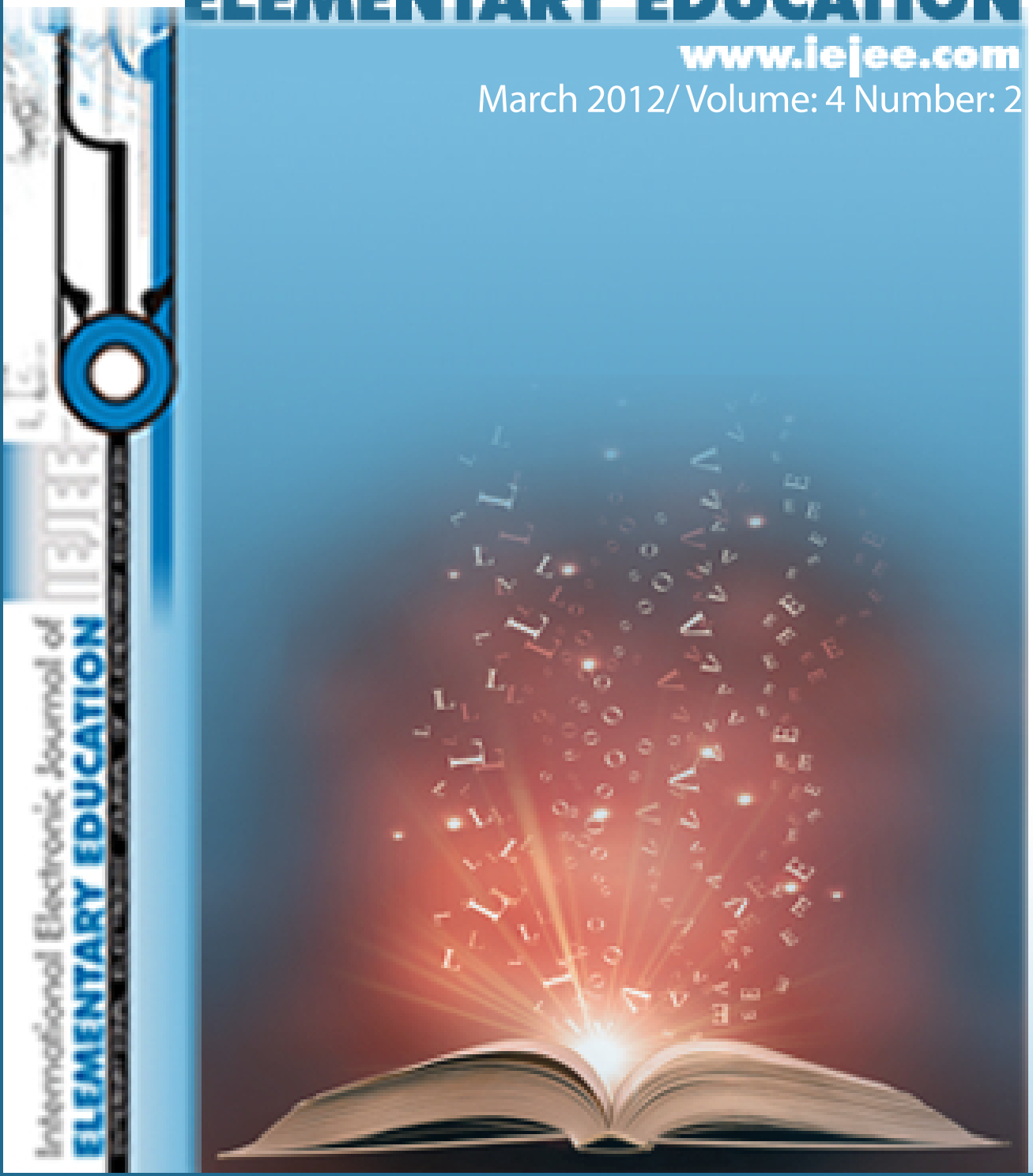
International Electronic Journal of ELEMENTARY EDUCATION

www.iejee.com
March 2012/ Volume: 4 Number: 2



International Electronic Journal of Elementary Education
Vol. 4, Issue 2, March, 2012.

IEJEE
International Electronic Journal of Elementary Education

International Electronic Journal of Elementary Education is an international, multi-disciplinary, peer-reviewed journal that is online published three times in a year. IEJEE aims to provide a platform for the publication of the most advanced high-quality research in the areas of learning, development, instruction and teaching at elementary level.

International Electronic Journal of Elementary Education publishes three issues per year (March, July, and October). IEJEE provides immediate open access to its content on the principle that making research freely available to the public to support a greater global exchange of knowledge.

ISSN: 1307-9298

Abstracting and Indexing:
Scopus, ProQuest, DOAJ, Education Research Complete™, Google Scholar, EDNA, Index Copernicus, Norwegian Social Science Data Services, NewJour, Open J-Gate.

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ISSN:1307-9298

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Dear IEJEE readers,

International Electronic Journal of Elementary Education (IEJEE) continues to accomplish its mission: Dissemination of research based knowledge from research milieus located in different parts of the World.

As Editor-In-Chief I am proud of receiving an increasing number of articles that are being submitted to the journal. We try to do our best in the peer-reviewing process. I hope the researchers can imagine the scope of this demanding but necessary procedure. In this volume you'll find various topics that researchers have addressed.

Media literacy levels of prospective teachers, the role of open-ended tasks in the promotion of classroom communication in Mathematics, on-line and off-line assessment of metacognition, teacher perceptions of gender-based differences among elementary school teachers, a mixed method approach to the assessment of learning difficulties in Math, attitudes and perceptions of elementary classroom teachers with regard to utilizing of PE time for planning, the primary school teachers' readiness to adopt 'Personal Response System' in ESL classroom, and how one can integrate technology with small group and peer-led discussions of literature, children's consception of planet Earth and *effectiveness of cover, copy, and compare (CCC) procedures on spelling performance* are the topics that the researchers have addressed and made their contribution to our efforts to the ongoing knowledge development in the fields of teaching and learning in schools.

I would like to express my deep gratitude to all of the authors. I also want to thank to Dr. Turan TEMUR and Dr. Gokhan OZSOY for their effective editorial coordination that made the materialization of the volume – in time, possible.

Sincerely,

Dr. Kamil Özerk, Editor-In-Chief
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ISSN:1307-9298

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International Electronic Journal of Elementary Education, 2012, 4(2), 269-285.

Examining Media Literacy Levels of Prospective Teachers*

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Received: January 2012 / Revised: February 2012 / Accepted: March 2012

Abstract

As in many other countries, following the 2007-2008 education year when media literacy courses began to be included in the curricula, media literacy has become one of the discussion topics among educators and decision makers in Turkey. Discussion topics related to media literacy have included who is going to give the media literacy courses, what qualifications will be sought out in media literacy education teachers, what will be included in the media literacy curriculum in terms of its content, and at what level the media literacy course will be given.

The current study which aims to examine media literacy levels of prospective teachers utilized the survey method. The sample of the study included prospective teachers (480) attending Elementary School Education, Social Studies Education and Turkish Language Education departments in the Education Faculty at the Dumlupinar University in the 2008-2009 education year.

The results of the study showed that prospective teachers have a low level of reaction to media messages, do not educate people around enough about the effects of media, but make use of different sources of media to gain information, and are cognizant of media literacy.

Keywords: Media Literacy, media education, critical media literacy**,** social studies

Introduction

The process of forming an information society and using the information transferred by media accurately are among the crucial problems of 21st Century. Every individual in the society is heavily exposed to message overload by mass media. These messages can by no

* This article is driven from the author's unpublished MA thesis entitled "Media Literacy Levels and Perceptions of Prospective Teachers."

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ISSN:1307-9298

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means be claimed to be impartial or objective. Being Media Literate has a significant impact on solving these problems.

This uncontrolled, intensive and effective information through mass media especially affects kids and teens because they get the messages unconsciously without sorting. Moreover, television prevents children from exploring the world through their own experience. It, instead, provides them with an already-structured and fictionalized life (Ertürk &Gül 2006: 2).

In the literature, the concept of "Media Literacy," which is also called "Media Education" or "Media Awareness" (Thoman & Jolls 2008), although very new in Turkey, has been widespread in such countries as the USA, England, Canada and Australia for almost 50 years ever since mass media entered and started to affect human life.

Education and communication experts are in favour of the fact that individuals should be able to take full advantage of mass media and use them consciously. In this context, while positioning Media Literacy into the education system, experts regarded it not only as a course, but also as a philosophy, and even a lifelong learning process.

Ever since 2007-2008 education period, when Media Literacy course started as a selective course in Turkey, several topics about Media Literacy have been a matter of debate among the related experts in Turkey just as in the whole world including who will give the Media Literacy course, what qualifications the teachers should possess, what should exist in the content and scope of the course and at what level it should be given.

Considering that the teachers to give the course didn't have Media Literacy training during pre-service period, it is essential to examine knowledge level of the prospective teachers, their opinions and readiness about Media Literacy.

Conceptual Framework

Media Literacy has been subject to various approaches and definitions by domain experts in different countries considering the realities and priorities in each country. Aufderheide (1993) defines Media Literacy as the ability to access, analyze, evaluate, and communicate messages in a wide variety of forms like television, video, cinema, advertisements, Internet and so on.

Hobbs (1998) draws attention of academicians and educators to two points in Media Literacy; the first one is the critical analysis of media messages and the second one is how an individual learns to create his/her own messages. While Hobbs refers to critical Media Literacy in the first dimension, she stresses the ability to create media messages in the second dimension.

All studies and evaluations so far have revealed that children who are exposed to visual, audial and written media as vulnerable receivers should be made conscious of media from pre-school years onwards. Thanks to being Media Literate, children will be able to receive the messages of mass media through a critical judgement and decode the messages of media as active individuals instead of being passive receivers (RTUK, 2007).

Kartal (2007) states in his study on secondary school students that these students spend 2-3 hours daily in front of the television and 3-4 hours in Internet. Kartal also adds that these students read 4-7 newspapers weekly which are 2-3 different types.

De Gaetano (2010) states that the following five basic characteristics will be observed in children and teenagers if they are cognizant of Media Literacy:

1. Be conscious and make use of screen technology appropriately.

2. Be able to criticize visual messages and cognizant of their emotional and cognitive effects.

3. Be able to express the realities, ideas and well-structured opinions about media scenes.

4. Be able to grasp the media production techniques like camera angles and lights so as to understand how the messages affect individuals.

5. Be able to use all forms of screen technology efficiently.

Media Literacy also aims to furnish children who are the most vulnerable group to the effects of the television with a skill to distinguish between fiction and reality in what they watch on TV. This course involves explaining how and why the media convey messages in certain ways so that children can be raised as conscious receivers who can look at the media from a critical perspective from primary school years.

Hobbs (1994) reveals that teachers have the main responsibility in equipping children with Media Literacy and therefore they should be well-prepared for this mission through well-established pre-service and in-service training by saying: Future of Media Literacy depends primarily on a long-termed, intensive and intellectual development in training of the teacher.

Kıncal and Kartal (2009) point out that through Media Literacy education, individuals develop awareness of media and media messages and gain critical skills. They also add that Media Literate individuals question media texts and thus come up with their own media messages.

A lot of studies in Turkey and all around the world emphasize that prospective teachers should have Media Literacy training during their training process. For example, it was determined in a qualitative study of Deveci and Çengelci (2008: 41) on prospective teachers of social studies that all the prospective teachers should be Media Literate. Deveci and Çengelci suggested prospective teachers who participated in their study that they can do such activities in their faculty to promote Media Literacy as preparing a news board, leaving newspapers on canteen tables.

In another study carried out to determine the attitudes of students towards Media Literacy course, it was found that the students didn't find the activities and methods of their Media Literacy teacher adequate and didn't like the way their teacher conducted the lesson (Elma et al., 2009: 105). In this study, it was also stated that the students shared what they had learned in the lesson with their families and friends, which created positive effects on both the families and the friends. Considine (2002) reveals in his study that in order for teachers to conduct Media Literacy education efficiently, teachers should be exposed to the developments in Media Literacy in both pre-service and in-service period through workshops.

In his study, Kıncal (2007) states that Media Literacy develops critical thinking in individuals and enhances the skill of active participation. Thus, the power of giving response to media messages can be regarded as one of the indispensable components of Media Literacy. In the same study, however, Kıncal (2007) says that prospective teachers convey their reactions and criticism towards positive or negative messages in the media to relevant authorities at a very low level.

Haider and Dall (2004), while defining a Media Literate individual, emphasize that this individual should be able to evaluate media messages by getting them from different sources in different formats. They also add that an individual called Media Literate should follow the developments in media technologies, have information about their development

history even at a basic level and have the skill to evaluate and analyze the manipulative messages of the media.

In the process of forming a Media Literate society, the campaign of The Radio and Television Supreme Council (RTUK) called "Smart Signs" is especially important for parents. This is an informative classification system about the content of TV programs. In the study conducted by Belviranlı et al. (2008) to determine the level of use of "Smart Signs" system by mothers, it was found that the mothers found the system useful at the rate of 84.2% but adequate only at the rate of 24.9%. The study also determined that the rate of making use of the system increased as the education level rose.

Research Problem

Family and school form the two pillars of Media Literacy conscious. Experts emphasize that in order to develop critical Media Literacy conscious in individuals, a school based formal education is necessary. Teachers, in this context, by all means have a pivotal role in every action to achieve a Media Literate society.

Considering the fact that teachers in charge of giving Media Literacy lesson at primary school level don't themselves have a Media Literacy course at Education Faculties during their pre-service training period, the readiness level of prospective teachers in terms of Media Literacy becomes crucial. It is a known fact that these prospective teachers have various courses on communication like Effective Communication, Human Relations and Communication and so on during their undergraduate education at university, but Media Literacy is not one of them. At this point, it is doubtful whether a prospective teacher responsible for a subject that she/he wasn't trained for can carry out the necessities of that course.

Purpose

The aim of the research is to determine the Media Literacy levels of prospective teachers.

For the sake of the efficiency of the course, it should be given by such teachers who can be called Media Literate individuals, follow the media, look at the media through a critical perspective, inform the people around about the media and produce media.

Besides this general aim, answers for the following questions are sought.

1- Do the Media Literacy levels of prospective teachers show difference depending on gender and department variables?

2- Do the media follow-up attitudes of prospective teachers show difference depending on gender and department?

Method

This descriptive research aiming to determine the Media Literacy levels of prospective teachers used survey method. Survey method is defined as a research method that tries to define a case as it is (Karasar, 2005). According to Karasar, in survey method, in order to get a general judgement about a population composed of multiple members, there are survey arrangements on the whole population or on a group/sample taken from that population.

Target Population of the Study

The target population of the study was composed of the students of Elementary School Education, Social Studies Education and Turkish Language Education Departments in Education Faculty at the Dumlupinar University during the 2008-2009 academic period.

Among the total 557 students of Education Faculty, 480 were reached. Since the majority of the students attending Education Faculty were reached, no sampling was taken and the group was considered as the target population.

Data Collection Tool and Process

During the data gathering tool development process, the literature on Media Literacy was surveyed first and a question pool of 65 questions was formed to determine the Media Literacy levels of the prospective teachers. In order to test the content validity of the questions, expert opinions were sought, upon which seven of the questions were left out due to the criticism of three different experts.

The survey form composed of total 58 questions was applied to 80 prospective teachers who weren't included into the research and 5 other items were excluded because they weren't regarded adequately functional. After further rearrangements, the data gathering tool was finalized in 4 sections composed of 53 questions. The alpha reliability coefficient of the scale was found to be .85.

Exploratory factor analysis was conducted for the survey and sub-factors were determined for the sections. According to factor analysis results, there are 4 factors with eigenvalue over one for determining Media Literacy levels of prospective teachers.

Data Analysis

Several statistical techniques were used in data analysis. Media follow-up levels of prospective teachers were described by using percentage (*P*) and frequency (*f*). The difference between the Media Literacy levels of the subjects was tested by t-test at two-variable level and by ANOVA at three-variable level and above. The difference between nominal variables was analyzed using X^2.

Results

In this part of the research, the data acquired from the Media Literacy Survey conducted on prospective teachers were analyzed and interpreted.

Media Literacy Levels of Prospective Teachers

Table 1. *t-Table for Media Literacy Levels of Prospective Teachers*

		N	*M*	*Sd*	*t*
I would make a judgement on the subject after I check different TV channels and newspapers.	*Female*	*269*			
	Male	*207*	*4.08*	*.78*	*-1.83*
I would follow the news in different media sources.	*Female*	*270*	*4.02*	*.91*	*-1.82*
	Male	*207*			
I would exchange information with my family about the programs I watch on TV.	*Female*	*270*			
	Male	*206*	*3.38*	*1.07*	*4.78**
I would exchange information with my friends about the programs I watch on TV.	*Female*	*270*			
	Male	*205*	*3.82*	*.85*	*.63*
I would exchange information with my family about the news I read on newspapers and magazines.	*Female*	*269*			
	Male	*205*	*3.33*	*1.10*	*4.61**

*$p < .05$.

Table 1 (Continue). *t-Table for Media Literacy Levels of Prospective Teachers*

		N	M	Sd	t
I would exchange information with my friends about the news I read on newspapers and magazines.	*Female*	*269*			
	Male	*206*	*3.87*	*2.16*	*-1.38*
I would contact with the TV channel to show my reaction and tell my criticism about the program I watch on TV (via phone-email-mail etc).	*Female*	*270*			
	Male	*207*	*1.42*	*.84*	*-.39*
I would contact with RTUK to show my reaction and tell my criticism about the program I watch on TV (via phone-email-mail etc).	*Female*	*268*			
	Male	*207*	*1.32*	*.70*	*-.32*
I would contact with newspaper agents to show my reaction and tell my criticism about the news I read on newspapers (via phone-email-mail etc).	*Female*	*270*			
	Male	*207*	*1.38*	*.713*	*-1.93**
I would contact with the manager of related web-site on Internet to show my reaction and tell my criticism about what I see on Internet (via phone-email-mail etc).	*Female*	*270*			
	Male	*207*	*1.73*	*1.04*	*-1.54*
I would caution people around me about the negative sides and negative effects of Media.	*Female*	*270*			
	Male	*206*	*3.54*	*1.02*	*1.01*
I would take smart signs into consideration while I watching a program on TV.	*Female*	*270*			
	Male	*207*	*3.44*	*1.19*	*3.78**
I would caution and encourage children around me to caution their own parents about Smart Signs.	*Female*	*270*			
	Male	*207*	*3.32*	*1.15*	*1.40*

*$p < .05$.

The table presents the t-test results that show the agree level of the subjects to the statements and whether there is a difference depending on gender. Accordingly, it can be said that in terms of the statement "I would exchange information with my family about the programs I watch on TV," the prospective teachers have information exchange with their families about programs at the low level. Analyzing the means depending on gender, it is seen that females (M=3.58) have more information exchange with their families for programs than males (M= 3.11) [$t_{(475)}$= 4.61, $p < .05$].

It is found in the statement "I would exchange information with my family about the news I read on newspapers and magazines" that the prospective teachers discuss the news they read in newspapers and magazines with their families at a low level. Analyzing the means depending on gender, differences exist in the agree rates on the statements (Female: M= 3.52; Male: M= 3.06). The difference between the means is statistically significant [$t_{(472)}$= 4.78, $p < .05$].

In terms of the answers to the statement "I would contact with newspaper agents to show my reaction and tell my criticism about the news I read on newspapers (via phone-email-mail etc)", it is seen that the prospective teachers do not react upon their critical thoughts about the news they read in newspapers. However, analyzing the means depending on gender, it is revealed that males (M= 1.44) react more than females (M= 1.32) [$t_{(475)}$=1.93, $p< .05$].

The prospective teachers stated with 3.44 mean that they agree with the statement "I take smart signs system into consideration while watching a program" at "sometimes" level. Analyzing the means depending on gender, it can be said that compared to males (*M*= 3.20), females (*M*= 3.62) take smart signs system more into consideration [$t_{(475)}$=3.78, p<0.05].

Table 2. *Descriptive Data for Media Literacy Levels of Prospective Teachers*

		N	*M*	*Sd*
1. I would make a judgement on the subject after I check different TV channels and newspapers.	Elementary	163	3.88	.84
	Social	195	4.16	.76
	Turkish	121	4.23	.66
	Total	479	4.08	.78
2. I would follow the news in different media sources.	Elementary	163	3.93	.96
	Social	195	4.01	.94
	Turkish	122	4.16	.76
	Total	480	4.02	.91
3. I would exchange information with my family about the programs I watch on TV.	Elementary	163	3.27	1.0
	Social	195	3.46	1.0
	Turkish	121	3.41	1.11
	Total	479	3.38	1.07
4. I would exchange information with my friends about the programs I watch on TV.	Elementary	163	3.68	.87
	Social	195	3.91	.85
	Turkish	120	3.85	.80
	Total	478	3.82	.85
5. I would exchange information with my family about the news I read on newspapers and magazines.	Elementary	162	3.20	1.11
	Social	193	3.44	1.11
	Turkish	122	3.31	1.07
	Total	477	3.33	1.10
6. I would exchange information with my friends about the news I read on newspapers and magazines.	Elementary	162	3.66	.91
	Social	194	3.89	.87
	Turkish	122	4.13	4.01
	Total	478	3.87	2.16
7. I would contact with the TV channel to show my reaction and tell my criticism about the program I watch on TV (via phone-email-mail etc).	Elementary	163	1.48	.97
	Social	195	1.47	.86
	Turkish	122	1.28	.60
	Total	480	1.42	.84

According to Table 2, there is a difference between departments on Media Literacy levels of prospective teachers. ANOVA was carried out to test whether the differences in favour of Turkish Language and Social Studies Departments were statistically significant.

Table 3. *ANOVA Results for Media Literacy Levels of Prospective Teachers According to Departments*

		Sum of square	*df*	Mean of square	*F*	*P*	Difference
d1	Between Groups	10.43	2	5.21	8.71	.000	
	Within Groups	285.05	476	.59			Elementary-Social Elementary-Turkish
	Total	295.49	478				
d2	Between Groups	3.61	2	1.80	2.17	.115	
	Within Groups	396.08	477	.83			
	Total	399.70	479				
d3	Between Groups	3.32	2	1.66	1.43	.240	
	Within Groups	552.44	476	1.16			
	Total	555.77	478				
d4	Between Groups	5.19	2	2.59	3.62	.027	
	Within Groups	340.69	475	.71			Elementary-Social
	Total	345.88	477				
d5	Between Groups	4.70	2	2.35	1.92	.147	
	Within Groups	578.96	474	1.22			
	Total	583.66	476				
d6	Between Groups	15.08	2	7.54	1.60	.201	
	Within Groups	2228.62	475	4.69			
	Total	2243.71	477				
d7	Between Groups	3.32	2	1.66	2.31	.100	
	Within Groups	342.26	477	.71			
	Total	345.59	479				

Analyzing the descriptive data (Table 3), differences in favour of Turkish Language Education and Social Studies Education Departments stand out. Whether this difference between the means is statistically significant was tested using ANOVA. According to ANOVA results, the difference between the departments is statistically significant [$F_{(2\text{-}476)}$= 8.71, p < .05]. Scheffe test was conducted to determine between which groups these differences were. Accordingly, in terms of agree levels to the statement "I would make a judgement on the subject after I check different TV channels and newspapers," significant differences were found between Elementary School Education and Social Studies Education and between Turkish Language Education, which can be interpreted as the fact that those in departments of Social Studies Education and Turkish Language Education form a judgement on a current matter after following it on different TV channels and in different newspapers.

A difference was found between departments in terms of agree level to the statement "I would exchange information with my friends about the programs I watch on TV". Whether this difference between the means was statistically significant or not was tested using ANOVA. According to ANOVA results, the difference between the means of the departments is significant [$F_{(2-475)}$= 3.622, $p < .05$]. According to Scheffe test conducted to determine between which groups these differences were, in terms of agree levels to the statement "I would exchange information with my friends about the programs I watch on TV," there is a significant difference between the means of prospective Elementary School teachers and Social Studies teachers in favour of the latter. This finding can be interpreted as the fact that compared to prospective Elementary School teachers, prospective Social Studies teachers have more information exchange with their friends about the programs they watch on TV.

Despite the differences between the means of the items "d_2, d_3, d_5, d_6, d_7" in the scale, they are not statistically significant.

Table 4. *Descriptive Data for Media Literacy Levels of Prospective Teachers*

		N	*M*	*Sd*
8. I would contact with RTUK to show my reaction and tell my criticism about the program I watch on TV (via phone-email-mail etc).	Elementary	161	1.28	.69
	Social	195	1.43	.83
	Turkish	122	1.19	.45
	Total	478	1.32	.70
9. I would contact with newspaper agents to show my reaction and tell my criticism about the news I read on newspapers (via phone-email-mail etc).	Elementary	163	1.30	.54
	Social	195	1.47	.80
	Turkish	122	1.36	.73
	Total	480	1.38	.71
10. I would contact with the manager of related web-site on Internet to show my reaction and tell my criticism about what I see on Internet (via phone-email-mail etc).	Elementary	163	1.60	.93
	Social	195	1.79	1.06
	Turkish	122	1.80	1.13
	Total	480	1.73	1.04
11. I would caution people around me about the negative sides and negative effects of Media.	Elementary	163	3.43	1.00
	Social	194	3.71	1.02
	Turkish	122	3.43	1.03
	Total	479	3.54	1.02
12. I would take smart signs into consideration while I watching a program on TV.	Elementary	163	3.49	1.08
	Social	195	3.50	1.25
	Turkish	122	3.28	1.21
	Total	480	3.44	1.19
13. I would caution and encourage children around me to caution their own parents about Smart Signs.	Elementary	163	3.27	1.16
	Social	195	3.46	1.14
	Turkish	122	3.18	1.14
	Total	480	3.32	1.15

According to Table 4, Media Literacy levels of prospective teachers showed differences depending on departments. Whether these differences were statistically significant or not was tested using ANOVA.

