baltimore, MD, USA: The John Hopkins Press.
- NORMS Liaison Council (2000). *A northern rural medical school. Increasing rural medical graduates in Ontario. A preliminary proposal*. Thunder Bay, ON: NORMS Liaison Council.
- Northern Ontario School of Medicine. (2010). *Strategic plan 2010-2015*. Retrieved from http://www.nosm.ca/uploadedFiles/About_Us/Vision,_Mission_and_Strategic_Plan/Strategic%20Plan%20-%20English%20-%20Full%20report%20-for%20web.pdf (accessed on June 3rd, 2014)
- Northern Ontario School of Medicine. (2012). *NOSM's Class of 2012 Matches 100% to Residency Programs*. Retrieved from http://www.nosm.ca/about_us/media_room/media_releases/media_release.aspx?id=14866 (accessed on June 23rd, 2014)
- Northern Ontario School of Medicine. (2013). *Admissions. Non-academic requirements*. Retrieved from <http://www.nosm.ca/education/ume/general.aspx?id=1242> (accessed on June 3rd, 2014)
- Pathman DE, Steiner BD, Williams E, Riggins T (1998). The four community dimensions of primary care practice. *J. Fam. Practice*, 46:293-303.
- Prohansky HM (1978). The city and self-identity. *Environ. Behav.* 10:147-169. <http://dx.doi.org/10.1177/0013916578102002>
- Proshansky HM, Fabian AK, Kaminoff R (1983). Place-identity: physical world socialization of the self. *J. Environ. Psych.* 3: 57–83. [http://dx.doi.org/10.1016/S0272-4944\(83\)80021-8](http://dx.doi.org/10.1016/S0272-4944(83)80021-8)
- Rolph E (1976). *Place and placelessness*. London, UK: Pion.
- Riley RB (1992). Attachment to the ordinary landscape. In: Altman I, Low SM (Eds.). *Place Attachment*. New York, NY: Plenum Press. http://dx.doi.org/10.1007/978-1-4684-8753-4_2
- Rowles GD (1983). Place and personal identity in old age: observations from Appalachia. *J. Environ. Psych.* 3: 299-313. [http://dx.doi.org/10.1016/S0272-4944\(83\)80033-4](http://dx.doi.org/10.1016/S0272-4944(83)80033-4)
- Sempowski IP (2004). Effectiveness of financial incentives in exchange for rural and underserved area return-of-service commitments: systematic review of the literature. *Can. J. Rural Med.* 9(2), 82-88.
- Shor I (1980). *Critical teaching and everyday life*. Boston, Massachusetts: South End Press.
- Smith GA (2002). Place-based education: learning to be where we are. *Phi Delta Kappan* 83:584-594. <http://dx.doi.org/10.1177/003172170208300806>
- Smith GA, Sobel D (2010). *Place-and community-based education in schools*. New York: Routledge.
- Stern DT, Papadakis M (2006). The developing physician—becoming a professional. *New England J. Med.* 355(17): 1794-1799. <http://dx.doi.org/10.1056/NEJMra054783>
- Stokols D, Shumaker SA (1981). People and places: A transactional view of settings. In: Harvey J (Ed.), *Cognition, Social Behaviour, and the Environment*. New Jersey, NY: Erlbaum.
- Stokowski P (2002). Languages of place and discourses of power: Constructing new senses of place. *J. Leis. Res.* 34: 368-382.

- Strasser R (2003). Rural health around the world: challenges and solutions. *Fam. Pract.*, 20: 457-463. <http://dx.doi.org/10.1093/fampra/cm9422>
- Strasser R, Hogenbirk JC, Minore B, Marsh DC, Berry S, McCready WG, Graves L (2013). Transforming health professional education through social accountability: Canada's Northern Ontario School of Medicine. *Med. Teach.* 35: 490-496. <http://dx.doi.org/10.3109/0142159X.2013.774334>.
- Strasser R, Lanphear J, McCready W, Topps M, Hunt D, Matte M (2009). Canada's new medical school: the Northern Ontario School of Medicine – social accountability through distributed community engaged learning. *Acad. Med.* 84: 1459-1456. <http://dx.doi.org/10.1097/ACM.0b013e3181b6c5d7>
- Strasser R, Neusy AJ (2010). Context counts: training health workers in and for rural and remote areas. *Bull. World Health Organ.* 88: 777-782. <http://dx.doi.org/10.2471/BLT.09.072462>
- Tesson G, Hudson G, Strasser R, Hunt D (2009). The making of the Northern Ontario School of Medicine. A case study in the history of medical education. Montreal and Kingston, Canada: McGill-Queens University Press.
- Training for Health Equity Network (2014). About THEnet. <http://thenetcommunity.org/about-thenet/> (Retrieved on June 3rd, 2014).
- Tuan YF (1974). *Topophilia: a study of environmental perception, attitudes, and values*. Englewood Cliffs, NJ: Prentice-Hall.
- Tuan YF (1977). *Space and place: the perspective of experience*. Minneapolis, MN: University of Minnesota Press.
- Tuan YF (1980). *Landscapes of Fear*. Oxford, UK: Basil Blackwell.
- Twigger-Ross CL, Uzzell DL (1996). Place and identity processes. *J. Environ. Psych.* 16:205-220. <http://dx.doi.org/10.1006/jevp.1996.0017>.
- Wade ME, Brokaw JJ, Zollinger, TW, Wilson JS, Springer JR, Deal DW, White GW, Barclay JC, Holloway AM (2007). Influence of hometown on family physicians' choice to practice in rural settings. *Fam. Med.* 39(4):248-254.
- Whitehead M (1992). The concepts and principles of equity and health. *Int. J. Health Serv.* 22(3):429-445. <http://dx.doi.org/10.2190/986L-LHQ6-2VTE-YRRN>.
- Williams, DR, Vaske, JJ (2003). The measurement of place attachment: validity and generalizability of a psychometric approach. *Forest Sci.* 49:830-840.
- Woollard RF (2006). Caring for a common future: medical schools' social accountability. *Med. Educ.* 40(4):301-313. <http://dx.doi.org/10.1111/j.1365-2929.2006.02416.x>
- WONCA working party on rural practice (2001). *Policy on rural practice and rural health*. Traralgon, Victoria, Australia: Monash University School of Rural Health.
- World Health Organization. (1978). *The declaration of Alma-Ata: The international conference of primary health care*. Alma-Ata, USSR. Geneva: World Health Organisation.
- World Health Organization. (1996). *Doctors for health. A WHO global strategy for reorienting medical education and medical practice for health for all*. Geneva: World Health Organisation.
- World Health Organisation (2006). *Constitution of the World Health Organization – Basic Documents, Forty-fifth edition, Supplement*. Geneva: World Health Organisation.
- World Conference on Social Determinants of Health (2011). *Rio Political Declaration on Social Determinants of Health*. Geneva: World Health Organization.
- Worley P, Prideaux D, Strasser R, Magarey A, March R (2006). Empirical evidence for symbiotic medical education: a comparative analysis of community and tertiary-based programmes. *Med. Educ.* 40:109-116. <http://dx.doi.org/10.1111/j.1365-2929.2005.02366.x>



Educational Research and Reviews

Related Journals Published by Academic Journals

- African Journal of History and Culture
- Journal of Media and Communication Studies
- Journal of African Studies and Development
- Journal of Fine and Studio Art
- Journal of Languages and Culture
- Journal of Music and Dance

academicJournals