Table 5. *ANOVA Results for Media Literacy Levels of Prospective Teachers According to Departments*

		Sum of square	*df*	Mean of square	*F*	*P*	Diffe-rence
d8	*Between Groups*	*4.43*	*2*	*2.21*	*4.46*	*.012*	
	Within Groups	*235.95*	*475*	*.49*			*Social-Turkish*
	Total	*240.38*	*477*				
d9	*Between Groups*	*2.87*	*2*	*1.43*	*2.84*	*.059*	
	Within Groups	*241.04*	*477*	*.50*			
	Total	*243.92*	*479*				
d10	*Between Groups*	*3.92*	*2*	*1.96*	*1.79*	*.167*	
	Within Groups	*519.94*	*477*	*1.09*			
	Total	*523.86*	*479*				
d11	*Between Groups*	*8.80*	*2*	*4.40*	*4.22*	*.015*	
	Within Groups	*495.88*	*476*	*1.04*			
	Total	*504.69*	*478*				
d12	*Between Groups*	*4.13*	*2*	*2.06*	*1.46*	*.233*	
	Within Groups	*674.45*	*477*	*1.41*			
	Total	*678.59*	*479*				
d13	*Between Groups*	*6.29*	*2*	*3.14*	*2.38*	*.093*	
	Within Groups	*629.70*	*477*	*1.32*			
	Total	*635.99*	*479*				

According to Table 4 and 5, a significant difference was found in agree rate to the statement "I would contact with Radio and Television Supreme Council RTUK to show my reaction and tell my criticism about the program I watch on TV (via phone-email-mail etc)" between prospective Social Studies teachers and Turkish Language teachers in favour of the former. According to ANOVA results, this difference is statistically significant [$F_{(2\text{-}475)} = 4.463$, $p < .05$]. Accordingly, it can be said that prospective Social Studies teachers react to the programs they watch critically more than prospective Turkish Language teachers.

Despite the differences between the means of the items "d_9, d_{10}, d_{11}, d_{12}, d_{13}" in the scale, they are not statistically significant.

The reactions of prospective teachers when they are disturbed by scenes in TV programs are given below.

Table 6. *First Reaction*

	f	*P*	Total *P*
I would change the TV channel	333	76.7	76.7
I would continue watching since such images does not bother me	40	9.2	85.9

Table 6 (Continue). *First Reaction*

	f	*P*	Total *P*
I would continue to watch even though I am bothered	26	6.0	91.9
I would turn off TV	13	3.0	94.9
I would caution people about how harmful it is	13	3.0	97.9
I would move to somewhere else different	4	.9	98.8
I would complain to RTUK	4	.9	99.8
I would show my reaction by calling the TV channel	1	.2	100.0
Total	434	100.0	

Table 7. *Last Reaction*

	f	*P*	Total *P*
I would complain to RTUK	114	27.3	27.3
I would turn off TV	79	18.9	46.2
I would caution people about how harmful it is	78	18.7	64.8
I would continue watching since such images does not bother me	44	10.5	75.4
I would move to somewhere else different	39	9.3	84.7
I would show my reaction by calling the TV channel	26	6.2	90.9
I would continue to watch even though I am bothered	23	5.5	96.4
I would change the TV channel	15	3.6	100.0
Total	418	100.0	

Table 6 and 7 show the first and last reactions of prospective teachers as percentage and frequency when they are disturbed by scenes in TV programs. According to the Table, 3/4 (76.7%) of the prospective teachers stated that the first thing they do is to change the channel when they encounter a disturbing scene on TV. To the question asked to prospective teachers to reveal their final reaction, 27.3% of them replied that they complain to RTUK about the program. The reaction ranking the second is as "I would turn off TV."

Table 8. *Media Production Levels of Prospective Teachers*

			Yes	**No**	**Total**
Department	Elementary	*f*	42	120	162
		P	25.9	74.1	100.0
	Social	*f*	72	123	195
		P	36.9	63.1	100.0
	Turkish	*f*	54	68	122
		P	44.3	55.7	100.0
Total		*f*	168	311	479

Table 8 presents data about whether the prospective teachers attempt to do any kind of media production (bringing out school paper or magazine, writing for any paper or magazine, doing a radio program, using a camera or making a film etc.). According to Table 8, 1/4 of prospective Elementary School teachers (25.9%), 36.9% of prospective Social Studies teachers and 44.3% of prospective Turkish Language teachers have been involved in a sort of media production. Accordingly, it can be said that compared to the other departments, prospective Turkish Language teachers have been involved in a sort of media production more.

Media Monitoring Habits of Prospective Teachers

Table 9. *Daily TV Watching Rates of Prospective Teachers*

Watching rates	*f*	*P*	Total *P*
Never	136	28.3	28.3
Less than 1 Hour	115	24.0	52.3
1-2 Hour/s	132	27.5	79.8
2-3 Hours	55	11.5	91.3
3+ Hours	42	8.8	100.0
Total	480	100.0	

Table 9 presents daily media monitoring habits of prospective teachers. Accordingly, it is seen that almost 1/3 of the prospective teachers (28.3%) don't watch TV while 24% watch TV for an hour daily and 27.5% watch TV for 1-2 hours. Consequently, it can be said that half of the participant prospective teachers watch TV up to two hours daily.

Table 10. *Newspaper Reading Frequency of Prospective Teachers*

Frequency of Newspaper Reading	*f*	*P*	Total *P*
Daily	186	39.1	39.1
Every other day	106	22.3	61.3
Once a week	127	26.7	88.0
Once a month	40	8.4	96.4
Never	17	3.6	100.0
Total	476	100.0	

Table 10 presents the newspaper reading frequency of prospective teachers. According to Table 10, 39.1% of the prospective teachers read a newspaper a day regularly whereas 22.3% read a newspaper every two days and 3.6% never read a newspaper. Accordingly, it can be said that more than half of the prospective teachers read a newspaper at least every two days regularly.

Table 11. *How Many Different Newspapers Are Read*

How many different newspapers	*f*	*P*	Total *P*
1	300	66.7	66.7
2	114	25.3	92.0
3	16	3.6	95.6
4	9	2.0	97.6
5	5	1.1	98.7
6+	6	1.3	100.0
Total	450	100.0	

Table 11 presents how many different newspapers the prospective teachers read a day. According to Table 11, 2/3 of the prospective teachers (66.7%) read only a newspaper a day whereas 25% read two newspapers and the remaining 8% read 3 or more newspapers a day. Accordingly, it can be said that the majority of the prospective teachers follow the printed media through just one source.

Discussion

In this part of the research, a discussion is presented by comparing the findings of the analyses to the literature.

Evaluating the answers of the prospective teachers to the questions asked to determine their Media Literacy levels, the statement "Do the prospective teachers have a critical/responsive approach?" show that the prospective teachers do not inform either the relevant channel or RTUK about their response or criticism for the programs they watch. At the same time, it is seen that they don't demonstrate a critical/responsive approach towards the news they read in newspapers. However, it is found that, though partially, they show a critical/responsive approach towards the news they encounter on Internet. This kind of an attitude shows similarities to the findings of the research of Kıncal's (2007) on prospective teachers. Kıncal states that only 21% of the prospective teachers call a TV channel to show their response to any negativity they encounter in a program; that 13.4% of them call a newspaper to show their response and that this rate is 36.6% in the case of Internet. Kıncal also states that a Media literate individual should possess a skill of active participation. In the research, it is seen that the prospective teachers do not have this skill. The level of the prospective teachers to convey their criticism and responses to relevant authorities about the news on TV and in newspapers is rather low. The fact that this level is a bit high in terms of Internet might be due to the fact that it is technologically easier for them to convey their criticism and responses on Internet.

Evaluating the answers of the prospective teachers to the questions asked to determine their Media Literacy levels, it is seen that their habit of monitoring different media sources and their skill to evaluate the news through different sources are at a high level, which corresponds to the opinion of Haider and Dall's (2004) while they are defining a Media Literate individual- that this individual should receive the media messages from different sources in different formats and evaluate them accordingly.

It is also found in the research that the prospective teachers take Smart Signs system into consideration and warn the people around about taking them into consideration at a low level. Belviranlı et al. (2008), in their research to determine the level of use of Smart Signs system, state that mothers find this system useful at the rate of 84.2% but make use of the system at the rate of 24.9%. They also add that the rate of making use of the system increases as education level rises. The fact that the prospective teachers use this system at a low level but females use this system at a higher level than males shows parallelism with the research of Belviranlı et al.

Analyzing the responses of the prospective teachers to negativity they encounter on TV, it is determined that their first reaction is to change the channel followed by complaining to RTUK. Although the order of responses in these findings is considered to be accurate, it conflicts with another finding about their levels of complaining to RTUK. Considering that the prospective teachers state that they never complain to RTUK, this does not correspond to their statement that they complain to RTUK as a second response. In a research by Kıncal (2007), it is stated that prospective teachers respond to the negativity in the media by turning the TV off, stopping reading a newspaper, not visiting a web site again but these are

passive actions and an active attitude is required instead. It is understood here that complaining and warning the people around are considered to be active attitudes.

Dealing with media production is considered to be a dimension of Media Literacy. Hobbs (1998) claims that unless teenagers experience such things in Media Literacy process as taking photos, planning and organizing their thought through storyboard, writing texts and performing in front of the camera and designing their own web pages, they cannot become the real critical consumers of mass media. Kıncal and Kartal (2009) also mention about the importance of media production in media education. In the study, it is found that most of the prospective teachers cannot achieve media production. The level of media production in Turkish Language Education is found to be a bit higher than that in Elementary School Education and Social Studies Education. However, in general, media production dimension of Media Literacy in the prospective teachers is found to be at an insufficient level.

While determining the media monitoring rates of the prospective teachers, it is found that the rate of watching TV is much lower than the Turkish and international means. Considering that the Turkish TV watching mean is 4-5 hours and the international mean is 2-3 hours (RTUK, 2007: 37-38), the prospective teachers are seen to watch TV at a low level. In Kıncal's (2007) research on prospective teachers, the rate of never watching TV is 6,5% whereas this rate is determined as 28,3% in this research. The TV watching levels of the prospective teachers for 1 hour and for up to 2 hours show similarities to Kıncal's research. Findings of Yeşil and Korkmaz's research (2008) on TV addiction of prospective teachers that Social Studies teachers have more TV addiction than the other department teachers and the findings of this study about TV watching rates of Social Studies prospective teachers show parallelism.

In terms of "the frequency of reading a newspaper regularly" dimension of media monitoring levels, it is seen that the frequency of prospective teachers reading a newspaper regularly is above the average found in Turkey. Odabaş (2008) states that the rate of newspaper reading regularly in Turkey is 25%. This rate is almost 40% among the prospective teachers. In Kıncal's research (2007) on prospective teachers, the level of reading a newspaper regularly every day is about 40%. The findings of the study, therefore, are seen to be parallel to those in Kıncal's research.

According to the research findings, 2/3 of the prospective teachers state that they read just one newspaper a day while 1/3 state this number to be 2 or more. Considering the fact that following the news from different sources is crucial in Media Literacy, it is revealed that most of the prospective teachers do not demonstrate this attitude. Also, this finding contradicts with the "generally" answer of the prospective teachers to the statement that "I form a judgement after following the news through different sources."

Conclusion and Suggestions

In this part of the research, the conclusion based on the findings and the suggestions of the researcher based on the conclusion are presented.

As result of the research, it is revealed that the prospective teachers do not sufficiently respond to every kind of message they encounter in the media by conveying their positive or negative responses, criticism or comments to the relevant authority (media institutions and those to inspect the media) either by virtue of citizenship consciousness or in accordance with being a teacher. In terms of achieving one of the features striven for by Media Literacy; being a conscious, active, critical media consumer, it is seen that the prospective teachers haven't been able to develop this conscious sufficiently.

The main feature of an individual, in order to be called Media Literate, should analyze the media messages from news sources of different formats and afterwards forming a judgement taking different points of view into account. Considering this kind of attitude, it can be stated that the majority of the prospective teachers in the current study can be concluded as Media Literate.

The Smart Signs System that aims to inform the families about the programs with negative content to protect their children from them has a crucial function of achieving Media Literacy conscious in the society. Teachers have an indispensable role in explaining and encouraging this system. However, in the study it is found that prospective teachers themselves neither take this system into consideration sufficiently nor, as prospective teachers, warn the people around them about paying attention to this system.

Changing the channel and complaining to RTUK when the prospective teachers encounter disturbing scenes in TV programs can be regarded as the right attitude. However, although this reaction should be put into action as stated by the prospective teachers, when their replies to the item "I complain to RTUK" are analyzed, it is revealed that they hardly ever do it themselves. Accordingly, the first and last reactions stated as changing the channel and complaining to RTUK turn out to be what they want but what they don't do themselves.

Media production has a crucial place in Media Literacy. Besides critical Media Literacy, media production is a complementary element for the education of prospective teachers. It is hardly possible to form a judgement on media messages without seeing and practicing what steps media messages go through. At this point, media production steps in the research shows that the prospective teachers have deficiency in the matter.

Media monitoring dimension of Media Literacy is considered as a complementary element. The research shows that TV watching rates of the prospective teachers are below the average in Turkey. While evaluating a conscious viewer, apart from duration, the content of the programs, whether different sources are sought and whether they give importance to such technical points as scenario-set up are also important factors. Accordingly, the prospective teachers can be said to be in "conscious TV viewers" category.

Analyzing the newspaper reading findings of the prospective teachers, their reading rate above the Turkish average corresponds to the definition of Media Literate individual. However, in terms of reading various newspapers, it is clear that the majority read one type of newspaper, which contradicts with the criteria of critical Media Literate and forms a negative effect on Media Literacy of the prospective teachers.

Suggestions

- Media Literacy Education should be regarded as a whole system; it should be given to children and teenagers from pre-school period to primary and secondary school periods not only as a separate course but also integrated into other related courses.
- Courses in Media Education can be provided for all departments in Education Faculties, especially Social Studies teachers, responsible for Media Literacy course.
- In order for Communication Faculty graduates to give Media Literacy course, there should be Media Literacy Non-thesis master's programs in which they can get teaching formation certificate.
- Media Enterprises can be encouraged to support Media Literacy education.
- In-service training opportunities can be provided for teachers in Media Literacy.

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International Electronic Journal of Elementary Education, 2012, 4(2), 287-300.

Open-ended Tasks in the Promotion of Classroom Communication in Mathematics

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Received: October 2011 / Revised: February 2012 / Accepted: February 2012

Abstract

Mathematics programmes in basic education are currently undergoing reform in Portugal. This paper sets out to see how teachers are putting the new guidelines for the teaching of mathematics into practice, with particular emphasis on maths communication in the classroom. To achieve this, an experiment in teaching the topic 'Sequences and Regularities' with open-ended tasks, using a qualitative and interpretative approach, is reported. Data were collected during two class observations, from two interviews and by analysing the activities of the students. An exploratory task was chosen in the first lesson and a investigative one in the second. One month separated the two lessons, and during this time the teacher read and discussed texts on mathematics communication. Observation of the first lesson showed that the communication in the classroom was mostly focused on the teacher, which provided little student-student and student-class interaction. In the second observed lesson, the teacher changed the attention she paid to what each student said and did, encouraging the students to ask each other and encouraged student-class and the student-student communication.

Keywords: Reform of mathematics programmes; teaching mathematics; open-ended tasks; forms of communication; sequences and regularities.

Introduction

The constant evolution of knowledge in the field of mathematical education determines the changes that are made periodically in maths programmes. In Portugal, the reformulation of the basic education maths programs, which began in 2009/10, is now in the implementation stage and covers all the school years this academic year[1]. The basic education maths

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[1] The Portuguese education system encompasses 12 years prior to entry into higher education, as in most countries. The first nine of these years comprise basic education and the last three are secondary education. Basic education consists of three cycles: the first lasts four years with just a single teacher; the second lasts two years, and the third lasts three years. During these nine years the maths curriculum is same for all students. In the three

ISSN:1307-9298

programme that is being overhauled has existed since the early nineties (1990 for the 1st cycle and 1991 for the 2nd and 3rd cycles). The publication in 2001 of the National Curriculum for Basic Education brought changes to the previous programme, especially to the learning goals and objectives and to the way that maths topics are addressed. These changes are justified by the need to update the curriculum to the new ways of developing knowledge about the teaching and learning of mathematics and to improve the coordination between the programmes of the three cycles. The programme begins by presenting the general aims and objectives of the teaching of mathematics, which are the main goals shared by three cycles of basic education. Next, it presents the mathematical topics, numbers and operations, geometry, algebra, organisation and data processing.

The present reformulation focuses on the organisation of maths topics that link together the different teaching cycles and the methodological guidelines for teaching these topics; the emphasis was on the cross-disciplinary aspects to be developed over one school cycle – resolution of problems, mathematical reasoning and mathematical communication. Regardless of the study topic, the teaching of mathematics currently recommends the use of strategies which value student activity over a teaching process that is essentially centred on the activity of the teacher, where students mainly listen to and do what the teacher asks (Nicol, 1999, NCTM, 2007). But the conceptions of the teacher about the act of teaching go hand in hand with the curricular reforms (Ponte, 1992), conceptions that are very often focused on teacher authority in validating what happens in the classroom. When appraising what the student says and does in classroom activities, the how the teacher stimulates and manages mathematics communication is paramount. Current methodological guidelines for the 3rd cycle program are that the teacher should present different types of tasks that enable the "comparison of results, the discussion of strategies" (Ministry of Education, 2007, p. 8). Teaching strategies therefore involve engaging the students in activities of analysing, doing, listening, reflecting, arguing, and discussing. Such activities affect how teachers evaluate students' reasoning and encourage them to analyse and respond to other students' reasoning, which relates to how mathematical communication is promoted during classroom work:

> The creation of adequate opportunities for communication is assumed to be an essential part of the work being done in the classroom. (...) Students compare their problem-solving strategies and identify the arguments made by their colleagues through oral discussion in class. They have the opportunity to clarify and explain in more detail their strategies and arguments through written work. (Ministry of Education, 2007, pp. 8-9)

Mathematics communication is essential to enabling students to understand about processes, discussions and decisions that are made. However, the achievement of curricular rules depends on how they are interpreted by teachers and on how they adjust them to their own conceptions on the act of teaching. In order to see to what extent the methodological guidelines are produced in practice, we seek to ascertain how maths teachers promote mathematical communication in the classroom through open-ended tasks.

Communication in mathematics classes

Taking the classroom as a special place for relationships between students and between them and the teacher, the way that this relationship is promoted becomes fundamental in the development of the teaching and learning process. By regulating the social interactions that are generated in the classroom, communication enables the sharing of ideas and clarification of mathematical understanding. Here we have a perspective of teaching that

years of secondary education, where students begin to be routed to a group of higher education courses, the maths curriculum varies according to whether courses in sciences, humanities, arts or technology are followed.

stimulates students to explore and make sense of the mathematical activities that are developed (Brendefur & Frykholm, 2000; Nicol, 1999). The way in which the teacher promotes verbal or written communication determines how the students voice their doubts and justify their ideas. Sharing and comparing the processes results in ways of thinking that promote the significance of mathematical concepts. When the students establish conjectures and discuss the activities with their colleagues, new collaborative knowledge is developed, which ensures that mathematics is seen as a normal human activity (NCTM, 1994).

Brendefur and Frykholm (2000) classify classroom communication as uni-directional, contributive, reflective and instructive. In uni-directional communication "teachers tend to dominate discussions by lecturing, using essentially closed questions. They create few opportunities for students to communicate their strategies, ideas and thinking" (p. 126). In contributive communication the teacher gives the students opportunities "to discuss mathematical tasks with one another, present solution strategies, or help each other to develop solutions and appropriate problem solving strategies" (p. 127). In reflective communication what the students and teacher do "becomes the subject for discussion. Reflective discourse often occurs when students try to explain or refute conjectures offered by their peers" (p. 128). In instructive communication the interactions that occur in the classroom help the students to construct and modify their mathematical knowledge. By verbalising their ideas, the students allow the teacher to understand their thinking processes, their effectiveness and limitations, to alter the way the lesson develops and to draw conclusions for future situations. Apart from uni-directional communication, the other types describe forms of communication to stimulate students to share their ideas, their thoughts, conjectures and mathematical solutions. This is precisely the direction indicated by the new basic education mathematics syllabus when it recommends that "students must be able to express their ideas and to interpret and understand the ideas that are presented and participate constructively in discussions about ideas, processes and maths results" (Ministry of Education, 2007, p. 8).

As for asking questions, the NCTM (1994) considers that the questions that the teacher formulates help students to make sense of their activities, to be able to decide whether something that is or is not mathematically correct, to speculate, argue about and resolve problems and to link mathematical ideas and applications. Moyer and Milewicz (2002) identified various strategies for questioning that the teacher can adopt: (1) *follow the questions as planned*, whereby the teacher passes from one question to another with little consideration for the students' answers; (2) *teach and transmit*, whereby the teacher plants questions to direct the students' answers and stops asking questions in order to teach the concept to be tackled without encouraging the students to think or frame a response; (3) *ask questions and give follow up*, whereby the teacher uses different types of questions to find out more about the ideas of the students and to meet their questions with other relevant questions, thus giving them the idea that their response is still open for discussion; (4) *only question a wrong answer*; (5) *non-specific questioning*, when the teacher follows up the students' answers but with questions that indicate a lack of specificity; and (6) *competent questioning*, when the teacher listens to the students' answers and uses them to gather information about their way of reasoning.

The use of each of these strategies shows the importance that a teacher gives to questioning in the activities carried out in the classroom. Besides the right questions at the right time, Nicol (1999) says that teachers should know how to listen to their students – by paying attention to their words and trying to understand their contributions – and to respond to their actions constructively. A good question represents the difference between constraining

students' thinking and encouraging new ideas, and between their retaining trivial facts or constructing meanings (Moyer & Milewicz, 2002).

The nature of the tasks in promoting communication in mathematics

One good way to encourage maths communication is to provide the students with a learning environment that arouses their active participation. One way of doing this is to use challenging tasks (Ponte, 2005). Stein and Smith (1998) draw attention to the importance of choosing tasks that challenge the students to think, justify, explain and find meaning and which stimulate them to make connections. The NCTM (1991) takes the same stand by recommending that the tasks permit students to actively "explore, formulate and test out conjectures, prove generalisations and discuss and apply the results of their investigations" (p. 148).

The nature of the tasks can have implications for how students are involved in the construction of their mathematical knowledge. Ponte (2005) distinguished tasks according to their degree of difficulty (low/high) and their structure (closed/open). Though exercises and problems may be of a closed structure, they will differ in their degree of difficulty. Exercises have a low degree of difficulty, which appeals to the mechanisation and repetition of the processes in pursuit of the intended response. Problems have a higher level of difficulty since they translate non-routine situations for which students do not have an immediate solution process and which can be solved by various methods. These characteristics are also present in investigative task that - according to Ponte - requires students to participate in the "specific formulation of their own questions to be solved" (p. 15), to search for regularities, establish and test conjectures, argue and communicate their processes and their conclusions.

The tasks in which the students carry out a set procedure that is memorised in a routine way are, for Stein and Smith (1998), much less rewarding than the tasks that challenge the students to establish connections between mathematical concepts, to reason and to communicate mathematically. Osana, Lacroix, Tucker and Desrosiers (2006) stress the use of open-ended tasks which favour students' involvement in class activities and encourage them to explore and investigate, increase their motivation for generalisation, look for models and links, communicate, discuss and identify alternatives.

However, the selection of tasks does not in itself guarantee effective teaching. Teachers are crucial to determining the "aspects to be underlined in a given task; like organising and guiding the work of the students; what questions to ask, so as to challenge the different levels of skills of the students" (NCTM, 2007, p. 20). It is important for the students to "work on mathematical tasks that set up relevant subjects for discussion" (NCTM, 2007, p. 66). Discussion is thus the next step after the implementation of the set tasks, thus making it possible for the student to think, rationalise and communicate mathematically. Stein, Engle, Smith and Hughes (2008) set out five practices that promote discussion:

> (1) *anticipating* the students' likely answers to cognitively demanding mathematical tasks; (2) *monitoring* the students' answers to the tasks during the exploratory phase; (3) *selecting* some students to present their mathematical responses during the discussion phase; (4) *intentionally sequencing* the students' responses; and (5) *helping* the class to make mathematical connections between the students' different responses. (p. 321)

These discussion practices contribute to teachers using the students' answers, so as to develop the mathematical understanding of the class. It is within this framework that this study intends to analyse how maths teachers, promote mathematical communication in the classroom through open-ended tasks, during the implementation of the methodological guidelines for the current maths programmes of the third cycle of basic education.

Method

This study is about an experiment devised by two teachers, Mariana and Inês, on the methodological guidelines resulting from the reformulation of the basic education mathematics programme. To increase the implementation of these guidelines, the Ministry of Education created a national network for monitoring it, which consists of university lecturers and teachers representing a group of schools from the same geographical area. These representatives meet regularly with teachers from schools in their area to review and discuss the theoretical assumptions that underlie the changes made in the basic education mathematics programmes. This move had an impact on the professional practice that teachers develop in their schools. The individual work has led to work on an equal footing in the preparation, observation and discussion of lessons, sharing the experiences with their students and discussion of texts on the field of mathematics education. This is context of the work that Inês and Mariana undertook to implement the curriculum in a 7th year class. Mariana was the class teacher and Inês the representative of the schools in their geographical area; both have 13 years teaching experience.

When implementing the methodological guidelines of the revised programme, they paid special attention to the relationship between communication in the mathematics classroom and the tasks the students are set. They therefore chose a topic, *Sequences and Regularities*, for which the new programme specifies a different approach from the previous one. The two teachers together prepared two classes, the first and last on this topic, with open-ended tasks. This topic deals with the general term of a numerical sequence, representation and algebraic expressions.

In the first class, Mariana implemented an exploratory task, while the second class involved a task of an investigative nature. The exploratory task – *V flight* – provides patterns with geometric figures that change at each position according to a rule. The work might be very intuitive at first, describing her natural reasoning, with the use of diagrams, the submission of calculations or the use of symbols. Students can use different strategies to characterise a next term: analysis of the previous figures, analysis of regularity in the associated numerical sequence and decomposition of the figure into parts. When characterising a distant term, students can compare the figure number with the number of points in this figure. The investigative task - *Explorations with numbers* - lets different paths be followed to obtain various regularities and numerical relationships. Students are challenged to hypothesise, test and reformulate their conjecture and generalise. This task promotes written communication as students are asked to describe the regularities identified using natural language and mathematical language. The task provides an opportunity for students to express themselves orally in student-student dialogue on the regularities found, when they work in pairs or groups. Students have to indicate clearly and use a mathematical language appropriate to their findings so that they all understand and can verify that these are always valid. They can also see if the same conclusions are reached, if other ones are reached, or if, based on the findings of their colleagues, they can identify new regularities.

The two classes were observed by Inês, whose attitude was that of non-participant; she focused on the interactions between Mariana and her students during the collective discussion. The time between the two classes was about a month, to ascertain: (1) the development of student participation in classroom discussions and their involvement in learning the sequences and regularities topic, and (2) the teacher's progress in monitoring these discussions, after meetings with Inês when they read and discussed texts on mathematical communication in the classroom.

Following a qualitative interpretative methodology, data were collected through two audiotaped interviews that Inês held with Mariana - one before the experiment (I1) and one after (I2) -, the observation of two classes by Inês (CO1 and CO2), recorded on video, of the discussion of these classes (DCO1 and DCO2) and activities produced by the students. From the analysis of data collected by these methods, the information was organised thus: (1) Mariana's class involving an exploratory task; (2) Mariana's class involving an investigative task; (3) Mariana's views about the influence of the tasks on classroom discussion.

Results

Mariana has been a teacher of mathematics for 13 years - a profession that she thought of following in her ninth school year, as she very much liked this subject. In the current academic year (2009/10) her job was to co-ordinate the third cycle in the implementation of the Mathematics Syllabus of Basic Education (MSBE) in her school and to teach a seventh year class and an education course class. Her 7th year class consisted of 13 boys and 6 girls. It was an uninterested class; 47% of students had failed mathematics at the end of the 1st period.

From her professional career Mariana highlights the moment when the test became mandatory for 9th year students. She explains this because she sees exams as a way to regulate the practice of maths teaching and to encourage varying the type of tasks. For example, she says that prior to mandatory examinations the tasks that prevailed were mainly "exercises" (I1). Realising that national exams have open-ended tasks, she saw that "there could not be more of the same, because the exams involve more than just exercises" (I1). With regard to the changes that have occurred in the pedagogical practices of teachers she stresses that "the collaborative work that has emerged over the past three years and the receptivity of teachers has opened the classroom door to other colleagues" (I1). This year, more than any other, she worked a lot with her colleagues. Thanks to the implementation of MSBE, she met periodically with her colleagues, who are also teaching the seventh year. At these meetings they prepared worksheets and tests, studied and defined strategies and debated the difficulties encountered in implementing them.

One of Mariana's classes involved an exploratory task

To start the topic of *Sequences and Regularities*, Mariana selected the task 'Flight in the V (formation) of ducks' because it allows: (i) checking if a number is a term in a sequence, (ii) determining the order of a known term, (iii) understanding the notion of a general term of a sequence, and (iv) formulating and testing conjectures.

In the sequence that follows each figure represents a flock of ducks and each dot represents one of the ducks in the flock. Here are the first four terms:

Answer the following questions and state your reasoning using words, diagrams, calculations or symbols.

1.1. How many dots does the next figure of this sequence have?

1.2. How many dots does the hundredth figure (term of the order 100) of this sequence

have?

1.3. Is there a figure with 86 dots in this sequence? If there is, indicate the order to which it corresponds.

1.4. Is there a figure with 135 dots in this sequence? If there is, determine the order to which it corresponds.

1.5. Write a rule for determining the number of dots in each figure of this sequence.

1.6. Write an algebraic expression that expresses the rule described in the previous question.

Figure 1: Exploratory task given to the students, about sequences and regularities.

The teacher started the class by organising the students into groups, and by instituting the following rules: "tell your ideas to each other (…) at the end we are going to discuss the conclusions and share the different strategies" (CO1). Next, she gave the task to all the students and delivered to each group an OHP transparency on which to record their responses. The students began to solve the tasks without any explanation from the teacher, who was busy with the management of the group work: "exchange ideas, explain your reasoning and only then write your answers on the transparency" (CO1). When the students showed they were having difficulties, Mariana asked questions to guide them in the activity that they were carrying out, as is shown in the following example:

Student: The rule is to add 2 to the previous figure.

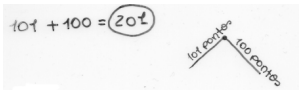
Teacher: In fact, adding 2 to the number of dots in the previous figure does allow you to discover the number of dots in the next figure but will this be a practical strategy to find the number of dots in the hundredth figure? Look at the various figures. What other characteristics do they have? What can we use to represent the given information? (CO1)

In the discussion phase, when the spokesman of one group presented its solution, the rest of the students in the class did not intervene spontaneously. The attention of the teacher centred on the answers that were given by each group spokesman and she confirmed them with statements like "very good" (CO1). When the answers were wrong, Mariana asked another group for its answer. After the presentation of the solutions by the group spokesmen, the teacher would interpret the solution by repeating what the student had explained:

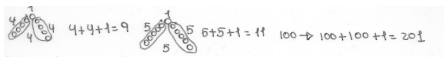
Student: I made 101+100 = 201. The explanation is that in Figure 1, 2+1 = 3; in Figure 2, 2+3 = 5; in Figure 3, 4+3 = 7; thus in Figure 100, 101+100 = 201

Teacher: Do you see what he found out? Do you see how? Perhaps it was geometrical, wasn't it? Is there another group that also saw this characteristic? Who did? Was it you Tiago? Did anyone see it another way?

Diana: We drew a diagram. On one side we put 101 and on the other 100



Teacher: This group used the same reasoning only they drew a figure. In Figure 100 they imagined that on one side of the V they had 101 and on the other they had 100. So $100+100+1=201$. (CO1)



The determination of the number of dots in Figure 100 helped some students to formulate and test conjectures. Only two groups indicated the general term ($n \times 2+1$ and $c+c+1$). In this generalisation, one of these two groups turned to symbolic representation and the other group expressed their reasoning through symbolic representation and a diagram.

Mariana's class involving an investigative task. For this class, Mariana selected the task *Explorations with numbers*[2] so that she could encourage mathematical communication between the students in the discovery of numerical regularities and relationships.

Look at the following table:

0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
…	…	…	…

Answer the following questions. Give your reasoning using words, diagrams, calculations or symbols.

1.1. Continue the representation of the table presented above until you obtain the number 40.

1.2. Assume that this table continues indefinitely. Identify the regularities that you manage to find.

1.3. In this table can you predict in which column you will find the number 64? And in which line?

1.4. Can you predict in which column you will find the number 99? And in which line? Explain how you proceeded.

1.5. Taking any number, can you predict in which column and in which line it will be found in this table? Explain your answer.

Figure 2: Investigative task proposed to the students about sequences and regularities.

With this task Mariana wanted the students to guess in which line and in which column a specific number would be found, so that they would manage to generalise for any number. As she wanted to involve the students in the discussion about the task, Mariana set the rule that whoever "does the presentation must involve the others and these others must ask questions, request explanations and, if they do not agree with what is being said or wish to add something, that they should intervene" (CO2).

The first regularity encountered by the students was the multiples of 4, which encouraged the students to "look for other multiples" (CO2). When she found that they were only concerned with discovering multiples, the teacher encouraged them to look for "another type of number, one that we have already talked about in class (…) you have to communicate, describe the regularity encountered and write the algebraic expression" (CO2). When presenting their activities, the students identified some regularities and showed the general term of the sequences that they had found:

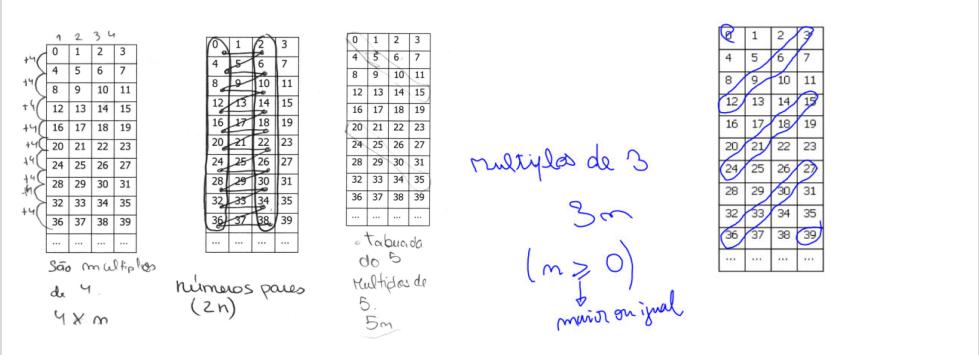
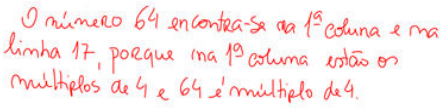


Figure 3: Students' solution of some questions from the *Explorations with numbers* task.

[2] Ponte, J. P., Branco, N., and Matos, A. (2009). *Álgebra no ensino básico*. Lisboa. Ministério da Educação, DGIDC.

In relation to the question "Can you predict in which column you will find the number 64?" one student gave his group's answer on the interactive board, which exemplified the sort of communication that livened up some parts of the class:

Diana: The number 64 is in the first column and on row 17, because the multiples of 4 are in the first column and 64 is multiple of 4



Teacher: Read Diana's answer.

Student: Why is it on line 17?

Diana: I always added 4 to the numbers in the first column and arrived at 64. It gave 17.

Student: It would be 4x16.

João: I did the table. I was writing the numbers and I got to 64.

Teacher: This is not the purpose of the question; it is to predict and not to confirm. Did anybody find a strategy for prediction? Somebody did? Did anybody manage to predict why it is line 17? I will have to give a hint….

Student: Wait a minute…

Students: I know! I know!

Teacher: Work on your idea. Think better! Keep thinking and check your strategy!
[Mariana gave them a little more time to think]

Teacher: Diana, have you got it yet?

Diana: No.

[The teacher asks Diana to sit down and lets Rui speak]

Teacher: Those who do not understand ask Rui.

Rui: 4x16 gives 64. But the 4 isn't on the first line, 4 only comes on the second line.

Students:I don't understand.

Teacher: You didn't write what you've said …

Rui: It's the way it is, 4x16 = 64. Since 4 doesn't come on the first line, this gives 17.

Teacher: Who doesn't understand? Ask Rui questions. Those who already know can help Rui to explain (the answer).

Renato: I don't understand your explanation.

Rui: 64 is in the first column. But, as the 4 isn't on the first line, you have to add 4 by 4, 16 times from 4 [the student exemplifies with gestures next to the table]. Afterwards you have to add the first line. Thus it's on line 17.

Teacher: Anybody want to add anything? Is it clear now?

Students: Yes.

Teacher: Good… but we need to complete the answer. You get there without me giving a hint. (CO2)

The teacher tried to get the students to ask the colleague that presented their answer one of the specified questions. The question was a form of contributive communication sustained

by student-student, teacher-student and student-class interaction. There were only a few spontaneous interventions from the students, which raised the question: what happened to the requested explanation? The students begged their colleague for explanations instead of asking Mariana.

Synthesis of Mariana's two classes

The way the communication was promoted in the two maths classes differs, as noted in the interaction that develops between the teacher and students in each class.

Table 1. *Promoter of the communication in the classroom.*

	Lesson 1	Lesson 2
Initiations		
Request response	Teacher	Teacher and students
Request for explanation	Teacher	Students
Answers		
Answer	Students	Students
Explanations	Students and teacher	Students
Reconceptualisation		
Reaffirm	Teacher	Students
Expand	-	Students
Reformulate	-	Students
Validate	Teacher	Students and teacher

In the first class, when students presented their activities, their colleagues generally did not participate willingly. The teacher tried to get the students to justify their answers. But, was Mariana who validated almost all the answers and who interpreted the students' presentation to the class. After a student gave his explanation the teacher tended to reaffirm what this student said. When questions arose, students directed them at the teacher.

In the second class, the students were more attentive to the presentations of their colleagues and student-student interaction was more frequent. The divergence of answers that the task provided meant that students gave presentations that had not been explained. The teacher took care not to validate the answers and so created space for the students to do it. When the students asked the teacher, she sent the question back to the class, which meant that they sometimes addressed and asked colleagues who were presenting their activity.

Mariana's views about the influence of the tasks on classroom discussion. In terms of the methodological guidelines that have emerged from the reformulation of the Mathematics syllabus for Basic Education, Mariana pointed out "the type of tasks that are different from those usually implemented and the topics that are approached in an exploratory way by discovery" (I1). For Mariana, the effect of the exploratory tasks on the learning of the students raised "many doubts about whether we would get better results, whether the students would be more competent mathematically (…) we have a lot of work and little supervision" (I1). She assumed that she would not always make "the students interact with each other, perhaps because they aren't used to it" (I1). Before the experiment, Mariana recognised that the form of communication that predominated in her classes was uni-directional communication sometimes with interpolations when the students would be asked "to justify their reasoning and explain how they think" (I1).

When analysing the first class observed, Mariana identified critical aspects of her action, such as a tendency to repeat what the students said and did and the difficulty of encouraging the students to discuss their activities with one another:

> The students explain and there's something I always do, but I don't know if it's good or bad; the students explain and I repeat their explanation, I don't know if I should do that. Another thing that I think is that I don't promote student-student communication, which I think is very difficult, but some people think it can be done. Student-class and student-teacher communication exists, but student-student - the type where one student puts their hand up and asks another – there's none of that. It may have happened in groups but in groups it is very difficult to evaluate, we would have to monitor each group closely. They put their hand in the air to give their answers or when a student answers badly, but they don't ask questions. I have to improve student-student communication. (DCO1)

The teacher recognised that the students did not question their colleagues' answers and she questioned the way that she promoted the confirmation of the students' answers: "I always confirm, never ask if they agree... I should ask for another strategy leaving out the previous automatic ratification" (DCO1). She was aware, above all, that she asked questions from her point of view and that she gave little time for the students to respond to what she ended up doing. In the class discussion of a presentation by the spokesman of one group, Mariana was able to solicit an explanation from this group and later on she was able to direct another group to present an explanation that would contradict or supplement the one given.

From the analysis of the second class, Mariana identified the initiative of the students in stimulating communication between them without her having to intervene, which in her view she did not manage in her previous classes: "I had the students communicating more student-student" (DCO2). Although she had used easy questions, she recognised that the question of generalisation was only understood by some students, which she would have widened if "in the previous questions, she had prepared them better for managing to generalise" (DCO2). Time limited her action and this prevented her from "exploring what the students did a little more" (DCO2). When comparing the two classes, the teacher considered that "in the first the discussion was very much centred on me, it was me that confirmed" (I2), while "in the second class I gave more opportunity to the students but it made the class more time-consuming" (I2).

Including open-ended tasks in the classroom has implications for the care and time necessary for their preparation. Carrying out of this type of task ensured that Mariana paid heed to what the students said and did and she had to look for ways of involving them in class discussions:

> I liked to prepare the class, where I would have a place for discussion and not simply the preparation and solving of the task, more frequent in my day-to-day work. I was aware of the importance of frequent class discussions between the students and paid attention to my efforts to promote these discussions. During classes I asked myself: Are they communicating among themselves? What questions should I put? And if this happens, what should I do? Should I wait a bit longer? What example should I choose to stimulate discussion? (I2)

Besides the structure of the task, the rules that the teacher established for carrying out the student activities and the conceptions she had about the teaching of mathematics tended to influence how the students engaged in the class activities:

> All the same it was very difficult to involve many students in mathematical discussions and, while there was some progress between the first and second classes, the students did not communicate with each another but limited themselves to setting out their ideas. It was me that was always intervening, essentially by asking pointed questions and finishing off by confirming the answers. The student interventions coming from the class were short (presentation of their answers) and limited, since the interaction was predominantly from teacher to student. However, there were times when the students

> questioned their colleagues and gave valid reasons, leaving me in a less prominent position. All the same, the students' contributions came close to influencing the course of the lesson with some inspired discoveries and questioning about them by the others. Inquiry questions predominated in discussions about the task of this class up to question 1.5, which is not my normal practice, while for question 1.5 focusing questions were asked, which is more normal for me. (I2)

The completion of the two tasks in the classroom enabled Mariana to perceive the influence that her conceptions had on the way that she promoted communication: uni-directional communication - with little space for the students to intervene and, when they did, it was to present answers - gave way to contributive communication during the presentation and discussion of the students' solutions, which tended to influence the course of the class. Her openness to innovate in her practice contributed to this change and it also helped her to read and discuss with colleagues texts about the didactical aspects of teaching.

Discussion

Of importance to the translation of the methodological guidelines of the current school syllabuses are the nature of the tasks that teachers should adapt for their classes, and particularly the attention to be given to student activities, as this gives an understanding of the way others think. The conceptions that teachers develops in their professional career about the teaching of mathematics tend to hamper the implementation of these guidelines (Ponte, 1992). Willingness to innovate in teaching practice and a critical analysis of it help to overcome some obstacles, as observed in the teaching practices of Mariana in relation to how she fostered communication with her students. Although she considered that discussion of classroom activities is one factor that stimulates student learning, the teacher did recognise the difficulty students have with the presentation of alternatives to the proposals presented by their colleagues. This difficulty tends to be due to the habits that students develop in learning environments where the authority of the teacher in the management of classroom activities prevails (Moyer & Milewicz, 2002; Nicol, 1999). It is the belief that teaching is a uni-directional process of transmitting information to students in a way that enables them to reproduce what the teacher says and does (Brendefur & Frykholm, 2000).

Before completing the exploratory task, Mariana questioned the importance ascribed by the methodological guidelines to this type of task in student learning, because of the time it requires, which would indicate a preference for repetitive tasks of a lower cognitive level (Stein & Smith, 1998). In this way she became aware of her fears about organising the students in groups in her classes. Such fears were overcome in the class in which she proposed the exploratory task covering the topic '*Sequences and regularities*.' As the students were not used to working in groups, the teacher stated some rules about how the students should communicate their ideas to the others. She herself realised that it was not the rules that she defined or the nature of the tasks that were chosen that really altered the atmosphere in the classroom. In the first lesson observed, teacher activity prevailed to the detriment of student activity. When a student from one of the groups presented its solution, the others did not intervene. Mariana tended to explain what the students were doing by repeating what they said, and to ask planned questions (Moyer & Milewicz, 2002). After the class with the exploratory task, the teacher recognised in this class that she repeated what the students said and did. She did this for the benefit of students who did not question their colleagues who had presented their solutions. Although Osana et al. (2006) consider that tasks of an open nature stimulate students to engage in class activities, Nicol (1999) stresses the importance of teachers knowing how to listen to their students in order to encourage them to discuss the classroom activities. Only then, as suggested by Moyer and Milewicz

(2002), can the teacher use student responses to collect information about their way of thinking.

The reading and discussion of texts about mathematics education with other maths teachers made it clear that Mariana needed to hear more about what her students said and that she needed to develop in them the habit of asking their colleagues when they had doubts or had other strategies for solving the task. This is what happened in the class with the investigative task. The students put questions to their colleagues, who answered, and when they had doubts they did not put them to the teacher but to their colleague who was presenting his group's solution, with the aim of understanding the answers he gave. As the prevailing forms of communication tend to move away from uni-directional, students contribute to the course of the class and give meaning to learning (Brendefur & Frykholm, 2000). These are the guidelines that are emerging from the current programme of the 3º cycle (Ministry of Education, 2007).

Comparing the two classes, the teacher confessed that in the first class the students did not communicate with one another; there was no direct communication between them, and that she herself neither give them time nor stimulated student-student communication. She realised the need to try to get the students to present their ideas and to ask each other questions by taking on the role more of a moderator (Stein et al., 2008). Mariana admitted that it is "very difficult to involve many students in mathematical discussions but I noted some improvement from the first class to the second one, when there were times when the students questioned colleagues and confirmed reasoning, while I stayed more in the background" (I2). In the second class the teacher felt that "the contributions of the students came closer to influencing the course of the class with inspired discoveries and questioning from the others about these discoveries" (I2). The change in the way that she encouraged student communication gave the impression that it was due, as advocated by Stein and Smith (1998), to the higher cognitive level of the task that she proposed, which stimulated the discussion and formulation of conjectures. But also it was due to the attention that the teacher gave to the students' answers. Consideration of what the students say and do must become part of a classroom culture that is nurtured in the earliest of school years and should persist in the more advanced years. Only then will the students understand that their involvement in class activities is not only enriching their own learning but it is also enriching the learning of their colleagues. The discussion of texts on mathematical communication with a colleague and the divergent nature of the open-ended tasks played a major part in bringing about this change.

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International Electronic Journal of Elementary Education, 2012, 4(2), 301-315.

On-line and Off-line Assessment of Metacognition

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Received: Dec ember 2011 / Revised: February 2012 / Accepted: March 2012

Abstract

The study investigates the interrelationships between different on-line and off-line measures for assessing metacognition. The participants were 47 fifth grade elementary students. Metacognition was assessed through two off-line and two on-line measures. The off-line measures consisted of a teacher rating scale and a self-report questionnaire. The on-line measures were thinking aloud protocols and accuracy ratings of text comprehension. The results showed positive significant correlation between data from two off-line measures and negative significant correlation between data from two on-line measures. The off-line metacognitive measures had non-significant correlations with all on-line measures. Principal Component Analysis, performed on four metacognitive measures, yielded a two-factor solution and this two-factor solution accounted for 71.5 % of the sample variance. The data from two off-line measures loaded on the first component with a variance proportion of 38.6 % and the data from two on-line measures loaded on the second component with a variance proportion of 32.9%. The findings of the study showed that metacognitive processes form a complex structure that needs to be assessed using various methods. However, in the multi-method studies, using on-line and off-line measures together will be appropriate rather than using only on-line measures or only off-line measures.

Keywords: Metacognition, on-line/off-line assessment, think aloud, accuracy rating, self-report, teacher ratings.

Introduction

Over the past thirty years, there has been growing interest among researchers in the study of metacognition. Flavell (1979), defined metacognition as "the individuals' knowledge about cognitive processes and the application of this knowledge for controlling the cognitive process". Metacognition has been postulated as a multifaceted and overarching structure

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ISSN:1307-9298

www.iejee.com

made up of sub-elements, each having different features. Flavell (1979) classified metacognition into two dimensions, as metacognitive knowledge and metacognitive experiences; and Brown subsumed metacognition under two dimensions namely, knowledge of cognition and regulation of cognition. In both classifications, the second dimensions are defined similarly as an individual's monitoring, controlling and regulating his/her own cognitions. According to Efklides (2006; 2009) metacognition has three subcomponents, namely, metacognitive knowledge, metacognitive experiences and metacognitive skills. Recent research shows that metacognition is taken as a three-faceted structure being *metacognitive knowledge, metacognitive monitoring* and *metacognitive control* (Dunlosky & Metcalfe, 2009).

Metacognitive knowledge involves knowing one's own cognitive characteristics (knowledge of person), the nature of different cognitive tasks (knowledge of task) and the possible strategies that enable the fulfilment of different cognitive tasks (knowledge of strategy). Because metacognitive knowledge is stored in the long-term memory, by nature, it is relatively static and declarative knowledge (Flavell, 1979; 2000). *Metacognitive monitoring* refers to assessing or evaluating the ongoing progress or current state of particular cognitive activity. *Metacognitive control* pertains to regulating on ongoing cognitive activity (Dunlosky & Metcalfe, 2009).

It's obvious that how metacognition is modelled is closely related to both the assessment methods of metacognition and the results that are concluded from these assessments about the metacognitive processes. For this reason, it is important to examine the methods for assessing metacognition. Metacognition can be assessed by many different methods. These methods are usually classified as on-line or off-line according to when they are collected (Desoete, Roeyers & De Clercq, 2003; Pintrich, Wolters & Baxter, 2000; Veenman, 2005).

On-line Measures

On-line measurements are collected while the individual is engaging a specific task in hand. They assess domain specific metacognition with a focus on the learning process. Typically, individuals are recorded during task performance. Think-aloud protocols, accuracy ratings and systematic observations are on-line measures frequently used to assess metacognition.

In *think-aloud protocols*, individuals are instructed to think aloud while they are working on a specific cognitive task. The researcher interferes as little as possible. All utterances are recorded on audio or video-tape. Afterwards, the recordings are transcribed and metacognitive activities are scored according to a coding scheme (e.g. Cromley & Azevedo, 2006; Pressley & Afflerbach, 1995; Thomas & Barksdale- Ladd, 2000; Veenman & Beishuizen, 2004; Veenman, Elshout & Meijer, 1997; Veenman, Kok & Blöte, 2005; Veenman & Veheij, 2003). *Accuracy ratings* refer to ongoing assessments of learning or performance. In this methodology, the individual performs a criterion task and immediately makes a judgement regarding confidence, ease of solution judgements or performance accuracy (Schraw, 2009). The absolute difference between an individual's rating and her/his actual performance is calculated (e.g., Hacker, Bol & Bahbahani, 2008; Hacker, Bol, Horgan & Rakow, 2000; Nietfeld, Cao, & Osborne, 2005; Pressley & Ghatala, 1989). In *systematical observation*, data is collected during individuals' task performance. The judges observe the individual during task performance and/or watch videotapes afterwards and score the individual's metacognitive behaviours (e.g., Veenman, Kerseboom & Imthorn, 2000; Veenman, Kok & Blöte, 2005).

Off-line Measures

Unlike on-line measures, off-line measures aim at assessing metacognition either in general (i.e. without any explicit reference to a specific task) or specific to a task. Task-specific off-line

measurements are collected retrospective to task performance. Common off-line techniques are self-report questionnaires, interviews, and teacher ratings.

Self-report questionnaires are usually Likert type scales, developed with the aim of assessing metacognition. Generally, two types of metacognitive questionnaires are used in metacognition research: general and domain specific. General metacognitive questionnaires are designed to assess metacognition independent of any specific domain (e.g., Pintrich, Smith, Garcia, & McKeachie, 1991; Schraw & Dennison, 1994; Sperling, Howard, Miller & Murphy, 2002). Domain specific self-report questionnaires are generally developed with the aim of assessing metacognition in a single domain such as reading, problem solving, etc. (e.g., Mokhtari & Reichard, 2002; Schmitt, 1990; Fortunato, Hecht, Tittle, & Alvarez, 1991). Another off-line technique to assess metacognition is *interview protocols*. Mainly, there are three varieties of interview protocols encountered in metacognitive research. One way of assessing metacognition using the interview protocols is to simply ask the subjects to describe what is typical behaviour under certain circumstances (e.g., Myers & Paris, 1978; Paris & Jacobs, 1984). Alternatively, individuals are asked to describe their metacognitive behaviours after completing a specific task (e.g., Artzt & Armour-Thomas, 1992). In more advanced interview protocols, hypothetical learning situations are depicted and subjects are asked what they would do in these particular situations or they are asked to generate as many possible strategies that can be used in such situations as they can think of (e.g., Annevirta, Laakkonen, Kinnunen & Vauras, 2007; Zimmerman & Martinez-Pons, 1988, 1990). *Teacher ratings* are another off-line way of assessing metacognitive levels of school-age children. The teachers are requested to evaluate their students' metacognition on a rating scale (e.g., Bingham & Whitebread, 2008; Desoete, 2008; Sperling, Howard, Miller & Murphy, 2002; Whitebread & Coltman, 2010; Whitebread et al., 2009).

Although studies in this area are increasing exponentially, it is observed that there are still issues related to measuring metacognition (Winne & Perry, 2000; Veenman, 2005). These issues are not only limited to the development of various techniques aimed at measuring metacognition but also the need to analyse the correlation between these techniques as well as their validity, reliability (Schraw, 2009).

Relations among Metacognitive Measures

Results from several studies using multiple metacognitive measures discredit the measures that are frequently used in metacognitive research and compel researchers to scrutinize what they are actually measuring. For instance, in studies using multiple on-line measures, in general, significant correlations are reported between measurement methods. Veenman, Kerseboom and Imthorn (2005) and Veenman, Kok and Blöte (2005) examined the metacognitive skills of 12- and 13-year-olds using on-line systematic observation and think-aloud protocol analyses. They reported a significant correlation between the assessment methods (r= .78 and r= .89, respectively). Veenman, Wilhelm and Beishuizen (2004) reported that the results of the logfile and think-aloud protocols in university students yielded high correlation values. Log file measures and protocol analysis correlated .85 for the task in the domain of biology and .84 for the task in the domain of geography with one another. Cromley and Azevedo (2006), in their study of ninth-grade students, found significant correlations between the scores from think-aloud protocol analysis and the scores from concurrent multiple-choice strategy use measure.

On the other hand, mixed results are obtained from studies using multiple off-line measures. Minnaert and Janssen (1997), in their study with college students, compared the results from two questionnaires: the Leuven Executive Regulation Questionnaire and the Inventory of Learning Styles. The researchers found correlations between .13 to .80 between

corresponding subscales of the questionnaires. In their study, Sperling, Howard, Miller and Murphy (2002) examined the correlations among various questionnaires (Jr. Metacognitive Awareness Inventory, Index of Reading Awareness, Metacomprehension Strategies Index and Strategic Problem Solving) for assessing metacognition of students in 3rd through 9th grades. They found no substantial correlations among the results from the questionnaires. The researchers also compared the questionnaires' results to teacher ratings. They found significant correlation for the younger group but not the older group. In the same vein, Sperling, Howard, Stanley and DuBois (2004) investigated college students' metacognition in two studies. In their first study, they assessed college students' metacognition using two questionnaires, namely, Metacognitive Awareness Inventory and Learning Strategies Survey. Results from the two questionnaires correlated .50 with one another. In their second study, the researchers examined the correlations between results from Metacognitive Awareness Inventory and Motivated Strategies for Learning Questionnaire. The two questionnaires correlated significantly with one another. However, in a study with 3rd graders, Desoete (2008) reported that there was no significant correlation among scores from the prospective questionnaire, the retrospective questionnaire and the teacher ratings.

The results of the studies employing off-line and on-line techniques in combination generally show that there is no significant correlation among scores from off-line measures and on-line measures. In their studies with college students, Schraw and Dennison (1994) and Sperling, Howard, Stanley and DuBois (2004) found no substantial correlation between college students' monitoring accuracy scores and the results from the Metacognitive Awareness Inventory. However, Schraw (1997) reported a significant correlation of 0.30 between monitoring accuracy and monitoring strategies in college students. Studies concerning young age groups have also revealed similar results. Hannah and Shore (1995) analysed the metacognitive skills of primary and secondary school students using a think-aloud protocol and prospective interviewing and reported that there was non-significant correlation between the two measures (r = .26). In a study on 3rd and 4th graders, Van Kraayenoord and Schneider (1999) reported that there was non-significant correlation between the results of the qualitative protocol analyses and the results of the reading strategies questionnaire in both grades (r = .26 for third graders and r= .07 for fourth graders). In their study with ninth grade students, Cromley and Azevedo (2006) reported that the scores from the self-report questionnaire did not correspond neither with the scores from think-aloud protocol analysis nor with the scores from concurrent multiple-choice strategy use measure. In Desoete's (2008) study with third graders, too, the scores from two off-line questionnaires did not correlate with the scores from think-aloud protocols.

When the results obtained in the studies mentioned above are considered together, we see that the results obtained by means of different on-line methods are related with each other. Likewise, there are relations among the results obtained from off-line methods. However, there is not a relationship between the scores obtained by means of off-line methods and on-line methods. In his comprehensive review, Veenman (2005) also showed that scores from off-line measures do not correspond to individuals' scores from actual behavioural measures during task performance. In other words, data from the off-line and the on-line measures, generally, do not correlate with each other.

However, the majority of studies, whose results have been addressed together, have used various types of off-line and on-line techniques and various types of criterion tasks. This variety confounds the conclusion of precise results about the validity and reliability of the measurements. We believe that examining the participants' metacognition within the same criterion task and by using more than one on-line and one off-line measure will better reveal the relations between the measures. Along these lines, in this study our aim is to compare

two on-line and two off-line methods in relation to a text-learning task. At the same time, the study aims to identify the patterns between the measures by conducting a factor analysis.

Methods

Participants

The participants were from three state schools in Istanbul. The schools were purposefully selected because they educate children mostly from families with average income, judged by the opinions of the school principals and classroom teachers. The students were selected randomly from six classes (two classes from each school and 10 students from each class). The total number of the participants was 60. Think aloud protocols of 4 students could not be transcribed due the high noise level in the background, as some parts of the protocols coincided with the break time. From 56 students, all the students with missing data were eliminated. Eventually, the participants in this study were 47 fifth graders (20 girls, 27 boys, M_{age} = 10.00 years, age range: 9-11 years).

The teachers who participated in the study were the classroom teachers of these six classes. In the first five years of compulsory education in Turkey, students remain with the same teacher. In some rare cases, the teacher can be changed due to illness, school change, retirement, etc. However, the participant teachers in this study had been teaching the same students for five years. The average professional experience of the participating teachers was 11.5 years.

Measures

Off-line measures. Two off-line measures of metacognition were used in this study.

Jr MAI (Form A). The Turkish version of the Jr. Metacognitive Awareness Inventory- Form A was used for the study (Sperling et al., 2002). Jr. Metacognitive Awareness Inventory-Form A (Jr. MAI-A), a self-report inventory, was developed as a measure of general metacognitive awareness of children in grades 3-5. The Jr. MAI was developed from a previous instrument, the Metacognitive Awareness Inventory (MAI), used with adult populations (Schraw & Dennison, 1994). Jr. MAI is a 3-point likert type scale ranging from 1 ("never") to 3 ("always"). Its purpose is to assess children's domain general metacognition. The original inventory consists of 12 items (α=.76) with two subscales, namely, the knowledge of cognition (e.g., "I learn more when I am interested in the topic") and the regulation of cognition (e.g., "When I am done with my schoolwork, I ask myself if I learned what I wanted to learn"). Although originally there were two subscales as the results of the factor analysis yielded a single factor solution, the researchers recommended using the inventory as an overall measure of metacognition.

The Turkish version of Jr. MAI was adapted by Karakelle and Saraç (2007). The Turkish version of the inventory consisted of 12 items. The internal consistency reliability for the scale was .64 and test-retest reliability of the Turkish inventory was .74 (N = 356, p < .01). The factor analysis for the Turkish version yielded one factor solution; the authors recommended using the scale as an overall measure of metacognitive awareness. For this study, the internal consistency reliability of the scale was .70. Jr. MAI is chosen since it is the only metacognition scale adapted for Turkish samples in this age group.

Teacher rating scale. A rating scale that is adapted from Sperling et al. (2002) was used to collect teachers' opinions about the students' metacognition. Prior to rating, the teachers were provided two information sheets, one with a brief explanation of metacognition and typical characteristics of metacognitive children and the other with behavioural descriptors to distinguish students who are high in metacognition (e.g. "judges performance accurately",

"asks questions to insure understanding while learning"). After reading the information sheets mentioned above, the teachers then rated each of their students accordingly, on a scale ranging from 1, designating "very low metacognition" to 6, designating "very high metacognition". No significant differences by teacher were indicated in the ratings, F (5, 41) = 0.351, $p <$ .001.

On-line measures. Two on-line measures of metacognition were used for the study.

Think-aloud protocols. Students were presented a text-learning task. The text for this study, taken from Demirel (1995), was about the design, working principles and types of balloons. The text consisted of nine paragraphs with 456 words. Prior to the study, seven fifth grade teachers, other than the participating teachers, read the text and judged it as appropriate for fifth grade readers.

The children were instructed to think aloud while studying the text. All the readers' utterances were audiotaped and transcribed. All the transcriptions were segmented according to a study by Cote, Goldman & Saul (1998) in which unit of analysis was defined as "a comment or set of comments on the same core sentence or group of sentences as well as the reading behaviour associated with those comments" (p. 14). After the identification of the units of analysis, the units were analyzed according to the Taxonomy of Metacognitive Activities in Text-studying (TMATS), developed by Meijer, Veenman and van Hout-Wolters (2006). TMATS consists of five categories: orientating, planning, executing, evaluating and elaborating. Under each category, there are several metacognitive activities. The total number of metacognitive activities listed in the taxonomy is 70. After several analyses, Meijer, Veenman and van Hout-Wolters (2006) concluded that the more parsimonious distinction of Flavell (1979) would be more suitable, so the researchers reverted to the original three categories. The activities of orientating and planning were subsumed under the category of planning, the activities of monitoring were subsumed under the category of monitoring, and the activities of evaluating and elaborating were subsumed under the category of evaluating. The category of executing was left out as most activities in this category were thought to reflect cognitive activities rather than metacognitive activities. According to the taxonomy, the category of planning, combined with orientating, consisted of 15 metacognitive activities (e.g. establishing task demands, continue reading hoping for clarity, selecting a particular section of text to look for required information). The category of monitoring consisted of 12 metacognitive activities (e.g. noticing unfamiliar terms or words, commenting on task demands, noting lack of knowledge). The category of evaluating, combined with elaborating, consisted of 12 activities (e.g. finding similarities, explaining strategy, connecting parts of text by reasoning). For the entire taxonomy of metacognitive activities in text studying, see Meijer, Veenman and van Hout-Wolters, 2006.

Three judges, knowledgeable in metacognition and reading processes, segmented the protocols simultaneously. The three judges scored all the protocols, independently, on the presence of metacognitive activities in TMATS. Each unit, corresponding to a metacognitive activity on the taxonomy, was coded in the margin as belonging to one of the three categories: planning (e.g. "I'm going to read this part about valves again"), monitoring (e.g. "I don't know what this word means") and evaluating (e.g. "I'm glad that I read this part again because now I understand what it says"). Then, for each student, the number of activities under each category was counted. Three scores (planning, monitoring and evaluating) were computed for each student. Table 1 shows the descriptive statistics for the categories of TMATS. The interrater reliability was 96% between the first and the second judge, 97% between the first and the third judge and 96% between the second and the third judge.

Table 1. *Descriptive statistics for the categories of metacognitive activities*

N= 47	*M*	*SD*	Minimum	Maximum
Planning	1.45	1.87	0	8
Monitoring	1.34	2.71	0	16
Evaluating	7.61	8.00	0	32

Accuracy Ratings. Accuracy measures the degree to which children's confidence judgments match their actual test performance (Hacker, Bol & Bahbahani, 2009; Hacker, Bol, Horgan & Rakow, 2000; Pressley & Ghatala, 1989). Metacognitive monitoring accuracy was calculated by taking the absolute value of the difference between students' ratings on the prediction scale and their performance. In this study, the students' performance was assessed by a post-test consisting of 15 multiple choice questions (α = .77). Six of the questions were text-implicit and 9 of the questions were text-explicit. The students' prediction judgements (JOL) were used to measure metacognitive monitoring accuracy. After the children studied the experimental text, they were asked to rate how well they think they understood the text on a rating scale ranged from 1, designating "not at all", to 4, designating "very well". For each reader, the difference between rating on the prediction scale (converted into percentages) and performance score (converted into percentages) was calculated and the absolute value of this difference was taken. With this formula, the accuracy scores ranged between 0 and 100, with the scores of 0 indicating perfect accuracy and scores of 100 indicating total inaccuracy. To prevent any confusion due to reverse points, all scores were subtracted from 100 and consequently the accuracy scores for this study ranged between 0 and 100, with the scores of 100 indicating perfect accuracy and scores of 0 indicating total inaccuracy.

Procedures

The first author, in a quiet room in the school, assessed all students individually during school time. In a typical session, at the very beginning, the researcher had a short chat with the student, trying to make the student feel comfortable and safe with the researcher. After this socializing, the child, following the suggestions of Ericsson and Simon (1993), was first instructed to think aloud while working on a text. In this instruction session, two texts, other than the experimental text, were used. The trial session with the trial texts lasted till the subject felt comfortable with thinking aloud (approximately 10-min.). Then the experimental text was introduced. The students were allowed to study the text without any time limit. The shortest think aloud session took 182 seconds period and the longest session took 1494 seconds (*M*= 594.09 *SD*= 275.65). The experimenter used only standard prompts, "Please, keep on thinking aloud" and "What are you thinking?" whenever the student fell silent. No other interaction between the student and the experimenter was allowed. After the students mentioned that they were ready for the test, they were instructed to rate their understanding on the rating scale below the text. Then they were presented with the learning performance test. At the end of the session, the students completed Jr. MAI (Form A). In each school the first author, after finishing data collection with the students, met the classroom teachers individually in a quiet room. After a short introduction about the aims of the study, the teacher was presented with the information sheet about metacognition and requested to read it. The teacher was allowed to read the sheet without any time limit and to ask any questions regarding metacognition. After the reading session, the teacher was asked to rate the participating students from his/her class accordingly on the rating scale. The teacher was requested to base her/his judgements according to the students' typical learning behaviours across domains.

Results

In this study, two off-line and two on-line metacognitive measures were used. Descriptive statistics for each metacognitive measure are presented in Table 2.

Table 2. *Descriptive Statistics for Variables*

N= 47	*M*	*SD*	Minimum	Maximum
Jr-MAI	31.55	2.71	25.00	36.00
Teacher-Rating	4.21	1.35	2.00	6.00
Think-Aloud Protocols	17.02	10.93	1.00	43.00
Accuracy Ratings	78.01	14.63	40.00	100.00

Pearson product-moment correlation coefficients were computed to investigate the interrelations among metacognitive measures. The two off-line measures, Jr. MAI (Form A) and the teacher ratings, correlated significantly with one another (r = .50, p < .01). The two on-line measures, think aloud protocols and monitoring accuracy, correlated significantly with one another but the correlation was negative (r = -.30, p < .05). No significant correlation was found between the results from Jr. MAI (Form A) and the results from two on-line measures. Also, no significant correlation was found between the teacher ratings and the results from the two on-line measures. Correlations among metacognitive measures are presented in Table 3.

Table 3. *Correlations between Jr MAI-A; Teacher Ratings, Think-aloud Protocols and Accuracy Ratings*

N= 47	Jr MAI	TR	TAP	MA
Jr MAI-A	1			
Teacher Rating(TR)	.50**	1		
Think-aloud Protocols (TAP)	.12	.12	1	
Monitoring Accuracy(MA)	.07	.21	-.30*	1

** p < .01, * p < .05

A principal component analysis (PCA) was performed on the results from four metacognitive measures to investigate the factor structure. Previous research provides a wide range of recommendations regarding the sample size in PCA. As a general rule of the thumb at least 300 cases are required for PCA (Tabachnick & Fidell, 1996). However, research has demonstrated that this general rule for minimum sample size is not valid. Sapnas and Zeller (2002) report that the sample size should not be too large and sometimes additional subjects waste research resources. According to MacCallum et al. (1999), the sample size is dependent on the characteristics of the variables and the study. Particularly, the level of variable communalities is important in establishing sample size. High variable communalities, that is, .60 and greater, require small sample size. In the same vein, Wieringa (2009) recommends that in case of high factor loadings and low number of factors, a sample size below 50 is sufficient for PCA.

In this study, there are only two factors and the item communalities range between .63 and .80. So, this sample size of 47 seems to be sufficient for PCA. Furthermore, KMO coefficient (.44) and Bartlett test of spherecity (21.567, p < .001) were performed and the results showed that the data is suitable for PCA.

The PCA analysis yielded a two-factor solution. The two factors, with eigenvalues above 1, together accounted for 71.5 % of the total variance explained. The unrotated solution showed that the scores from the two off-line measures loaded on the first factor. This factor, with an eigenvalue of 1.54, accounted for the 38.6 % of the total variance explained by this solution. The scores from the two on-line measures loaded on the second factor. This factor, with an eigenvalue of 1.31, accounted for the 32.9% of total variance explained by this solution. Factor loadings from unrotated solution are presented in Table 4.

Table 4. *Unrotated Component Matrix for Metacognitive Measures*

	Component 1	Component 2
Eigenvalue	1.54	1.31
Teacher Ratings	.85	.27
Jr. MAI	.84	-.01
Accuracy Ratings	.03	.86
Think-aloud Protocols	.22	-.71

Discussion

This study examined the patterns of the relations between metacognition scores obtained via two on-line and two off-line measurement methods.

Relation between Off-line Methods

In the study, a self-report measure (Jr-MAI) and the teacher ratings were used as off-line measures. The results revealed that these two measures are significantly correlated; in other words, the individual's assessment of his own metacognitive activities is compatible with his teacher's assessments which are built on the teacher's observations across domains. Similarly, in the study conducted by Sperling, Howard, Miller and Murphy (2002), a significant correlation between Jr. MAI and the teacher ratings was observed for 3rd, 4th and 5th graders. However, the researchers reported non-significant correlation between Jr. MAI and the teacher ratings for the older age group (6th to 9th graders). Desoete (2008), too, reported a significant correlation between the teacher ratings and the other metacognitive measures for 3rd graders, indicating that the teacher ratings could be an alternative method for metacognitive macro-evaluation. The results gathered from these studies can be interpreted as showing that teacher ratings are more accurate for the young age groups. The fact that the observations of the teachers were consistent with the task-specific observations of the researchers in a study carried out by Whitebread et al. on the preschool children points that the teachers' ratings are appropriate for the young age groups (Bingham and Whitebread, 2008; Whitebread et al., 2007; Whitebread et al., 2009; Whitebread and Coltman, 2010). From this point of view, by carrying out developmental studies in which the teacher observations will be used, it will be possible to explain why the teachers make more accurate evaluations for the younger age groups. In these kinds of studies, it could be interesting to analyse the type of observations that teachers make to assess their students' metacognitive levels. For instance, if the teacher ratings are based on all of the procedural behaviours observable in daily activities, this could bring a whole new perspective to the analysis of metacognitive processes.

The significant correlation between the questionnaire and the teacher ratings also suggests the need to address the criticism that the self-report questionnaires consist of the individual's opinions about one's self. Even if the questionnaires assess the individual's opinions of her own metacognitive activities, in this example, it can be considered that these

opinions do not solely consist of the individual's assumptions as the assessment is supported by an external measure (the teacher ratings).

Relation between On-line Methods

In this study, a think-aloud protocol and accuracy ratings were used as on-line measures for the text-learning task. The results show that the two on-line measures have a significant negative correlation, that is to say, those who can make accurate judgments of learning (JOL) perform less metacognitive activity.

One explanation may be that this negative correlation is the result of underconfidence-with-practice-effect (UWP), a phenomenon introduced by Koriat, Sheffer and Ma'ayan (2002). This effect points out that the JOL accuracy decreases as the amount of practice increases. There are studies showing that the UWP effect is present for both the item by item JOL accuracy and global judgements (Finn & Metcalfe, 2007; Koriat, Ma'ayan, Sheffer & Bjork, 2006, Rast & Zimprich, 2009; Serra & Dunlosky, 2005). In the think-aloud protocols, since the participant continues the learning activity until mastery, he/she generally makes repetitions more than once and thus has the probability to carry out more metacognitive activities. If the JOL accuracy shows a decrease depending on the repetitions, it is a logical result that monitoring accuracy decreases as the metacognitive activity number determined with think-aloud increases.

An alternative explanation of this result may be in terms of study-time allocation. Given that the task used in this study was a text-learning task, lower metacognitive activity means that a short amount of time was allocated to studying the text. Within this framework, those that make accurate judgements of learning could be performing less metacognitive activity because they can correctly eliminate easy-to-learn from difficult-to- learn, and well-learned from to-be learned. This elimination could help the learner use his time more effectively, thus avoiding unnecessary and ineffective strategies. According to Metcalfe (2009) recent studies indicate a causal relationship between JOLs and study behaviour and a negative correlation between time allocated for studying and JOLs. Although this finding is obtained from the studies in which the JOL accuracy is examined item by item, we can expect to obtain similar results for the global judgements. In this direction, it will be appropriate to examine the participants' global judgements in the studies to be carried out relevant to the study-time allocation.

Interrelations among Off-line and On-line Methods

This study did not reveal a significant relationship among the on-line and off-line methods used. These findings are compatible with several of the aforementioned studies. The results of the exploratory factor analysis showed that the metacognitive measures used in the study clearly fall into two distinct categories, namely on-line and off-line methods. The off-line measures are grouped in one single factor, explaining the 38.6% variation in the metacognitive scores. Similarly, the on-line measures are grouped in one single factor, explaining the 32.9% variation in the metacognitive scores. These results suggest that off-line and on-line measures form distinctive assessment structures and these assessment structures are internally coherent. This result can be a sign that off-line and on-line measures assess independent structures that are internally coherent. When developing any type of test, in such a case, each factor would be named separately given that each factor assesses an independent dimension. However, since the study only analyses different methods that aim to assess the same structure, this raises the question of how to explain the measures acting as if they belong to different dimensions. Of course it is possible to explain this discrepancy between assessments using off-line and on-line methods as the weaknesses of the measures. However, this differentiation can also be explained in terms of the elements of

metacognition. The compatibility or incompatibility between studies using multi-methods can be attributed to issues related to the assessment of different structures. As stated by Brown (1987) there are activities that individuals do not need to express verbally or be aware of during the execution of performance. Metacognitive judgements have implicit and unconscious aspects just as they have explicit and conscious ones. According to Koriat (2000, 2008), while knowledge-based metacognitive judgements are built on explicit and conscious inferential processes, experience-based judgements are built on subjective feelings, like the "tip-of-the-tongue" phenomenon. Within this framework, it can be considered that off-line methods such as questionnaires could be more sensitive to explicit and conscious processes and on-line methods such as think- aloud protocols could be more sensitive to implicit and unconscious processes. As also addressed by van Hout-Wolters (2000, cited in Helms-Lorenz & Jacobse, 2008), off-line measures may not clearly reflect the learning activities and off-line and on-line measures tend to measure somewhat different constructs.

In summary, the findings of this study support the view that metacognitive processes form a complex structure that needs to be assessed using various methods. However, in the multi-method studies, using on-line and off-line measures together will be appropriate rather than using only on-line measures or only off-line measures. Using these two methods together in a complementary way may allow us to see the metacognitive activities as a whole. Although there is criticism of the off-line methods, according to the study results, the fact that there is compliance between the teachers' opinions and the opinions their students hold about themselves reminds us that more consideration is necessary before putting away the questionnaires while deeming them "quick and dirty". In addition, it should be taken into consideration that the teacher ratings can be an assessment method to be used especially for studying young age groups.

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International Electronic Journal of Elementary Education, 2012, 4(2), 317-345.

Teacher Perceptions of Gender-Based Differences among Elementary School Teachers*

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Received: September 2011 / Revised: February 2012 / Accepted: February 2012

Abstract

The purpose of this study was to examine teacher perceptions of gender-based differences among elementary school teachers. In this mixed-methods study, the researcher utilized an online survey to collect data. Quantitative analysis revealed no statistically significant differences; however, qualitative analysis showed that there were more negative responses to survey statements pertaining to males. More than half of the participants perceived differences between female and male elementary teachers, including beliefs that female teachers are more nurturing, that male teachers are more laid back, and that male teachers are more dominant and commanding with students. Four conclusions were drawn: elementary teachers perceive differences between female and male teachers, male elementary teachers are perceived more negatively than female colleagues, a vast majority of participants feel that more male elementary teachers are needed in the elementary schools, and differences between female and male elementary teachers remain unclear.

Keywords: Teacher Gender, Differences, Elementary Education, Perceptions, Male Teacher

Introduction

Gender differences provide content for discussion in a variety of media including movies, television, books, magazines, and research; however, differences between female and male elementary teachers have not been fully researched and analyzed. According to the National Center for Education Statistics, women outnumber men in the teaching profession by approximately three to one (2006). In 2001, the National Education Association reported that only 9% of America's elementary school teachers were men. More than a decade later, the situation has improved little; for example, the Bureau of Labor and Statistics (as cited by the

* This article is written from the author's doctoral dissertation research.

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ISSN:1307-9298

www.iejee.com

Men Teach organization) reported that 18.8% of elementary and middle school teachers in America were men. Jones (2003) cites female teachers' concerns about the comparatively low number of men in the teaching profession and their hope of having more male elementary colleagues to offset the disproportionate number of female teachers. One might conclude that this deficit would result in an unacceptable balance in elementary teacher gender demographics.

The lack of balance could lead to a difference in perceptions about female and male teachers. In addition, this lack of balance could be caused by a difference in perceptions. This research study uses a phenomenological approach, which Glesne (2006) defines as the description of an individual's consciousness and experience of a phenomenon. Phenomenological research analyzes the research participants' thoughts, beliefs, and perceptions; for example, this study has gathered qualitative and quantitative data regarding female and male elementary teachers' perceptions of their colleagues. The purpose of this research was to examine the perceptions of teachers related to gender differences in elementary teachers. The data from this research may underscore the need to increase the male teacher population at the elementary school level. Educators may also use this data to improve teacher education programs and professional development.

The main research question was: *What are teacher perceptions of gender-based differences among elementary teachers*? For the purpose of this study, the researcher will examine the issue by grouping previous literature into three domains: Teacher as Self, Teacher to Student, and Teacher to Teacher. It is through these domains that the researcher implemented his own study.

Teacher as self

In the Teacher as Self domain, literature was analyzed that discussed teachers' classroom management style. Previous research was also analyzed that focused on teachers' content knowledge and instructional effectiveness.

Regarding classroom management, Chudgar and Sankar (2008) noted that male teachers were more focused on maintaining classroom authority by enforcing strict discipline. Furthermore, Green et al. (2008) identified one possible difference between female and male teachers' classroom management; female teachers perceive behavior challenges to be more severe than do their male colleagues. However, Yavuz (2009) found no difference between female and male teachers' attitudes about classroom management or their instructional management. Carrington et al. (2008) found that teacher gender had no effect on student achievement. Previously, Alghazo (2005) had noted that there was no difference in teachers' perceptions of the delivery and evaluation of instruction based on gender, but added that there were statistically significant differences in the amount of time that female and male special education teachers spent on planning instruction and how they rated the effectiveness of their instructional management. In Alghazo's study, male teachers rated themselves as spending more time planning instruction than did their female colleagues. In addition, male teachers rated themselves higher than did female teachers in instructional management, contradicting Yavuz's later findings. Dee (2006) states that "a teacher's gender does have large effects on student test performance, teacher perceptions of students, and students' engagement with academic material" (p. 71). The argument, Dee asserts, is that boys perform better when taught by male teachers and girls perform better when taught by female teachers. By contrast, Mullola et al. (2011) stated that teacher gender had no effect on student grades. Driessen (2007) notes two differences between female and male teachers. One difference is that, in Year 6, male teachers in the Netherlands tested their students more often than did female teachers. Second, in Year 8, male teachers emphasized cognitive

objectives more often in the classroom. According to Driessen, the difference in teacher education between female and male teachers was statistically significant, suggesting that because males have more education, they also may have more content knowledge than their female colleagues.

Teacher to student

The Teacher to Student domain focused on various aspects of the teacher–student dynamic. It focused on teachers as role models and their ability to be nurturing, patient, fair, and sensitive to their students' needs. It addressed teachers' ability to motivate and engage their students. Finally, it discussed teachers' general desire to work with children and their ability to develop relationships with their students.

According to studies by Martin and Marsh (2005), Driessen (2007), and Martin et al. (2008), neither boys nor girls are motivated any more or less by female or male teachers; they found no differences in this regard between the abilities of female and male teachers. Martin and Marsh believe that motivation was more of a student factor than a teacher factor, and that an individualized approach would yield the greatest results. In her study, Jones (2003) found that female teachers overwhelmingly responded that male teachers would be better at motivating boys than would female teachers. However, her research also demonstrates that the longer the interview process lasted with female teachers, the more they would discuss limitations in male teachers' ability to motivate male students. In the mid-1900s, females were thought of as being perfectly capable of serving as role models for all students. Wiest (2003) notes that women were "deemed better suited to serve as role models and teachers of moral behavior" and that they possessed "emotional qualities to work with youth" (p. 63). Even though Driessen's (2007) research emphatically shows that there is no statistically significant difference between men and women serving as role models, he raises probing questions about teachers. For example, did students even look up to teachers as role models? He goes on to state:

It is also the case that just as male teachers do not always constitute a suitable role model for boys, female teachers do not always constitute a suitable role model for girls. Furthermore, such matching according to sex may simply reinforce and strengthen stereotypes at times. To be viewed as a role model by their pupils, teachers must earn respect and admiration (p. 186).

Men are considered good possible role models not only for regular education students, but also for students in special education. Rice and Goessling (2005) state that schools need more male special education teachers to provide a "balanced educational experience for their students" (p. 354). Even if a male teacher can be a positive role model for his students, Martino and Kehler (2006) argue that schools cannot solve "boys' diverse educational and social problems" by simply providing male teachers in the building (p. 125). Cooney and Bittner (2001) raise the concern of some teachers "that a poor male role model could do a lot of damage in the classroom and it is important to be aware that good teaching is critical" (p. 81). Noted author and researcher Carol Gilligan (1982) proposed that females have a unique ability to make moral decisions pertaining to personal and caring aspects of development. Cooney and Bittner discuss the stereotype that males do not nurture, commenting that this was a "barrier to recruiting males to the field" (p. 80). Males are not stereotypically associated with nurturing and sensitivity. Data collected by Jones (2003) and Cushman (2005) suggest that males who display a combination of sensitivity and masculinity are the most desired in elementary education. In their research, Carrington et al. (2008) states that "it was clear that students who had female teachers had more positive attitudes" toward school (p. 321). Williams-Johnson et al. (2008) explain that teachers can engage students with their own

brand of nurturing, adding that teachers will nurture according to their own pre-existing beliefs about the most important aspects of the educational process. This would indicate that, unless male teachers identify the importance of nurturing in the classroom, they would not be effective at nurturing their students. According to Tatar and Emmanuel's research (2001), male elementary teachers "tended to give more egalitarian responses" (p. 221) to students in certain situations. The authors explain this trend by commenting that male elementary teachers were working against the stereotype that they were not as fair as female teachers. Huang and Fraser (2009) found that even after controlling specific variables, such as background and characteristics of schools, male teachers perceived better relationships with their students than did female teachers.

Teacher to teacher

The third domain focused on teachers' perceptions of their colleagues' ability to develop effective relationships. This domain also discussed the expected jobs of men and women in the elementary education setting.

Huang and Fraser (2009), Wiest (2003), and Cooney and Bittner (2001) suggest that collegiality may be of greater importance to male elementary teachers because of their lower numbers. Weist also claimed female teachers wish males fit in better and made more of an effort to be team players. As suggested earlier, prospective male teachers often do not enter the profession because of a lack of male peers and the societal perception of the profession being feminine. Cooney and Bittner found, through interviewing teachers, that isolation was a major issue for male teachers. One interviewee stated that he did not feel comfortable sharing some of his concerns or successes with the female teachers in his building. This research was extended by Smith (2004), who concluded that loneliness and lack of opportunities for socializing were detriments to attracting more men into the field. Through their qualitative research studies, Jones (2003) and Wiest found that female teachers expressed a desire to have male colleagues who would be good listeners, team workers with a sense of humor, and not arrogant. They wanted a male teacher who could "fit in" and contribute to the overall team atmosphere of the school. Rice and Goessling (2005) assert that "contact with men in schools, particularly elementary schools, is usually limited to interactions with the principal, janitor, or physical education teacher or coach" (p. 348). In her native country of the Netherlands, Driessen (2007) found that only 23% of headmasters, or principals, were women, whereas 84% of teachers were women. In addition, 77% of the support staff were women. These statistics illustrate a trend common to many countries: although most administrative positions are held by men, the majority of teachers are women. Piper and Collamer (2001) identify the difficulties that men have in typically female jobs (e.g., librarian). The male librarians they interviewed felt that at least occasionally, females in the building asked them to perform traditionally male jobs such as lifting and carrying heavy objects. However, the male librarians felt that although they were treated as "special because of their maleness, they never were left out because of it" (p. 408). In addition to the role of the librarian, Rice and Goessling found that special education also attracts few men. Librarians and special educators are predominantly women.

This study explored teachers' perceptions of female and male colleagues' effectiveness in the three domains previously discussed. Understanding teachers' perceptions of gender-based differences among elementary school teachers can lead to improvements in teacher education and professional development programs. It also may lead to the recruitment of more men into the teaching profession. In addition, collecting teachers' perceptions of their colleagues and fully analyzing such data may lead educators to a better understanding of why there are so few male elementary teachers.

Method

Participants

It was encouraging to note that the majority of respondents to the online survey were experienced teachers and, therefore, potentially able to provide more comprehensive information. An impressive 43% of participants had 13 or more years teaching experience. Also, a combined 39% of participants had 5 to 12 years of teaching experience. A combined 80% of survey respondents had attained master's degrees or higher. The researcher assumes that the varied teacher experience provides rich, descriptive, and meaningful data that inform the findings of this study. Survey respondents' experience in their own classrooms and their education play an important role in this study's contribution to the field of education. Although not essential to the purpose of this study, it is interesting to note that of the 215 respondents who answered the item regarding race/ethnicity, 206 were Caucasian. Of the remaining nine, five were African American, two were Hispanic, one was Native American, and one was Asian American.

Data collection method: The online survey

In this study, the researcher used a mixed-methods approach with an online survey (Appendix A) to gather data. According to Patton (2003), a survey or questionnaire that solicits responses by asking fixed choice, or closed-ended, questions as well as open-ended questions is an example of how qualitative inquiry and quantitative measurement are combined in a single research study. Glesne (2006) suggests that open-ended questions focusing on teachers' perceptions of the past or present "tend to be richer ground" for descriptions (p. 82). Participants also had the opportunity to add comments describing their experiences and clarifying their responses to closed-ended questions. Johnson and Christenson (2008) state that using closed-ended items "exposes all participants to the same response categories and allows standardized quantitative statistical analysis" (p. 177). This research collected quantitative information through closed-ended items from the survey and allowed the researcher to use numerical data to explore differences between female and male teachers. As Dillman (2007) points out, the principle of standardization applies because the researcher is providing repeated stimuli such as item stems, response categories, and additional information to the participants. Furthermore, Johnson and Christenson state that the principle of standardization is utilized to ensure maximum response comparability. This researcher compared the responses of female and male participants. Although only 25 of the 217 participants were male teachers, a thorough analysis of teachers' perceptions was still conducted.

Development of the survey

The primary instrument for data collection was an online survey questionnaire that was developed by the researcher. The researcher piloted the survey items with a group consisting of former elementary teachers currently teaching at the middle school level, along with elementary teachers working at elementary schools other than his own. The group consisted of both women and men; the researcher believed their experiences would provide valuable feedback to aid in the development of the online survey. The researcher further developed the online survey questionnaire for this study in collaboration with Dr. Rina M. Chittooran, Educational Studies faculty at Saint Louis University. A third party vendor, Key Survey, was chosen by the researcher to administer and distribute the survey and to collect feedback from the participants. Sue and Ritter (2007) and Czaja and Blair (2005) identify essential components to an Internet survey, including a brief message stating the purpose, encouraging participation, and providing clear directions for beginning and completing the survey. Advantages of an Internet survey include low cost and speed of data collection (Czaja

& Blair 2005; Sue & Ritter 2007). Czaja and Blair have found that response time for Internet surveys ranges from 10 to 20 days and explain that the "ability to obtain reasonably complete and detailed answers to open-ended questions may prove to be an advantage of Internet surveys…" (p. 41). The geographic distribution of the sample and sample size has no effect on the cost of an Internet survey (Czaja & Blair 2005; Sue & Ritter 2007). Although research has confirmed that the Internet survey is a viable means of data collection, there are some disadvantages to note. A low response rate is one such disadvantage (Czaja & Blair 2005; Gilligan, 2007; Sue & Ritter 2007). The response rate with this study was 19%, falling short of Sheehan's (2001) recommended rate of 36.83%, and is one limitation to the generalizability of this study. This could be due to participant disinterest or technical difficulty, such as slow telecommunications speed, unreliable Internet connections, and low-end browsers. Response bias is another disadvantage to Internet surveys. Teachers may respond to the items in a way that will appease the researcher, instead of answering truthfully. Czaja and Blair suggest that another disadvantage to an Internet survey is that the researcher has "no control over who actually completes the questionnaire" (p. 44).

The first section was designed to gather both quantitative and qualitative information pertaining to participants' experiences of working with female and male teachers. The survey questionnaire includes items in a Likert format to which participants were asked to respond as follows: 5 – Strongly Agree, 4 – Agree, 3 – Neither Agree nor Disagree, 2 – Disagree, or 1 – Strongly Disagree. There was space provided after each item for participants to offer additional information. The second section was the qualitative portion of the study consisting of open-ended items designed to gather information about participants' in-depth experiences. The third section contained demographic items for participants to provide basic information about themselves and their work settings.

Reliability and validity

Survey questionnaires are inherently weak with validity but strong in reliability (Colorado State, 2007). Lincoln and Guba (1985) explain that validity is approached differently in a qualitative study than in a quantitative one. Some qualitative researchers refer to validity as trustworthiness. Glesne (2006) asserts that trustworthiness is an issue that should be addressed in research design and throughout data collection. In this study, peer review was used to augment trustworthiness. Glesne describes peer review as external reflection and input on one's work. The researcher utilized the suggestions of peers from Saint Louis University throughout this process. Another method used to strengthen validity was clarification of researcher bias, a process defined by Cresswell (2003) as continuous reflection on the part of the researcher in order to minimize interference from his attitudes, opinions, or perceptions. Because the researcher is himself a male elementary teacher, the potential for researcher bias in this study was significant. Glesne describes the effectiveness of researchers' reflection regarding their own subjectivity and how they use and monitor such reflection. Furthermore, the researcher used evidence based on content; this is defined by Johnson and Christenson (2008) as a "judgment on the degree to which the evidence suggests that the items, tasks, or questions" appropriately represent the researcher's topic of interest (p. 152).

Data collection procedures

The survey questionnaire development process was continuous up until the point of administration, thus allowing the researcher to maximize the tool's effectiveness. A district recruitment letter was sent to four school districts asking for permission to recruit teachers at their elementary schools. After the district officials agreed to participate, they documented their approval on Notification of Assent to Participate letters. Once approval was granted, the

school districts provided the researcher with the elementary teachers' e-mail addresses. The researcher uploaded the e-mail addresses into Key Survey, which then distributed invitations to teachers requesting that they participate in the study. Each invitation to participate included a link to the survey website, along with the purpose of the study and instructions for completing and submitting the Internet survey. The e-mailed invitation also outlined the intent of the survey to the potential participants and stressed that the feedback would be strictly confidential. It also explained that although no complete guarantee could be provided, comprehensive measures were taken to minimize risk of data loss or compromise. The recruitment letter explained that completion of the survey implied consent to participate in the study. Key Survey e-mailed approximately 1 170 surveys to teachers working in four public school districts around a major metropolitan city in the Midwestern United States. Two hundred seventeen teachers responded to the survey questionnaire.

Key Survey ensured that each participant responded only once to the survey. It was not necessary to answer the survey items in order; the participant could skip questions, and later return to provide a response. All survey items provided adequate space for the participants to submit written comments and feedback. Key Survey provided contact information in case of technical difficulties completing or submitting the survey. Data security was ensured by various measures used by Key Survey, including ensuring the security of its website, data encryption, Secured Socket Layers (SSL), and firewall protection.

Fourteen days after the first invitation to respond, Key Survey sent a follow-up email to thank participants for completing the survey; it also encouraged any teachers who had not yet completed the survey to do so. Finally, Key Survey collected data for analysis and the final report. The use of Key Survey allowed the researcher to maximize the advantages of the Internet survey while minimizing the disadvantages associated with online surveys.

Data analysis

Once the data had been collected from the survey, the researcher analyzed the data for trends and variance. The vendor provided the total sum of responses, the response percentages, and charts and graphs that represented the collected data. The researcher thoroughly analyzed the survey responses for qualitative data that would provide insight into how female and male elementary teachers perceive one another. It is important to note that while there were no statistically significant findings in respondents' perceptions of gender-based differences among their elementary school colleagues, there were qualitative differences. These have been reported and interpreted in subsequent sections. Indeed, it may be that clinical findings such as these have greater implications for what actually happens in the elementary school setting. Qualitative data were printed and coded for analysis of trends and variance. Data were used to comprehensively identify the participants' perceptions of their colleagues regarding gender.

Results and Discussion

The three domains

In each of the following subsections, the survey results are grouped and discussed according to the three domains created by the researcher: Teacher as Self, Teacher to Student, and Teacher to Teacher. Fixed-choice survey items are discussed first, followed by a discussion of the qualitative responses to open-ended items. It is important to note that some of the survey participants did not respond to every item, so the number of responding participants is also noted.

Teacher as self. This domain focuses on teachers' individual classroom management style, content knowledge, and instructional effectiveness. Regarding teachers having adequate

content knowledge, a combined 9.21%, or 21 participants, selected neutral (Neither Agree nor Disagree) or negative (Disagree and Strongly Disagree) responses for male elementary teachers, compared with 4.63%, or 10 participants, for female teachers. Thus, some participants perceive their male colleagues as having an inadequate amount of content knowledge to teach their classes. Table 1 summarizes the responses for the survey item pertaining to teachers' content knowledge.

Table 1. *Teacher Content Knowledge*

	The female teachers I have worked with have adequate content knowledge to teach their classes.		The male teachers I have worked with have adequate content knowledge to teach their classes.	
	(*n*)	(%)	(*n*)	(%)
Strongly Agree	125	57.87	108	49.77
Agree	81	37.50	88	40.55
Neither Agree Nor Disagree	10	4.63	17	7.83
Disagree	0	0.00	3	1.38

Several comments were made by teachers indicating that "it always depends on the teacher" and that "some did and some didn't" have adequate content knowledge. The second survey item regarding male elementary teachers' content knowledge resulted in similar comments, such as, "depends on the teacher" and "male teachers also have the knowledge and experience in their areas." Item responses to male elementary teachers' content knowledge, however, also provided several references to the limited number of male elementary teachers. There were three respondents who did not perceive their male colleagues as having enough content knowledge to teach their classes. It could be that in this suburb of a major metropolitan city in the Midwest, both female and male elementary teachers have adequate content knowledge. However, the multiple responses regarding the low number of male elementary teachers could indicate that it is difficult to compare teacher content knowledge when there are so few male elementary teachers.

Regarding teachers having effective teaching styles, results from this pair of survey items show a perceived difference between the teaching effectiveness of female and male elementary teachers. Although the percentage of teachers who responded positively (Strongly Agree or Agree) for both female and male teachers is nearly identical, there are differences with almost every other response choice. Female teachers obtained a mean score of 4.42 and male teachers obtained a score of 4.18 on a scale of 1 to 5. The range of the responses for male teachers having an effective teaching style was greater than that for female teachers. Table 2 shows the mean and standard deviations of responses.

Table 2. *Effective Teaching Style*

	The female teachers I have worked with have an effective teaching style.	The male teachers I have worked with have an effective teaching style.
Mean	4.42	4.18
Standard Deviation	.641	.855

The comments included with these two survey items were positive for female teachers; however, there were multiple negative comments regarding the effectiveness of male teachers. Two comments by female teachers pertaining to male elementary teachers having

effective teaching styles were "not as often as the female teachers" and "at times [they] can be overly strict." One comment suggested a caveat that males' effective teaching style is "partly from their physical presence." This could suggest that the respondent perceived that teaching style effectiveness was due to gender-related factors, and not because of experience, educational attainment, or skill. There were also several comments stating that the lack of male elementary teachers made it difficult to accurately assess their teaching style.

Regarding teachers using effective classroom strategies, respondents perceive that the effectiveness of classroom management is not determined by gender. One comment read, "I have not gotten the sense that effective classroom management is a reflection of gender as much as it is the core beliefs that individual teachers hold about children…" Multiple respondents again stated that the effectiveness of classroom management techniques depended on the teacher. Four respondents felt that the female teachers they had worked with did not use effective classroom management strategies, yet 16 respondents felt this way about the male teachers. One comment from a female teacher read, "My male colleague tends to manage his class in a military style, and some students do not respond well to it." This sentiment reflects a previous comment from a female teacher about male teachers' teaching styles sometimes being "overly strict." It could be that male teachers' "strictness," as perceived by the participant, helps them manage disruptive classroom behaviors more effectively than female teachers. However, an interesting contradiction from another female teacher also stood out. She stated, "I feel most males have better management skills… or the students tend not to pull as much for a male teacher." This respondent perceived that male teachers either have better classroom management skills or their students behave better simply because of their teacher's gender.

Teacher to student. The second domain pertains to the various aspects of the teacher–student dynamic. This relationship includes the ability to motivate and engage students, serve as a role model, and be nurturing, patient, fair, and sensitive to students' needs. It also includes teachers' general desire to work with children and to develop relationships with their students. Regarding teachers' abilities to motivate their students, a combined 93.52%, or 202 participants, felt that female elementary teachers are effective at motivating their students and keeping them engaged, whereas only 85.18%, or 184 participants, felt that male elementary teachers are effective in this area. A greater percentage of participants felt neutral or negative about male elementary teachers' abilities to motivate and engage their students (14.82%) compared with female teachers (6.49%). More survey participants selected neutral or negative choices for male teachers' classroom management than for female teachers. Multiple comments by many participants were provided about both genders, such as "depends on the teacher," "individual exceptions apply," and "it's the individual person." As with the survey items regarding effective teaching styles, respondents selected Neither Agree nor Disagree and Disagree for male teachers more often than for female teachers. One respondent commented about two of her male colleagues that "one has [motivated his students effectively] and one has not [motivated his students effectively]." Because of the low number of male elementary teachers, one male teacher who ineffectively motivates his students might artificially inflate negative stereotypes about male teachers; on the other hand, such inflation may not occur with the relatively large population of female teachers.

Regarding teachers serving as role models, although positive results were very similar for both genders, two differences emerged in the neutral and negative categories. One difference was that a greater number of respondents were neutral about the differences between the effectiveness of male teachers and female teachers as role models. Another difference was that more respondents disagreed with this statement for male teachers than

for female teachers. These differences do not emerge in any other survey items in this study. Table 3 lists the number and percentage of each response to these survey items.

Table 3. *Role models*

	The female teachers I have worked with effectively serve their students as role models.		The male teachers I have worked with effectively serve their students as role models.	
	(*n*)	(%)	(*n*)	(%)
Strongly Agree	97	44.91	100	46.30
Agree	97	44.91	95	43.98
Neither Agree nor Disagree	22	10.19	14	6.48
Disagree	0	0.00	7	3.24

Eighteen of the participants commented that it depended on the teacher, not their gender. Three separate comments about male teachers stand out: "Good male teachers can be hard to find, and students can tell when they have a good male teacher." "I think it is especially important to have males in elementary school, since so many children come from single parent homes." "It has been my observation that a good male teacher in the building has a strong influence on kids." It appears that a male teacher who can effectively serve students as a role model can have an important positive impact on students. Conversely, a male teacher ineffectively serving as a role model is often perceived negatively by his colleagues. One participant commented about female teachers serving as role models, stating that "other than white teachers not being a role model for some city children," most females were serving as positive role models. Although this comment addresses the role that race and ethnicity play in teachers serving as role models for their students, it does not address any perceived differences between female and male elementary teachers.

Regarding teachers' ability to effectively nurture their students, the survey revealed interesting results regarding perceived differences between the genders. Although the majority of respondents feel that both female and male elementary teachers are sufficiently nurturing and sensitive to their students, there was a large difference between the numbers of Strongly Agree and Agree responses for male teachers. Fifty percent, or 107 participants, responded that they Strongly Agree that female teachers are nurturing and sensitive with their students, whereas only 15%, or 32 participants, selected Strongly Agree in response to male elementary teachers. Furthermore, 23%, or 49 participants, selected Neither Agree nor Disagree or Disagree in response to whether male teachers are nurturing and sensitive to their students, whereas only 6%, or 12 participants, selected those same responses for female teachers. A comment made regarding female teachers' nurturing and sensitivity was that "the elementary setting brings this out in teachers (hopefully!)." This comment was absent from the male nurturing and sensitivity survey item, although three participants' comments stand out. "I think women are naturally more nurturing than men…" "I have observed both nurturing and 'professional' styles in male teachers." "Some male teachers are not as sensitive as female teachers; however the[y] still are concerned about their students." Thus, the perception of some elementary teachers is that male teachers are not as nurturing or sensitive as their female colleagues, which could support Carol Gilligan's work (1982) describing the unique nurturing and sensitivity possessed by females. Perhaps the schools surveyed are not hiring male teachers who have these characteristics. It also could be that the respondents made these comments because they perceive, much like the societal stereotype, that males do not inherently possess the abilities to nurture and be sensitive to

their students. This aligns with Cooney and Bittner's research (2001) that this perception can be a barrier to hiring more male elementary teachers.

In response to survey items regarding teachers' effectiveness in the area of patience with their students, most participants selected Strongly Agree or Agree for both female and male teachers, yet there were differences in the Neither Agree nor Disagree and Disagree responses. Whereas 9%, or 19 survey participants, responded with these two choices for female teachers, 18%, or 40 participants, responded with these two choices for male elementary teachers. While not statistically significant, more teachers responded negatively toward male elementary teachers. Data collected from these two survey items continue to show that in almost all cases, respondents state that it depends on the individual teacher. A closer look at the comments, however, reveals a slightly different perspective made by one respondent about male elementary teachers. This individual stated, "[Males] can be less patient than female teachers." Even though it is only one comment, there were not any statements made in response to the survey item addressing patience among female teachers. Data from this research reveal that more respondents perceive males as not having enough patience to be effective in the classroom; thus, it could be a challenge for males to be effective classroom teachers, which may explain why there are fewer male candidates entering the field of elementary education.

Data from the two survey items addressing teacher fairness are very similar across genders. Means and standard deviations were nearly identical regarding female and male teachers treating their students fairly. Although the range was greater regarding male teachers, the results were not statistically significant. Gender was not perceived as playing a role in fairness according to this study. Several interesting comments were made addressing the topic of fairness. For example, "What is fair? That used to be a 'trick' question on our district's phone interviews." Another respondent said, "The 'correct' answer was giving children what they need at the time. It may look different depending on the child and the particular circumstances." And yet another stated, "There are very likely teachers who consider themselves to be fair because they treat all kids equally—it's one of those things upon which we must really reflect continually."

Regarding teachers having a general desire to work with children, 95%, or 204 participants, felt that female teachers have a desire to work with children and 92%, or 199 participants, felt that male teachers have a desire to work with children. Table 4 shows the number of participants responding with each of the options to teachers' desire to work with children.

Table 4. *Desire to Work With Children*

	The female teachers I have worked with have a desire to work with children.		The male teachers I have worked with have a desire to work with children.	
	(*n*)	(%)	(*n*)	(%)
Strongly Agree	124	57.94	100	46.08
Agree	80	37.98	99	45.62
Neither Agree nor Disagree	10	4.67	14	6.45
Disagree	0	0.00	3	1.38
Strongly Disagree	0	0.00	1	0.46

One respondent commented that in her generation, it was expected that she become a nurse, mother, or teacher. Another said, "I don't see the same passion with the males in my building." Other comments referred to the trend of males entering secondary education

because of the opportunities for involvement in clubs and sports and indicated that many of the males in the elementary setting were headed toward administration.

Teacher to teacher. The third domain focuses on the perceptions that teachers have of their colleagues' ability to develop effective collegial relationships and have positive attitudes and their expected jobs regarding gender in the elementary education setting. Regarding teachers being collegial with each other, these survey items elicited a higher percentage of negative responses regarding male teachers (7.44%) than female teachers (2.33%). Respondents raised several intriguing points. One comment was made that female teachers are collegial "most of the time, but there is a lot of nit-picking that goes with working with mostly women." Another participant commented that "I find female teachers are either very collegial, or jealous and do not want to share." That comment was supported by another respondent who described two different working environments with females, one that was highly positive and productive, and one that was not. Participants stated that "male teachers tend to share more than female teachers" and that they "do not let a lot of things get to them." This survey item pertaining to female teachers' collegiality was the first in the survey to engender negative qualitative responses.

Regarding teachers having positive attitudes about their profession, overall, more participants responded negatively to the idea that male elementary teachers (4.47%) have positive attitudes than to that for female teachers (0.93%). Table 5 categorizes response frequencies and percentages for female and male teachers' positive attitudes.

Table 5. *Positive Attitudes*

	The female teachers I have worked with have generally positive attitudes about their profession.		The male teachers I have worked with have generally positive attitudes about their profession.	
	(*n*)	(%)	(*n*)	(%)
Positive (Strongly Agree and Agree)	194	90.66	179	82.87
Neutral	18	8.41	28	12.96
Negative (Disagree and Strongly Disagree)	2	0.93	9	4.47

Again, there were several comments made pertaining to teacher attitude. For example, regarding female teachers' attitudes, one respondent said, "at times it can become difficult to move forward and let things go." Furthermore, three participants' statements regarding male elementary teachers support this. One said, "Males don't take everything so seriously and tend to keep the women from getting 'bitchy.'" Another respondent commented, "…they are more positive because it (the profession) was their choice. Women often hit a glass ceiling." Yet another participant stated, "They seem to not let things bother them as much."

Several trends emerged regarding expected jobs for both women and men within the elementary setting. Fifty-six survey participants stated that all of the jobs described in the item were expected jobs for women at the elementary setting. One comment summarizes most responses, "I think all positions in the elementary building are open for both male and female teachers. I do not think that there is an expected job for a certain sex anymore in the elementary building." The second most common response—with 44 responses—was that the office staff was expected to be composed of women. One respondent stated that "office staff is the only job that would be seen as a female job." With 33 responses, the third most

common choice was classroom teachers. The vast majority of respondents made comments such as "all," "any of them," and "all of the ones you mentioned" to expected jobs for men in the elementary setting. The second most common response for expected jobs for men was administration, which was listed 40 times. Several participants stated that the only administrator they had ever worked with had been a man. Others, however, suggested that more women were becoming administrators every year. PE teacher was the third most expected job for men (indicated by 37 of those surveyed.) One respondent even stated, "My current principal actually voiced a desire to hire a male PE teacher, hmmm." Custodians and classroom teachers tied as the fourth most common expected job for men, with 22 responses. Four of the 22 respondents identifying that classroom teacher was an expected job for a man specifically stated that "they would be upper elementary" and "you rarely see a [male] kindergarten or first or second grade teacher." The fifth most common response, with 14 selections, was that all of the jobs were expected to be filled by men, except for that of office staff. This comment occurred so frequently that the researcher was compelled to create a separate category titled All Except Office Staff. Several teachers comments that they had never worked with a male secretary. Three respondents commented that although they had never worked with a male office staff member, they would be more than willing to do so without bias.

The researcher also asked the participants what, if any, differences existed between female and male elementary teachers. Of the 217 initial participants, 164 responded to this item. Sixty-nine participants commented that either there were no differences or that there were too few male elementary teachers to discuss such differences. Some of these participants made comments such as "there are none that I recognize," "I think gender does not make a difference, but personality does," "there are definitely differences in teachers but I do not feel it is due to their gender," and "in elementary school there is no difference." The vast majority of the participants stated that they had worked with many more female teachers than males, making it difficult to generalize what they know about male teachers. One comment sums up this perception nicely, "I really don't think of this [teacher differences] along gender lines. My experience with male elementary teachers is somewhat limited because I haven't worked with many."

The remaining 95 survey participants who responded to this item perceived differences between female and male elementary teachers. After coding the data, the researcher categorized the explanation of differences into four groupings: Males–Just Because, The Mellow Male, the Female Who Mothers, and Commander Male. Out of the five categories, 30 comments fit into the Female Who Mothers category. Noted author and researcher Carol Gilligan (1982) describes women as having the unique ability to nurture and demonstrate caring to their students. Several comments made in this research support Gilligan's work. One comment was, "Female teachers are more nurturing than males." Another respondent stated, "Female teachers are more sympathetic to students than male teachers." Yet another participant commented, "Female teachers are more giving of their personal time and show more empathy to their students." All comments that the researcher categorized in the Female Who Mothers group were not equally positive. Multiple comments were made describing the possible negative aspects. One comment was, "Female teachers are more motherly, smotherly towards their students." Another comment was made that "Female teachers seem to have difficulty with letting things go when there is a difference in opinion." A third respondent stated that "Female teachers are far more emotional and clicky (sic) than their male counterparts."

The Mellow Male had the next highest frequency, with 24 responses. These respondents commented that they perceive male teachers to be laid-back, relaxed, independent, and

have a better sense of humor than their female colleagues. Some of the specific comments made were "males seem more laid back," "the 'cool guy' mentality—that is an innate difference in general between women and men," "they tend to go with the flow," and "men seem to be more positive than women." Several comments show that this perception of males being laid back can also be negative. One such comment was, "Other males are much more laid back and don't mind letting the kids goof off." A female teacher stated, "Male teachers tend to be more lenient when it comes to management." Another female teacher's comment was, "Male teachers seem to be a little less organized." Again, because of the low number of male teachers it is difficult to generalize perceptions of the male teacher population. However, these responses raise several interesting issues about male teachers. Do they seem more independent because there are fewer male colleagues with whom they can be comrades? Why are male teachers perceived to be more laid back? Since they know they are in the minority could it be that they do not want to "rock the boat?" Perhaps it is because they are intimidated by their female colleagues and, therefore, cautious about voicing their opinions. Twelve respondents viewed their male teaching colleagues as "lazy." These respondents said that the male colleagues they knew put in far less work, left school early, and were less passionate about their jobs. Two respondents shared negative comments that "many of the male teachers expect the female teachers to do the planning and organizational work," and "in my building the males are followers of their female teammates. They do very little initiating and are told what to do and sometimes how to do it." It could be that coupled with the female teaching trait of being motherly, male teachers' attempts to fit in and be a part of the team are perceived as laziness and apathy. Twenty-two respondents said that males achieve a certain level of success simply because of their gender. This researcher labeled this category as Males–Just Because, since several respondents commented on male teachers' "maleness." One female respondent stated, "Male teachers tend to get more respect from students simply because they are men…" Another female participant commented that "Males tended to be more liked by a larger majority of students, especially other male students." Respondents commented that male teachers are counted on to discipline students, even when the students are not their own. Several respondents also stated that men in their building garnered more respect because of their gender. It could be that this perception is true, that men are respected more because of their gender. It could also be that because they are the minority, they do specific tasks in the building that female teachers are not willing to do or are not asked to do. Eighteen respondents commented on men being loud, outgoing, verbally direct, and business-oriented; thus, the researcher organized these comments into the Commander Male category. One comment was, "Male teachers tend to be very structured and organized, while female teachers can be disorganized." Another female respondent stated, "I find that male teachers tend to have firm boundaries without bending in special situations." Yet another female participant said, "Male teachers are better disciplinarians with challenging students." Most of the comments were positive in nature, yet a few respondents perceived these qualities to be negative. Two female survey participants stated: "Some male teachers are less accommodating to individual needs and learning styles," and "In general, my experience is that some male teachers are extremely strict and yell more often than their female counterparts." Again, these results could indicate that because of the low number of male teachers, it only takes a few ineffective ones to have a major impact on the stereotype of male teachers.

The researcher also surveyed participants regarding the need for more male elementary teachers. One hundred and eighty-four respondents perceived a need for more male elementary teachers; their responses were grouped by the researcher as follows: Male Role Models, Balanced Staff, Opportunity for Varying Styles, and The Male Presence. Seventy-six

percent, or 138 participants, who perceived a need for more male elementary teachers stated that more males were needed as role models. A large number of participants said that students, both boys and girls, needed male role models in elementary school because so many students' homes did not have a positive male influence. Forty-seven percent, or 87 respondents, stated that students needed a "strong" and "good" male role model. Nineteen percent (35) of the respondents who felt that more men were needed in elementary education believed that men provided a "balance" to the staff and school environment. Multiple comments addressed the fact that since the greater population is made up of almost half women and half men, our schools should represent those figures accurately. Missing from this reasoning was a need to hire a more diverse staff, including teachers of varying races and ethnicities. Eight percent, or 15 of the respondents, stated that more male teachers were needed because they offer a different approach to teaching; two of the comments are as follows: "To add another point of view and demonstrate that logic can be as effective as well as emotions." "[More men are needed] to offer diverse perspectives and styles in school that would benefit everyone." Two percent, or four of the respondents, stated that students enjoy and respond well to male teachers, and therefore schools need more of them. Respondents shared that male teachers are able to connect with students in a unique way and "get something different from them."

Less than one percent (.05%), or nine of the respondents, commented that more male teachers are not needed in elementary education. These respondents explained that gender is not an issue and that no one should get a job because they are male, female, or of a certain race. Two of these nine respondents stated that none were needed at the elementary level, but more were needed at the middle and secondary levels of education. Most research highlights the low number of male elementary teachers, yet these particular respondents perceived that there was no need for more male elementary teachers. However, the majority of survey participants felt that elementary education needs more male teachers.

Finally, the researcher asked for additional comments. Twenty-one percent, or 45 of the initial 217 participants, responded to this survey item. Twelve respondents commented on the importance of hiring more male teachers of high quality and stated that it was an important issue. Several respondents stated that this study was a "good idea" and that this study was "important for education." One female respondent stated "I really wish there could be some kind of push to get more male teachers in elementary school. [I] would like to see society communicate support for men entering the profession with importance and not just a role for women." This comment was supported by another female participant, who commented "I think that men would make excellent elementary teachers, but are often steered into higher grade levels." There were only two negative comments about the research topic itself. One female respondent stated her frustration this way:

It really irks me that they [males] are many times singled out for glamorization— movies made, books written, teacher of the year, etc. I think a lot of the attention they get is that they start out as a novelty/minority in the first place, so they are easier to focus on. I think that many female teachers get looked over because they are not a novelty, but an expectation.

Fifteen respondents commented on the challenge of discussing possible differences between female and male elementary teachers, because of a myriad of factors including the low number itself. Many comments included the fact that the respondents had never worked with a male teacher before, thus making it difficult for them to respond to the survey. One individual communicated that it was not a concern, because teachers should not be hired because of their gender, among other reasons. Another participant shared the opinion that

teacher gender has more effect on the grade level team dynamics than it has on the students. Two other comments were made regarding team dynamics. One comment was that "male elementary teachers tend to spend time more productively by staying focused on tasks to be accomplished during meetings and making decisions more quickly without discussing non-essential information unrelated to the decision." A second comment was simply put, in regard to staff personnel, "Male teachers are allowed to be more laid back." These comments support previous statements to other survey items relating to the emotional or attitudinal differences between female and male teachers.

Conclusions

A comprehensive review of the data and an analysis and synthesis of findings suggest the following conclusions regarding teachers' perceptions of gender-based differences among their elementary school colleagues:

1. Male elementary teachers are, overall, perceived more negatively than their female colleagues.

The reason that men received more negative responses than female teachers is unclear; it could be that men who work in elementary education are less effective than their female colleagues or that women working within the profession simply do not perceive their male colleagues as effective because of their own biases. Further, with the low number of male elementary teachers, it could be that a few ineffective men significantly impact negative perceptions related to their effectiveness, whereas similar numbers of ineffective female teachers are overshadowed by the majority of their colleagues who may be highly effective.

2. The majority of participants feel that there are differences between female and male teachers, particularly when it comes to their ability to serve as role models and the jobs they are expected to fill in the elementary setting.

More than half of the teachers surveyed felt that female and male elementary teachers were different in important ways. Respondents felt that women are more nurturing and sensitive to their students' needs than are their male colleagues, despite the fact that some of these character traits might be perceived negatively (such as being too nurturing or too sensitive). Men were also perceived positively as being more laid back but also, in interesting contrast, as being more strict than their female colleagues. Other respondents indicated that men were more successful in the elementary setting simply *because* they were men. Many of these perceptions may have their roots in stereotypes about men and women. They could also be based on differences in the socialization of men and women, and subsequent variations in their classroom functioning.

Perceived differences between female and male teachers are especially apparent when it comes to their ability to serve as role models and the jobs they are expected to fill in the elementary setting. Although seven female participants disagreed that male elementary teachers were effective role models for their students, this was the only pair of items on the online survey where women received more neutral responses than men. One reason for this pattern may be that female participants did not feel comfortable stating their perception because of perceived or self-imposed pressure to support female colleagues. Teachers who were surveyed expected to see more men than women in administrative positions, particularly in those that were high-ranking. They were aware that their male colleagues were often encouraged to seek administrative positions and stated that, at least in one district, there was no attempt to hire female administrators. Men may often enter administration because of the low number of male teachers and the desire for camaraderie.

3. A vast majority of participants feel that more male elementary teachers are needed in the school setting.

Nearly every respondent indicated that more males were needed in elementary education. This finding supports existing literature that suggests that the main reason for needing more male elementary teachers is so that they can serve as role models for students, especially for those students who lack male figures at home or outside school. Survey responses were interesting, considering that teachers also perceived males more negatively than their female colleagues, both generally, and more specifically, with regard to their functioning as role models for their students. Finally, teachers in this study felt that male teachers "balanced" the staff, exposed their students to a variety of teaching styles, and offered a beneficial presence in the building.

4. Differences between female and male elementary teachers are unclear in many areas.

Finally, perceived differences between female and male elementary teachers with regard to the characteristics addressed in this study remain unclear. Statistically significant differences between perceptions of female and male teachers were not found; however, there were qualitative differences, with males receiving more negative comments than their female colleagues. Differences could not be determined in each of the three domains, even though most participants responded to the open-ended item that such differences did, indeed, exist.

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Acknowledgments

My advisor and chair, Dr. Rina Chittooran, for her support and guidance throughout the dissertation project.

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Appendix A

Teacher Online Survey

Teacher Perceptions of Gender-based Differences Among Elementary School Teachers

Instructions: Please answer the following items which address your experiences working with female and male teachers. Remember, your feedback will be kept strictly confidential, and will not be linked to you in any way.
Thank you for your participation.

The female teachers I have worked with have adequate content knowledge to teach their classes.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with have adequate content knowledge to teach their classes.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with have an effective teaching style.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with have an effective teaching style.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with use effective classroom management strategies.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with use effective classroom management strategies.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with effectively motivate their students and keep them engaged.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with effectively motivate their students and keep them engaged.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with effectively serve their students as role models.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with effectively serve their students as role models.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with are nurturing and sensitive to their students.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with are nurturing and sensitive to their students.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with are patient with their students.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with are patient with their students.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with treat their students fairly.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with treat their students fairly.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with have a desire to work with children.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with have a desire to work with children.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with are collegial.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with are collegial.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The female teachers I have worked with have generally positive attitudes about their profession.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

The male teachers I have worked with have generally positive attitudes about their profession.

Please fill in the answers in the table below (mark appropriate circles and squares and fill in the blank spaces).

	Pick One	Comment
	○ Strongly Agree ○ Agree ○ Neither Agree nor Disagree ○ Disagree ○ Strongly Disagree	.....

What, if any, are expected jobs for females within an elementary setting (classroom teachers, administrators, physical education teachers, custodians, office staff, etc)?

Please write your answer in the space below.

.....

.....

.....

.....

What, if any, are expected jobs for males within an elementary setting (classroom teachers, administrators, physical education teachers, custodians, office staff, etc)?

Please write your answer in the space below.

What differences, if any, are there between female and male elementary teachers?

Please write your answer in the space below.

Is there a need for more male elementary teachers? Why or why not?

Please write your answer in the space below.

Are there any additional comments you wish to make pertaining to this study?

Please write your answer in the space below.

Demographic Information

Is your school a Title I school?

Please pick one of the answers below.

- ○ Yes
- ○ No

What is your gender?

Please pick one of the answers below.

- ○ Female
- ○ Male

How many years have you been teaching in elementary education?

Please pick one of the answers below.

- ○ 1 - 4
- ○ 5 - 8
- ○ 9 - 12
- ○ 13 or more

What is your age?

Please pick one of the answers below.

- ○ 22 - 27
- ○ 28 - 32
- ○ 33 - 38
- ○ 39 - 44
- ○ 45 - older

What is your race/ethnicity?

Please pick one of the answers below and add your comments.

- ○ African American
- ○ American Indian
- ○ Asian American
- ○ Caucasian
- ○ Other: Please specify

What grade level do you currently teach?

Please pick one of the answers below.

- ○ First Grade
- ○ Second Grade
- ○ Third Grade
- ○ Fourth Grade
- ○ Fifth Grade
- ○ Sixth Grade
- ○ Other

What is the highest level of education you have completed?

Please pick one of the answers below and add your comments.

- ○ Bachelor's Degree
- ○ Specialist's Degree
- ○ Master's Degree
- ○ Doctoral Degree
- ○ Other: Please explain

How many male elementary teachers currently work in your building?

Please use the blank space to write your answers.

What is the greatest number of male elementary teachers that have been employed in your building at one time?

Please use the blank space to write your answers.

Thank you for your participation!

International Electronic Journal of Elementary Education, 2012, 4(2), 347-366.

The Assessment of Math Learning Difficulties in a Primary Grade-4 Child with High Support Needs: Mixed Methods Approach

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Received: June 2011 / Revised: January 2012 / Accepted: January 2012

Abstract

This mixed-methods study incorporated elements of survey, case study and action research approaches in investigating an at-risk child. Using an in-take interview, a diagnostic test, an error analysis, and a think-aloud clinical interview, the study identified the child's major presenting difficulties. These included: inability to use the four arithmetic operations (addition, subtraction, multiplication, division) efficiently; not understanding the relationship between units, tens and hundreds; using any two of the four arithmetic processes (+, - , x, ÷) in combination within one operation; treating each column as a separate problem; place value problems / wrong alignment of numbers; poor eye-hand coordination leading to dysgraphia; and memory lapses. The other problems that became apparent through this investigation and implied in the findings include possible causal factors such as dyscalculia, dyslexia, low self-esteem, low self-efficacy, and math anxiety. Further assessment, intervention and research are recommended to address problems of this vulnerable child.

Keywords: Mixed Methods Research; Survey; Case Study; Action Research; Authentic Assessments; Dyscalculia; Dyslexia; Dysgraphia

Introduction

Students' academic and personal problems in institutions of learning can be identified and resolved in a number of ways that are familiar to educational psychologists, special educators, school counselors, and educational researchers. Normally, students' problems tend to be numerous, multifaceted and complex in nature and require an interdisciplinary approach to understand them adequately. This then calls for a variety of procedures to be employed when investigating and addressing students' problems in schools.

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ISSN:1307-9298

www.iejee.com

Mixed method research designs

These are studies that combine quantitative and qualitative research paradigms in an attempt to compare or contrast the findings and understand the presenting problem(s) more fully. A researcher may, for example, investigate the same problem in a two stepwise fashion or strategy starting as an exploratory quantitative survey and ending as an in-depth qualitative case study. Mixed methods research designs also use a mixture of data collection approaches (e.g. tests, questionnaires, observations, interviews, documents, and projectives) and adopt a wide range of data analysis techniques (both quantitative and qualitative). Investigators who use mixed method research designs also often report and interpret data and findings in different ways. In all these strategies, the data and findings are triangulted to confirm their validity. Mixed method research designs have several advantages and disadvantages but only three examples of each of these will be given here. The three main adavantages of the strategy are that it: (1) incorporates the strengths of both qualitative and quantitative approaches; (2) provides a more comprehensive view of the problem or phenomena being studied; and (3) does not limit the data being collected. The major disadvantages or limitations are that it: (1) requires high-level expertise in both quantitative and qualitative methods to use it competently; (2) needs extensive data collection and resources; and (3) is prone to being used superficiary such as claiming to have used several methods when in actual fact and reality only one was used. There are three main specific designs that are associated with the mixed method research approach and these are: (1) explanatory design - occurs when quantitative data are collected first followed by qualitative data collection; (2) exploratory design - whereby qualitative data are gathered first with quantitative data collection following later; and (3) the triangulation design – in which quantitative and qualitative data are collected silmultaneously to provide a more comprehensive and complete set of data. As is the case with other research methods, the investigator's decision and choice to use a mixed methods appoach is often arrived at after a long and careful thought based on the consideration of a number of important factors such as the type/nature of problem to be researched, specific research questions or hypotheses to be probed, the feasibility of the research strategy, rationale or justification for using the method, and expertise in using apprpriate data collection, analysis and interpretation techniques. It is pointless and redundant for ecclectic investigators to use a research method when it is not warranted.

Authentic assessments for learning

In the past, student academic evaluations focused mainly on the assessment of learning (the quantity of knowledge and skills a student obtains as a result of attending school and receiving instruction from teachers – i.e quantifying what one gets from undergoing a course of instruction). This quantity was usually reflected in test/examination scores and grades as manifested on the school report or transcript. Emphasis was placed on the so-called summative norm-referenced assessments that were used to mark the end of an educational cycle / level as well as rank and compare students for various purposes such as offering them admission, scholarship or employment. By doing so, examinations dominated the scene in schools and educational systems became examination-oriented (Mundia, 2010). Both teachers and students became obssessed with coaching and preparation for examinations respectively. In this way, examinations undermined good teaching which emphasizes understanding.

On the contrary, authentic assessments for learning stress that student evaluations should help learners to understand and master the knowledge and skills that they receive through teaching. These evaluations include both formal criterion-referenced assessments as well as

the informal formative assessments such as observations, experiments, interviews, portfolios, lesson studies, and assessments by the self, peers, and parents. There are no norms derived from the informal authentic assessments and the results cannot be used for comparison purposes. Despite this, these informal authentic assessments are seen or considered to be the key to meaningful learning based on understanding. They enable teachers and parents to identify the conditions and circumstances under which a student can maximize her/his potential to learn. Emphasis here is on assessing the learner holistically/globally for both academic and personal problems. The assessment results form the basis for improved teaching and learning. Though still relatively new and unknown, authentic assessments are already becoming well known in some developing countries (see Engelbrecht et al., 1999).

Sources of problems in learning mathematics

Many students at all levels of education in developing countries have problems in learning mathematics. The causes of these difficulties are many and wide ranging. Five of the numerous broad factors appear to be outstanding. First, some students seem to be negatively influenced by the stereotype beliefs held by many people that mathematics is a difficult subject (Heward, 1996). Second, for a number of learners their problems appear to stem from unsatisfactory teaching and the resultant lack of experience of success (Mundia, 1996; 1998). Third, still for other students their difficulties seem to be linked to the procedures used in evaluating mathematics learners (Somerset, 1987; Murray, 1996). Fourth, there are also students who unfortunately may have a genuine specific learning disability in mathematics (; Thornton et al., 1983; Hall, 1994; Mercer, 1997; Bos & Vaughn, 2002). Fifth, poor performance in mathematics might also be attributed to inadequate funding of education which results in fewer teaching/learning resources and low quality of education (Kelly; 1986; 1991). The child described in the present triadic study (nick-named B) required the joint efforts of an educational psychologist / school counselor, one of the child's parents (referrer) and a special educator, to solve. Dettmer, Thurston and Dyck (2002) discuss the viability and benefits of collaborative intervention strategy.

Development and persistence of math anxiety and phobia

Students who do not perform well in mathematics often develop math anxiety and phobia. Math anxiety and phobia in the context of the present study refer to the unreasonable worries about and fear of mathematics. This condition can be severe and persistent if not treated effectively through either educational interventions (e.g. provision of remedial instruction, learning support, and individualized educational plans), or via counseling. There are several counseling / therapeutic techniques that are used in treating anxiety and phobia. They include rational emotive therapy (RET), implosive therapy, systematic desensitization, operant conditioning, modeling, cognitive restructuring, and behavior therapy. Fogiel (1989) and Thompson (2003) discuss most of these procedures in detail.

Objectives of the study

The purpose of the present study was to identify the degree and nature of problems in math for a particular Year 4 (Grade 4) child. The study also sought to find and recommend ways the child's math problems could be investigated further to gain additional insights. In short, the study sought to answer the following three research questions: (1) what exactly were the child's problems in math?; (2) why were the problems recurring and persisting?; and (3) how could the problems be resolved and avoided in the future?

Research methods

The study used a mixed-methods design that incorporated the survey, case study, and action research elements. Initially, the study began as a field survey which was in form of a diagnostic math test administered to all the 29 students in a class that included a child referred to the researcher by parents for mathematics problems. The purpose of the survey phase was to determine the extent to which math problems were unique to the referred child and common to other students in his class. Upon confirmation of the problems, the referred child (pseudo-named B) was then included in the case study for further observation, interview assessments and analysis. The justification for adopting the case study procedure for the rest of the investigation was two-fold. First, the researcher wanted to make an in-depth functional analysis of the child with regard to mathematics. Second, only one child was referred to the psychologist by his parents for assessment. Throughout the present study, the investigation was done collaboratively in form of action research and as a triad involving the researcher, the class teacher, and one of the parents of the child pseudo-named B. This parent was the referrer. The rationale for incorporating an action research component was that the causes or sources of learning problems in math for a child can be many and multifaceted. Such numerous different factors might be best captured and understood from an interactionist view-point (Martin, 2010). A broad perspective on a student's problems in math may include the child's own weaknesses or difficulties, the unsatisfactory and harmful teaching at school, an inappropriate and disturbing home environment, and the overall quality of support given to the child in math at both school and home. Of course the causal factors are many more than indicated here and might include issues of teaching/learning resources, the curriculum, and assessment practices.

Data collection instruments

The data for this case study were collected through observations, school assessment reports and documents, an in-take interview with one of the parents, a researcher constructed 16-item diagnostic test covering contents (addition, subtraction, multiplication, division) already taught in the academic year which was administered to the whole class as a revision exercise; an error analysis of the child's mistakes in mathematics from the diagnostic class wide test; and a think-aloud diagnostic interview based on the error analyses. The math test had an alpha reliability of .76 and high content validity. In addition, the test also had good ecological validity in that it was administered by the child's math teacher as part of normal class activity and action research during a mathematics lesson. All the informal observations and interviews (in-take and diagnostic) were done inside the child's usual classroom, a non-threatening habitat that the child was accustomed with. This helped the child not to behave or respond in defense and cautious manners. The in-take interview with one of the parents provided the child's background information while the error analyses and think-aloud diagnostic interview provided valuable insights into the child's strengths and weaknesses in mathematics.

Initial Sample and Case study participant

The survey component of the present study was based on an initial purposeful sample of 29 Grade 4 (Primary Year 4) children of whom 17 (59%) were females. The children ranged in age from 8 years 9 months to 10 years 3 months with a mean age of 9 years and 6 months. The *t*-test statistic for independent groups indicated no significant difference in age between the two genders ($p > .05$). The case study level of the investigation had only one male participant who was referred to the researcher (educational psychologist / school counselor) by one of his biological parents for problems in learning mathematics. The biographical information of this student reported in this section of the study was obtained from both the

school records and the in-take interview with one of his parents. At the time of collecting the bio-data, the boy was aged 9 years and 7 months. He was the 5th and last born in an intact nucleus family with five children (three boys and two girls). During the in-take interview, his parent asserted that the family's home environment was peaceful and not economically disadvantaged.

Data analysis

Survey data were analyzed quantitatively while observational and interview data were analyzed qualitatively. Qualitative data included error analyses.

Procedures

From the beginning to the end of this investigation, the researcher (psychologist and counselor) was conscientious and mindful of the ethical and legal implications surrounding the use or involvement of children (minors) in psychological research, assessments, and therapy. In view of these sensitivities, the researcher consulted, for the sake of clarity, the relevant legal experts and ethical codes of conduct for the psychological society and the counseling association of which he was a member (regarding the contentious issues of voluntary participation, privacy, anonymity, confidentiality, physical and psychological harm, debriefing, and informed consent). No deception was used or involved in this study. As indicated above, the child described in the present study was referred to the researcher (psychologist / counselor) by his own parents. The parents of the child in the survey and case study therefore consented to the child to be assessed. Legally and ethically, minors (children) cannot, on their own, consent or volunteer to be in research or undergo assessment or be in therapy without the agreement and permission of the parents or significant others. Prior to carrying out the study, permission to conduct the survey and case study around the school and classroom premises was also obtained from both the school authorities and the class teacher as "loco parentis". The parents, school authorities, and class teacher also allowed the researcher to publish the results of the assessment in the present study as these might be of value and useful to both the local and international communities of researchers, parents, and teachers that are interested in improving young children's learning and understanding of mathematics. However, the parents, school authorities, and class teacher did not permit the researcher to reveal any identifying information. Due to these ethical and legal constraints, the researcher has kept anonymous and confidential the names, ethnicity and nationality of the child in the present case study throughout the article. Instead, the child is given a pseudonym B as his name in this study. The researcher and author had worked or taught in five different countries (all of which cannot also be named) and the specific country from which the data for the present study were obtained is kept anonymous and confidential. Only general educational implications of the findings deemed by the researcher to be of interest or value to the local and international community are discussed in the article. Similarly and at their request, the names and affiliation addresses of the co-researchers (cooperating teacher and collaborative parent) are also not revealed as part of the efforts and process to conceal the identity of the child. The study met the ethical requirements for using human participants (including children) in research stipulated by countries / governments in the Helsink Declaration of 1975 as revised in 2000 and 2005.

Results

Presented below are the results of performance for the child in the case study on addition, subtraction, multiplication, and division problems. The findings from the error analysis and the think-aloud clinical interview are also presented in this section. In addition to presenting all the results, this part of the article will also attempt to address the first and second research questions of the study, namely: (1) what exactly were the child's problems in math?; and (2)

why were the problems recurring and persisting? Plausible explanations to answer these questions are offered.

School records, in-take interview and informal observations

Both the teacher's observations that the child was struggling in math and the school assessment reports that indicated the child was two standard deviations below the mean concurred with the parents' own observations. This repeated failure and lack of experience of success may somewhat have de-motivated the child.

During the in-take interview, the parent reported that the child's birth, development, and health progressed normally throughout his childhood. The school records and parental input in the interview concurred that he attended school regularly with only a small and insignificant number of acceptable absences each year. Despite the good attendance recorded in the registers, school academic reports and observations (of both the class teacher and parents) suggested that the child had high support needs in mathematics. His poor performance could, however, not be attributed to negative impacts from the home environment or school atmosphere, both of which were considered to be conducive and supportive contexts (according to the in-take interview with the parent and the teacher).

Performance on math problems for the whole class (Appendix 1)

The performance of all the 29 students on math problems is presented in the table in Appendix 1. The items on this diagnostic test were arranged in an increasing order of difficulty starting with easy questions and ending with the most challenging items (with moderate or medium difficult items in the middle of the range). The four math topics covered were addition (Items 1-4), subtraction (5-8), multiplication (9-12), and division (13-16). The learner in the present case study is identified or labeled as student "A" in this table (Appendix 1). His total score (4) was the lowest but there were two other students (K and B) who trailed him and scored 5 and 6, respectively. These other two weak children were not included in the case study as they were not referred to the researcher (psychologist and counselor) by their parents. Both the weakest and strongest students in mathematics can be identified visually from this table. Apart from student A, who was referred for further assessment, none of the other two weak students was in therapy. Under the current and ongoing ethical and legal rules, children (minors) cannot be in therapy without the explicit consent of their biological parents or significant others. There was therefore no other way additional information could be obtained on these other weak children. Although the presenting problems for these other less able students are not known, it is quite possible they might have similar difficulties as the student in the present case study. In addition, it was also observed and noted that the school and class did not have any special needs support scheme.

Test and item statistics and alpha reliability analysis (Appendix 2)

Item 6 in the table in Appendix 2 was deleted (omitted or excluded) from analysis because it was too easy and every child got it correct (see table in Appendix 1). The facility value, standard deviation, and discrimination index for this item were all 1.00 (easiest item). Theoretically, the range of the total scores on this diagnostic test was 0-16 but the actual obtained score spread was 4-15. Student B's total score of 4 (25%) was 6 points below the class average of 10.069 (SD = 2.776). B's score was therefore more than 2 standard deviations below the mean (Z = -2.186). Given that the test as a whole had good alpha reliability, good content validity, good ecological validity, and was not biased in favor of either gender, B's poor performance could therefore not be accounted by (or attributed to) all these factors. A close scrutiny and analysis of his performance provided additional insights. His sub-scores by

topic were: addition (2 out of 4); subtraction (1); multiplication (0); and division (1). Of the four questions he got correct answers (Items 1, 3, 6, 13), Item 6 was the easiest question (p = 100%). In the table in Appendix 2, item mean scores are synonymous with item difficulty indices (facility values or p-values) because the data were dichotomous/binary (see Appendix 1). From the table in Appendix 2 it can be noted and observed that Items 1 and 3 were the second easiest questions with similar p-values (Facility = .93). Furthermore, Items 1 and 6 are too elementary and perhaps suitable for Grades 1-2 (Year 1-2) students. Moreover, even the only relatively challenging item that he got right (Item 13), is also more appropriate for Grade 3 (Year 3) students. Overall, the test diagnosed B as a very weak student in mathematics. His knowledge and skills in math were very shaky and fragile. In four years of primary schooling, this student only mastered the addition and subtraction of single digit numbers (units) that do not involve or include zeros. This evidence suggests that the child might be about two Grades (two academic Years) behind in mathematics as he seems to be operating at the level of a Grade 1 or Grade 2 pupil. He is weakest in division but this may be due to the fact that this was the last topic the class learnt before the diagnostic test was administered. He might, however, benefit from further assessment, early identification of causal factors, and early intervention, both educational and psychological (to build a strong and firm foundation).

Error analysis of math problems for the case study participant (Appendix 3)

The observations presented below are based on the results of the diagnostic test displayed in the table in Appendix 3, the error analyses of these results, and the subsequent think-aloud diagnostic interview with the child that allowed him to verbalize his strengths and weakness. Although the psychologist encouraged the child in a variety of ways (e.g. through probes) to talk during the diagnostic and think-aloud interview, the student said little other than uttering short sentences such as "I added"; "I subtracted"; "I multiplied"; and "I divided". His few verbalizations during the diagnostic interview demonstrated that he was perhaps deficient in language facility and possibly lacked both understanding and meaningful learning in mathematics. Despite this problem, the error analysis and think-aloud clinical interview generated significant and valuable insights (hints and clues) into the math problems of this child from observing and analyzing the way he practically solved math questions on the diagnostic test. These problems might be attributed partly to the child and superficial teaching. Listed and briefly discussed below are the main results from the error analysis and think-aloud diagnostic/clinical interview.

Addition errors (Items 2 and 4)

Item 2:

- Treats each column as a separate problem (Thornton et al., 1983)
- Fails to regroup when adding (Thornton et al., 1983)
- Number fact error- fails to master and do simple addition (Rivera & Bryant, 1992)

Item 4:

- Handles each column as a separate problem (Thornton et al., 1983)
- Inability to regroup when adding
- Place value problems e.g. aligns numbers incorrectly (Trafton, 1987)
- After probing he adds left-right (tens and hundreds)across the row e.g. 3+8= 11
- Cannot add large and small numbers
- Fails to carry simple addition manipulations

- Incomplete work

Subtraction errors (Items 5, 7, 8)

Item 5:

- Poor visual functioning - dysgraphia e.g. cannot write numerals such as 9 correctly
- Memory impairment e.g. he forgot that he borrowed 1 from 6
- Commits number fact errors e.g. has not mastered simple subtraction (Rivera & Bryant, 1992)

Item 7:

- Inability to regroup when subtracting a large number from a small number; he then rearranges the problem e.g.

  0 - 6 = _____, becomes 6 - 0 = 6 (in Q7)

- Zero difficulties e.g. 0 - X = X in the above statement
- Subtracts the smaller from the larger digit in each column (Thornton et al., 1983)
- Takes each column as a separate entity/problem
- Disturbance in quantitative thinking e.g. is unable to understand the relationship between units, tens, and hundreds
- Number fact errors e.g. is incapable of doing subtraction involving large numbers (numbers with two or three digits)

Item 8:

- Zero difficulties e.g. subtracts the smaller from the larger digit in each column (Thornton et al., 1983)
- Handles each column as a separate problem
- Aligns numbers incorrectly (place value problem)
- Finds it difficult to subtract a two digit number from a three digit number.
- Relationship between units; tens, and hundreds is not clear

Multiplication errors (Items 9, 10, 11, 12)

- Confusing multiplication with addition e.g. in item 9 he first multiplied 2 x 7 and got 14. He wrote 4 and carried 1 which he then added to the multiplier 2 to get 3 thereby obtaining 34 as the answer (item 9)
- Poor visual- motor functioning – dysgraphia e.g. inability to write 4 properly (Item 9)
- Poor visual – motor functioning – dysgraphia e.g. aligning numbers incorrectly (Items 9, 10, 12)
- Zero difficulties e.g. P x 0 = P (Item 11)
- Number fact errors e.g. lacks mastery of basic multiplication skills
- Confusing addition with multiplication e.g. he treated 4 like the number 1. He then added 8 + 1 = 9. Finally he dropped down to get 49 as the answer (Item 12).
- Lack of information errors

Division problems (Items 13, 14, 15, 16)

- Wrong placement of the quotient digits (Items 13-16)
- Zero difficulties e.g. 0 ÷ P = P (Item 14)
- Failure to recognize when the quotient is larger than both the numerator and denominator (Item 16)
- Know this division sign/symbol ÷ (Items 13-14) but does not know the other division sign/symbol in the last two items (Items 15-16)
- Number fact errors e.g. failure to comprehend simple division problems (Items 14-16)
- Confusing division with either addition or multiplication (Item 16)
- Poor visual – motor functioning- dysgraphia e.g. unable to write 4 correctly (Item 13)
- Inability to change and state a simple division problem in words (Items 14-16)

Persistent and recurring errors (Across the four processes)

- Number fact errors e.g. failing to do simple addition, subtraction, multiplication, and division.
- Using or mixing or confusing any two of the four processes (+, - , x, ÷) within one operation
- Bugs - the following systematic procedural errors occurred repeatedly and consistently:
    - Wrong alignment of numbers
    - Hand-eye coordination
    - Treating each column as a separate problem
    - Zero difficulties
    - Place value problems
    - Misunderstanding the relationship between units, tests and hundreds
    - Memory lapses; short-term memory
    - Dysgraphia (observed from the writing of responses/solutions to math problems)
- Potential problems that from observations seem to perpetuate the child's difficulties in mathematics and that may need further assessment:
    - Dyscalculia (not measured in the present study but implicated as a possible cause)
    - Dyslexia (not assessed in the present study but suspected to be a likely causal factor)
    - Mild to moderate learning disability (LD) in math (not evaluated in the present study but amply observable and evident from the child's interactions with the researcher during the diagnostic / clinical interview)
    - Low self-esteem in mathematics due to the negative effect of repeated failure
    - Low self-efficacy in mathematics because of lacking experience of success

- Math anxiety / phobia (no clues or hints on these from the present study but worth probing and preventing)

Discussion

Instead of discussing the results of the investigation presented above already with detailed explanations, this section of the article will address the third research question of the study, namely: how could the problem be resolved and avoided in the future? At this stage of the development of math problems in student B, primary prevention of the difficulties encountered would not be feasible because the problems have already occurred. More efforts should therefore be directed at the long-term (rather than short-term) secondary or perhaps tertiary preventative strategies. Failure to resolve the problems satisfactorily at this stage would perpetuate the difficulties and disable the child from mastering BODMAS (brackets, operations, division, multiplication, addition, and subtraction) or PEDMAS (parenthesis, equations, division, multiplication, addition, and subtraction) later at the upper primary and lower secondary school levels, respectively.

There are four broad ways the math difficulties of the student in the present case study may be resolved and in which problems of this nature might be avoided in the future. Based on the outcomes of the present study, the following long-term intervention strategies might be beneficial: (a) use of informal authentic assessments to evaluate math skills; (b) teaching interventions to address math anxiety and phobia; (c) administrative decisions to adjust math assessments and make them friendly; and (d) improving teacher education through initial and continuous training programs. Each of these is, in turn, explained below. The suggestions discussed in this section of the article (regarding authentic assessments, teaching interventions, administrative supports, and teacher education) are intended to assist a client / learner like student B to minimize his difficulties during math lessons and tests. They are to be implemented by regular teachers, the school administrators, and teacher educators respectively.

Use of informal authentic assessments to evaluate math skills

Experimental assessments

Students (young and old and at all levels of education) with special needs in mathematics and other subjects might benefit from the use of experimental assessments. Experimental assessments are informal assessments conducted by teachers, educational psychologists, school counsellors and parents to discover the effective learning conditions under which a child with difficulties in learning math works best. For example, a series of parallel tasks could be devised for a student to perform: (1) alone at home; (2) alone in class; (3) in a group in class; (4) in a group outside class; and (5) other structured conditions. Careful observations of the student will indicate what a learner can and will do in various test situations. This type of assessment will not tell us anything about how a student performs in relation to others in class but will be insightful in suggesting how she or he can be assisted. At present, experimental assessments are not used in developing countries' schools and homes and therefore unfamiliar to teachers and parents. Teachers and parents in these countries may need in-service training workshops to equip them with the necessary skills for using experimental assessments.

Observational assessments

For students with mild and moderate difficulties in learning math, alternative methods of assessment are essential. One way to do this is to observe the pupil's everyday activities (cognitive, psychomotor, and affective) and use some kind of a developmental scale as a

standard by which to reach a measure of a pupil's achievement. The kind of activities observed can then be related to the age that the nondisabled children achieve each one and an approximate developmental level determined. Observations of this nature can also be used in the assessment of the student's everyday behaviour. To reduce cautious or defensive reactions and improve the quality of the data obtained, both informal and formal observational schedules should be well constructed and administered by trained adults with whom children are familiar in the usual home or school environment (Van Tassel-Baska, Quek, & Feng, 2007). With the implementation of many educational reforms in developing countries regarding the curriculum, teaching strategies, examinations, inclusive education, and gifted education, the use of observations will be helpful to teachers and parents in identifying how regular and exceptional students are functioning in the reformed school system. However, both regular teachers and parents may need in-service training workshops to acquire observational skills. Special needs teachers, educational psychologists and school counsellors may serve as facilitators in these workshops.

Learning assessments

A learning assessment could be designed and implemented to inform the teacher what a child is capable of learning. In an ordinary achievement test, a particular task is given only once (occasionally two times) and the examinee is recorded as passing or failing. In a learning assessment, the pupil is first taught something in the assessment situation. She or he is then given the assessment task as many times as she needs to succeed or until the instructor gets a useful measure of the rate at which she/he learns. There are no norms for this kind of lesson study assessment and we cannot say how the child's learning compares with her/his age group or with that of a large group of non-disabled peers. However, three benefits are derived from a learning assessment of this nature. First, we would know more about the learning pace of the pupil. Second, we would get to know the type of reinforcements that are effective to the child. Third, the learner would eventually experience success, a desired motivating event. Teachers (both pre-service and in-service) in most developing countries would require additional training to be able to use learning assessments effectively. Current serving teachers could obtain this training through in-service workshops conducted by special education teachers, school counsellors, and educational psychologists.

Parental assessments

Children are raised in two main environments: home and school. At home children are always and constantly under the critical eyes of the parents. Some of the educated parents help their children with school work regularly or many times. Many of these literate parents even make detailed developmental notes in diaries or journals regarding their children. It would therefore be reasonable to expect parents to be partners in the assessment of school children. With reasonably high literacy rates in many developing countries these days, most parents may be able to assess their school children at least at the primary school level. At the secondary school level, many well educated parents would be able to assess their school children if they were given appropriate training in diagnostic observations, clinical interviews, and educational measurement to enhance and improve their assessment skills. When necessary, parents could be part of an assessment team (dyadic or triadic) with special education teachers, school counsellors, educational psychologists, and other specialists such as speech therapists. Parental assessment is especially critical when dealing with students with high support needs in challenging behaviours (e.g. defiant, oppositional, violent, school refusal, learning difficulties, autism, dyslexia, dyscalculia, emotional and behavioural disorders or EBD, and attention deficit hyperactive disorder/ADHD). At the moment it is

absurd to note that parents in most developing counties are only often told, rather than asked to assist in assessing their children's school work (Engelbrecht et al., 1999). More parental involvement in assessment is needed as advocated by many parent-teacher associations.

Peer assessments

Learners can help teach each other in studying any subject and this is called peer tutoring. Similarly, learners can also help to assess each other to some extent, a system known as peer assessment. Many practising teachers have for example seen students form informal study groups, discussing taught topics and asking each other spelling, arithmetic, science and social studies questions. In answering academic questions from peers, students express themselves freely without fear or intimidation and without anxiety, tension and stress. Peer assessment has potential to help students to master concepts and skills learned in various lessons. To be more useful and valuable, students involved in peer assessment need to be trained in social interaction skills, critical observation, and constructive appraisal. This is where special education teachers, school counsellors, and educational psychologists can be used as resource persons to train students in the effective use of peer assessment. Peer assessment may be challenging and difficult to use with young children in lower primary school or preschool level who might not be able to master its required skills. In addition, this form of assessment works better when a student has a buddy and if students work in small groups. When properly used, however, peer assessment can be a valuable learning tool. Peer assessment does not replace teacher assessment but rather enriches the process of student evaluation (Engelbrecht et al., 1999).

Self-assessments

In this mode of assessment a learner tests himself or herself and then reflects on his/her own capabilities (strengths and weaknesses). Self-assessment and self-reflection are key ingredients in the process of active learning. By doing this repeatedly, students learn to take control and responsibility for their own learning and eventually gain self-discipline and self-direction. Self-assessment helps students to master the learned contents and skills in several ways. Through repeated self-testing, a student eventually experiences success which raises her/his intrinsic motivation. Under self-assessment, a student competes against himself/herself and self-competition has fewer negative effects compared to competition with others. In self-competition there is no damaging effect of anxiety, tension, and stress. The success achieved through self-assessment and self-evaluation helps to boost a student's self-confidence and self-esteem. In view of all these advantages, self-evaluation is a valuable process for all learners (disabled, gifted, nondisabled, young, and old). It ought to be taught to and practised by students. At present, students in most developing countries may not know how to use self-assessment effectively. There is therefore a felt need to mount awareness or sensitization programs in schools to alert students about the potential benefits of using this study strategy to improve achievement particularly in challenging subjects such as mathematics. Students who develop and maintain a habit of self-evaluation often perform better in school work (Engelbrecht et al., 1999). Like peer assessment, the application of self-assessment among learners in lower primary and preschool levels may prove difficult because of the young children's inability to master its salient skills.

Portfolio assessments

A portfolio could be a file or container holding work examples or samples of tasks performed by a student (Engelbrecht et al., 1999). The examples of work samples could include pieces of writing, drawing, crafts, diary/journal entries, or anything that the student and teacher think is of value in assessing a learner. The pieces of work can then be evaluated by teachers,

parents, members of the parents-teachers association (PTA) or governing body as well as special support teams such as special educators, school counsellors, and educational psychologists. It is important to ensure that different pieces of work examples or samples are included in the portfolio. Diagnostic observations of the work samples, clinical interviews of the student on the work samples, and counselling discussions based on the portfolio contents can reveal quite a lot about a learner's weaknesses and strengths and provide insights about the best possible and available interventions. Portfolio assessment is important and valuable to all learners but more so for those with special needs and the gifted students. Teachers and students need training in assembling and critically evaluating a portfolio. Portfolio assessment is a relatively new form of evaluating students in developing countries. This kind of assessment has been proposed as an alternative to standardized and norm-referenced tests (see Taylor, 2000; Venn, 2000; Salvia & Ysseldyke, 2004). Recent studies show that portfolio assessments and other informal evaluations would be good non-traditional ways of accommodating the needs of students with disabilities as well as a simpler procedure for identifying gifted / talented students instead of using complicated traditional strategies such as tests of intelligence which may have linguistic and cultural bias (Lohman & Lakin, 2008; Olszewski-Kubilius & Kulieke, 2008). Portfolio assessment may also be used in conjunction with problem-based assessment (PBA).

Teaching interventions to address math anxiety and phobia

1. An error analysis of the client's performance in mathematics tasks needs to be made to determine where problems occur and the nature or extent of the problems. Both the weaknesses and strengths can be used in the intervention program.

2. Based on the error analysis, a diagnostic interview should be conducted to determine how and why the client makes these errors in mathematics. The findings can be used to improve strategies to teach the learner and assess him effectively.

3. Instruction should emphasize direct teaching (expository rather than discovery learning) of mathematics concepts and skills. Use of simple examples and demonstrations is recommended.

4. Mathematics lessons should be broken down into small steps and tasks that clearly show the client the relationships and inter-relationships between concepts within one lesson and concepts between different lessons.

5. The use of concrete materials e.g. visual aids, audio-aids; and audiovisual aids is highly recommended to facilitate explanation, demonstration, interpretation, and application of mathematical concepts and coefficients. This is important because the client is functioning at the concrete level.

6. Peer tutoring and cooperative learning are pro-social learning strategies that are highly recommended for the client. These techniques will eventually enable the child to have experience of success which will help increase his interest and motivation in mathematics thereby reducing anxiety and phobia.

7. Use positive reinforcements (including token economies) to encourage the client to maintain interest and motivation in mathematics.

8. Increase the funding of education so that the quantity and quality of teaching and learning resources can be improved.

Administrative decisions to adjust math assessments and make them friendly

1. The client should be given time extensions to complete math tests and examinations. Additional time will help accommodate his slow speed to read questions, conceptualize contents and process the responses.

2. General instructions on tests / examinations and specific instructions on how to respond to individual items should be written clearly in easy language. Both types of test instructions (general and specific) should also be verbally given to the student to ensure he understands them.

3. Ensure that the assessment instruments administered to the client contain a careful balance of both objective and short guided essay items. These types of items require many different cognitive strategies to answer. They also require different academic skills to answer satisfactorily.

4. Items on tests / examinations should not differ much in difficult so that the student's performance is easy to monitor and compare across items within one assessment instrument and between evaluation instruments.

5. The assessments should be criterion-referenced (emphasizing mastery / competence) rather than norm-referenced (stressing relative rank or position when compared to peers). What a student can be able to do is more important than how he competes with other students.

6. Continuous assessment, CA (formative evaluation) should be weighted more than final examinations (summative evaluation). CA gives a better picture of a person's abilities because it is multiple and multifaceted and permits an observation of the individual's non-cognitive skills over an extended period of time.

7. Using the results from frequent assessments under CA, it may be possible to monitor and chart the client's progress and difficulties. Both strengths and weaknesses would be useful in the student's intervention program.

Improving teacher education through initial and continuous training programs

1. Imparting special needs education instructional skills to regular early childhood education teachers to enable them to effectively help students with high support needs in learning mathematics.

2. Mount continuous professional development (CPD) workshops in mathematics to upgrade the knowledge and skills of early childhood math teachers.

3. Educational psychologists, school counselors, and special educators could help mount sensitization campaign messages (e.g. motivational talks, study skills, etc) to help prevent the development of math learning difficulties in young children. Such campaigns could use mediums popular to young children such as internet, movies/films, psychodrama, and role play.

Conclusion

This mixed-methods study incorporated elements of the survey, case study and action research approaches in investigating the research problem. Using a range of data collection strategies, the study assessed the academic problems of a young Grade 4 (Year 4) student who was referred for having difficulties in learning mathematics. From the diagnostic test, an error analysis, and a think-aloud clinical interview, the study identified some of the child's

difficulties. The major presenting problems included: inability to use the four arithmetic operations (addition, subtraction, multiplication, and division) efficiently; not understanding the relationship between units, tens and hundreds; using any two of the four arithmetic processes (+, - , x, ÷) in combination within one operation; treating each column as a separate problem; place value problems or wrong alignment of numbers; poor eye-hand coordination leading to dysgraphia; and short-term memory / memory lapses. The other problems that became apparent through this investigation and are implied in the findings include possible causal factors such as dyscalculia, dyslexia, low self-esteem, low self-efficacy, and math anxiety / phobia. Further assessment and research is recommended to probe and confirm the role of these variables in young learners with math difficulties such as student B, to gain additional insights. Future research should also be directed at examining the learning styles and study strategies in mathematics of young children with high support needs in this subject.

Limitations of the study

The present study was informed by three main limitations. First, it only reports on the outcomes of the assessment phase of a child who was brought into counseling by parents for inability to do math in Grade 4 (Year4). The consultation with the psychologist was limited to assessing the child only. The resulting copies of the technical report on assessment (that included recommendations for intervention) were given to the child's parent, math teacher, and school authorities. There was therefore no other data on this case and the results of the entire educational intervention that followed the assessment phase were ethically and legally outside the objectives and beyond the scope of the present study. Second, as a case study, the results cannot show cause-and-effect relationships among the variables investigated because of internal validity problems. While the results of a case study such as the present inquiry are only explorative rather than confirmatory, the findings may, however, provide useful research questions and hypotheses for further follow-up research studies. Third, because of the small and non-probability sample in the case study (n = 1), the results or findings cannot be generalized to other students with similar problems as the case study design is deemed to have low external validity. Despite these shortcomings, the present clinical case study has high practical significance and might be of value to both the local community in the country in which it was conducted as well as the international community elsewhere in the world.

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Appendix 1: Performance on math problems by the whole class ($N = 29$)

Student	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Total
A	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	4
B	1	0	0	0	1	1	0	0	1	1	0	0	1	0	0	0	6
C	1	1	1	1	0	1	1	1	1	1	0	1	0	0	0	0	10
D	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	11
E	1	1	1	1	1	1	0	0	1	1	0	1	1	0	0	0	10
F	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	12
G	1	1	1	1	0	1	0	0	1	1	0	1	1	0	0	0	9
H	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	11
I	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	13
J	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	12
K	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	5
L	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	14
M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	14
N	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	13
O	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	13
P	1	1	1	1	1	1	0	0	1	1	0	1	1	0	0	0	10
Q	1	1	1	0	1	1	1	0	0	0	0	0	1	0	0	0	7
R	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	0	12
S	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	11
T	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	11
U	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	14
V	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	11
W	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	14
X	1	1	0	1	1	1	1	1	1	1	0	0	0	1	0	0	10
Y	1	1	1	1	0	1	1	1	1	0	0	1	1	0	1	1	12
Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	13
AA	1	1	1	1	1	1	1	0	1	0	0	1	1	0	0	0	10
AB	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	14
AC	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	15

Appendix 2: Test statistics and reliability (*N* = 29)*

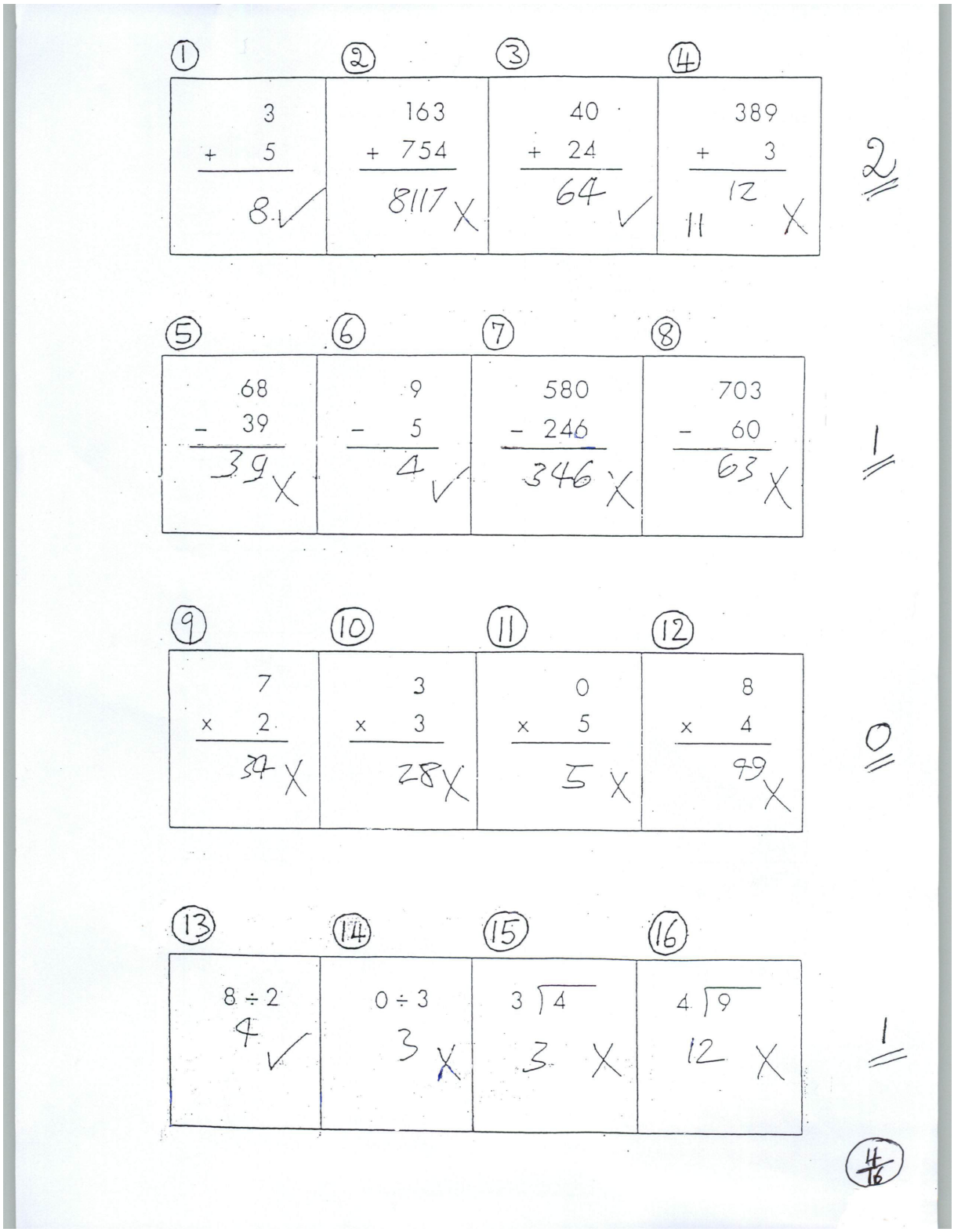
Item[a]	Mean	*SD*	Corrected item-total correlation	Alpha when item is deleted
1[b]	931	257	640	769
2	827	384	180	766
3[b]	931	257	218	760
4	896	309	604	732
5	862	350	221	761
7	724	454	456	740
8	586	501	509	734
9	896	309	652	728
10	827	384	476	739
11	310	470	422	744
12	827	384	717	716
13[b]	827	384	145	769
14	275	454	290	758
15	172	384	263	759
16	172	384	300	755

* Decimal points are omitted and all values are to three decimal places

[a] Item 6 is deleted/excluded from analysis (Facility value = 1.00; see Appendix 1)

[b] Items student B got right/correct

Appendix 3: Performance on math problems by the case study participant (n = 1)



International Electronic Journal of Elementary Education, 2012, 4(2), 367-376.

Attitudes and Perceptions of Elementary Classroom Teachers Use of Physical Education Time for Planning

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Received: September 2011 / Revised: January 2012 / Accepted: February 2012

Abstract

An elementary classroom teacher (ECT) has a busy day. The teachers teach their class, prepare class materials, and may supervise the lunchroom or the playground at recess time (Daily Physical Activity in School, 2005), attend meetings with parents and perform a number of other responsibilities. For this reason planning time is a very important component for the ECT. Planning time for the ECT is usually taken when students are in elementary physical education. This study investigated how elementary physical education can assist the ECT in their planning time. In this study 219 ECT from three states and 18 different schools participated in this study. The ECT was given a short survey to fill out regarding how, or if, planning time helps or benefits the ECT. The results found that the ECT appreciated the planning time that it was needed in order for them to be successful in the classroom and because of planning time the students would benefit. The results also showed a great respect from the ECT for elementary physical education, which can be beneficial for principals and other school administrators.

Keywords: Elementary Physical Education, Planning Time

Introduction

An elementary classroom teachers' (ECT) day can be considered busy. For example, they are responsible for their classes, which include teaching and preparing of the class materials. In many cases they may have recess duties, lunch supervision duties, meetings with students and parents, grade level meetings, and the monthly faculty meetings. Because of their demanding schedule one has to ask, when does the ECT have a chance to use the restroom

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ISSN:1307-9298

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or have a brief moment to themselves? This brief moment usually takes place during the ECT planning time. The planning time is a block of time; usually 30 to 60 minutes, when a teacher has no students in their classroom. The purpose of this time is to plan and prepare for upcoming lessons, correct tests, call parents, or have a brief moment to themselves. Principals and other school administrators can play an important role in the ECT planning time when they give the ECT planning time and encourage them to wisely and effectively use their planning time.

Aquila (1992) provided suggestions for teachers of how to manage their planning time more effectively. One of the first suggestions for planning time is to establish a quiet time. This allows the teacher time to distance themselves from the students and other distractions that may have occurred in class. A second suggestion is do not be afraid to delegate certain tasks. Elementary schools have aides, support staff, parent helpers, secretaries, and student assistants. When delegating certain tasks to others, this only gives the teacher more time to plan. A third suggestion is learn to say no. When saying no, this does not mean the teacher does not like the person asking for their time or being rude. The teacher needs to consider his or her own priorities and time. Aquila states that when teachers implement these simple steps, they can give the teacher more time for planning lessons and activities that will benefit student learning and can give the teacher the time for self-renewal.

Other literature dealing on teacher planning time uses a concept termed, common planning time. Warren and Muth (1995) defined common planning time to be when teachers are put on teams with other teachers. These teams could be determined by teaching the same grade level, teaching the same subject areas, or being on a interdisciplinary team, for example, consisting such as a math teacher, an English teacher and a history teacher. The purpose of having teachers collaborate is to give students a greater opportunity for learning. The authors found common planning time to be beneficial for new teachers when they are assigned with veteran teachers for their common planning time. This affords teachers a chance to exchange ideas dealing with classroom management, to using equipment or tools in a lesson, or give lesson ideas (Shank, 2005).

Another aspect from the literature-reviewed teacher planning time dealt with the individual teacher and their own planning time. Hargreaves (1992) investigated the theory of intensification and the effects it has on the ECT. Larson (1980) defined intensification as "the most tangible ways in which the work privileges of educated workers are eroded" (pg. 133). The definition continues by stating that intensification "compels the reduction of time within the working day when no surplus is produced." Larson presents examples of how intensification for the ECT can occur. The examples are, the teacher has no time for lunch, reduction in quality of services, including lesson planning, contacting parents and other school obligations, resulting in cutting corners, and teachers are overloaded, thus affecting all aspects of teaching. Because the theory of intensification is so common among ECT, planning time is an important and necessary component for the ECT, teachers have had to fight for their planning time. Shimahara (2002) stated that with intensification there is no beginning or end (of work) because it just continues. Work is brought home, spending one or two hours every day. Hargreaves (1992) continued by discussing teachers in a Metropolitan Canadian school district going on strike to have a minimum of 180 minutes per week of planning time. The planning time issues became the key bargaining issue. During the school districts negotiations, the teachers made the following case for the importance of planning time. Many teachers complained about the amount of paperwork the teaching profession has added in recent years, dealing specifically with special education reports. The number of forms and reports that have to be filled out, has seriously cut into the ECT planning time. One teacher stated that because she had so much paperwork to fill out, she

was leaving school around 6pm on some nights. The teacher stated that some of those nights she was taking home school work to correct and grade, because of her lack of planning time. Another point teachers brought out during negotiations for increasing planning time was, that teacher's quality of work increases with the appropriate amount of planning time. Teachers felt that having more time helped reduce stress from the classroom (Elementary teacher planning time, 2008). And finally, planning time helped restore teachers' personal lives outside of teaching, giving them more time for their families, for leisure activities, and for themselves. With all the positive points of planning time presented during negotiations, the author found that a minority of teachers had different views regarding planning time. For example, they felt that planning time did not necessarily enhance community and collegiality among teachers. Also, teachers felt that planning time did not improve their classroom services, such as lessons, lesson activities and testing. And finally, some of these teachers appreciated the planning time they now received, and that the fighting for more planning time was not that important to them.

Another study dealing with teacher planning time investigated the decision-making process teachers make during shared planning time (Gill & Hoffman, 2009). This study looked at four middle school math teachers and how they went about teaching, planning and implementing their middle school math curriculum. Even though the emphasis of this study was looking at middle school math teachers thought processes of teaching math. The use of a shared planning time brought to light the benefits of having a shared planning time. It was found that these teachers were able to discuss pedagogical content, beliefs about the curriculum they were teaching, the textbooks the students were using and about the student's abilities in class. The teachers felt that this was a time to freely express themselves, propose ideas to each other, and get feedback on questions they had. Overall, the teachers felt that the shared planning time was beneficial for the fact that they became better teachers.

Planning time is not a cure all for the ECT; it provides no guarantees. However, it offers the teacher opportunities. Planning time can be used for the purpose it is intended to be used for, or it can be used in other ways. How planning time is used, is left up to the ECT. The literature emphasized that however much time the ECT has for planning, they like having it, and they need it, and want it. With planning time being such a big part for the ECT, elementary physical education plays a significant role in allowing the ECT to plan. Thus, the purpose of this study is to investigate ECT attitudes towards elementary physical education and the impact it has on ECT planning time, thus helping principals and other school administrators to better understand the importance physical education has in the school.

Methods

Subjects

Elementary classroom teachers (N = 219, 206 females and 13 males) from three states, North Dakota (n=54), Oklahoma, (n=129) and Utah (n=36), comprised of 18 elementary schools participated in the study. Teaching experience of the participants ranged from 34 years to the first year of teaching. The Institutional Review Board (IRB) of the university approved the study. Participants gave their informed consent to participate in the study. For this study the ECT solely taught in the classroom.

Instrument

A review of literature failed to identify an instrument related to classroom teachers' attitudes and perspectives regarding the effects of elementary physical education on teacher planning time. Therefore, the researchers constructed a survey from discussions that were held with

elementary classroom teachers and elementary physical educators dealing with physical education in the public schools. The researchers constructed a survey of five statements. Two statements have a 5-point Likert scale (1=Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, and 5= Strongly Disagree) and three statements were yes/no statements. To establish content validity, the researchers had five experienced elementary physical educators with ten or more years of teaching and three-experienced ECT, with 10 or more years reviewed the survey, and found the statements from the survey to be valid with no suggested changes. For this study, two statements asked the participants to explain their answers. The purpose of having the classroom teachers give an explanation on the given statement was to better help the researcher understand their attitudes and perspectives towards the role of physical education it plays in planning time for the ECT.

Procedures

For this study, the researchers contacted the superintendent or assistant superintendent regarding the study and secured ethics approval to administer the survey to the teachers in their school districts. After permission was secured, the researchers proposed their intentions to the principals at each school. After receiving permission from the principals, each physical educator was informed regarding the study and agreed to assist in the study. The next step was to place the surveys in the classroom teacher's mailbox at their respective schools. From the schools that participated in the study, 70% of the surveys were returned. Within two weeks the researchers collected the surveys from those teachers that participated in the study. After the surveys were collected, they were analyzed. Results for this study are reported as percentages and as the ECT comments.

Data Analysis

The data was analyzed using descriptive statistics in the Statistical Package for the Social Science (SPSS) 14.0 program. Percentages were used to reflect the classroom teacher's responses for each item being analyzed. The other method of data analysis was analyzing teacher responses to the questions from the survey. Thus using a mixed methods analysis of the data. The researchers read and re-read until common themes became evident from the data (O'Sullivan & Tsanaridou, 1992).

Results

Tables provide percentages of ECT attitudes on the effects elementary physical education has on planning time, Table 1 by state and Table 2 by gender. For statement 2, ECT strongly felt (Oklahoma 98% (*n*=127); North Dakota 100% (*n*=54) & Utah 88% (*n*=29) that when students are in physical education class, it allows them the time to attend to other classroom needs. Percentages were similar for males (100%) and females (96%).

Table 1. *Percentages of ECT (State) Attitudes Towards Elementary Physical Education On Planning Time*

1. I personally know the physical education teacher in our school.

	Oklahoma (*n*=129)	North Dakota (*n*=54)	Utah (*n*=36)
Yes	93% (*n*=121)	75% (*n*=41)	94% (*n*=34)
No	7% (*n*=8)	25% (*n*=13)	6% (*n*=2)

2. I believe when my students are in physical education class, it allows me the time to attend to my other classroom needs? Please explain your answer.

	Oklahoma	North Dakota	Utah
Yes	98% (n=127)	100% (n=54)	88% (n=32)
No	2% (n=2)	0% (n=0)	12% (n=4)

Table 1. *Percentages of ECT (State) Attitudes Towards Elementary Physical Education On Planning Time (cont.)*

3. I use the time effectively when my students are in physical education time? Briefly explain what you do while your students are in physical education class.

	Oklahoma	North Dakota	Utah
Yes	94% (n=132)	100% (n=54)	97% (n=35)
No	6% (n=7)	0% (n=0)	3% (n=1)

4. I look forward to the time I have to prepare for class while my students are in physical education class? Please explain your answer.

	Oklahoma (n=129)	North Dakota (n=54)	Utah (n=36)
SA	90% (n=117)	71% (n=38)	56% (n=20)
A	8% (n=11)	20% (n=11)	15% (n=5)
N	2% (n=1)	5% (n=3)	23% (n=8)
D	0% (n=0)	2%(n=1)	0% (n=0)
SD	0% (n=0)	2% (n=1)	6% (n=3)

5. If there was no physical education teacher in your school, I feel confident enough that I could teach my students an effective physical education lesson? Please explain your answer.

	Oklahoma	North Dakota	Utah
SA	6% (*n*=8)	9% (*n*=5)	14% (*n*=5)
A	10% (*n*=13)	27% (*n*=15)	33% (*n*=12)
N	22% (*n*=29)	16% (*n*=9)	12% (*n*=4)
D	40%(*n*=50)	34% (*n*=17)	29% (*n*=11)
SD	22%(*n*=29)	14% (*n*=8)	12% (*n*=4)

Statement 3 asked the ECT if they effectively use their planning time when their students are in physical education class. The majority (Oklahoma 94%; North Dakota 100% & Utah 97%) of the ECT use their planning time effectively while their students are at physical education class. Interestingly, 6% of ECT in Oklahoma felt they did not effectively use their planning time. Also in this study, 97% of the female participants use their planning time effectively. Question 4 asked ECT if they look forward to the time they have to prepare for class while their students are in physical education class. Between the three states the majority of the teachers strongly agreed (Oklahoma 90% (*n*=117); North Dakota 71% (*n*=38) and Utah 56% (n=20) that they look forward to the time they have to prepare for classes while their students are in physical education class. One point of interest from the data came from the ECT from Utah. Twenty-three percent were neutral and six percent strongly disagreed with question four. When looking at the male and female ECT for question four, again a majority (male 62% and female 75%) strongly agreed with this statement. Yet, 15% of the males and 8% of the females were neutral in their response to this question.

And finally question one and question five. Question one asked if the ECT personally knows the physical education teacher in their school. The ECT in Oklahoma (93%) and Utah (94%) personally know the physical education teacher in their school. In North Dakota, 75% know the physical education teacher in their school, and 25% do not know their physical education teacher. For question five, the ECT was asked if there was no physical education teacher in their school, would they feel confident enough to teach their students an effective physical education lesson. From Oklahoma, 62% of the ECT felt (strongly disagreed or disagreed) they could teach an effective physical education lesson. Respectively, in North Dakota (48%) and Utah (41%) could not teach an effective physical education lesson.

Table 2. *Percentages of ECT (Gender) Attitudes Towards Elementary Physical Education On Planning Time*

1. I personally know the physical education teacher in our school?

	Male (*n*=13)	Female (*n*=206)
Yes	93%	88%
No	7%	12%

2. I believe when my students are in physical education class, it allows me the time to attend to my other classroom needs? Please explain your answer.

	Male	Female
Yes	100%	96%
No	0%	4%

3. I use the time effectively when my students are in physical education class? Briefly explain what you do while your students are in physical education class.

	Male	Female
Yes	100%	97%
No	0%	3%

4. I look forward to the time I have to prepare for class while my students are in physical education class? Please explain your answer.

	Male (*n*=13)	Female (*n*=206)
SA	61%	75%
A	23%	13%
N	15%	8%
D	0%	1%

5. I look forward to the time I have to prepare for class while my students are in physical education class? Please explain your answer.

	Male (*n*=13)	Female (*n*=206)
SA	61%	75%
A	23%	13%
N	15%	8%
D	0%	1%
SD	0%	2%

6. If there was no physical education teacher in our school, I feel confident enough that I could teach my students an effective physical education lesson?

	Male	Female
SA	7%	8%
A	50%	16%
N	21%	18%
D	15%	38%
SD	7%	20%

The other data results from this study looked at responses the ECT had from four of the five survey questions. The following are the responses from the ECT. When classroom teachers were asked (Question 2) when their students are in physical education class, does this allow them the time to attend to other classroom needs? The ECT responded with comments such as, " this is extremely valuable time for planning tasks as well as parental contact, collaboration, and a 'break' from constant monitoring of students. Like milk, it does a body

good." Another teacher stated, "It is a great break for us all. I do feel that it is time that I can talk to parents or set up for the next lesson. Heck, bathroom breaks are always welcome." Another question form the survey (Question 3) asked ECT if they effectively use their planning time while their student's are in physical education class. The following are some of the responses from the ECT, for example, one teacher stated that she "runs copies, check turned in papers, get ready for the next subject." One ECT stated, that she "collaborates with other teachers, prepare for lessons and activities, phone calls, respond to emails." Another teacher summed it up by stating, "Plan, write lesson plans, research subjects, copies, return emails, contact parents, collaborate, eat a snack, sit down, relax, check office mail, grade and record answers."

For Question four ECT were asked if they look forward to the time to prepare for class while their students are in physical education. For example, statements were given, like "we need time to do tasks that can't be done with children in our charge." One teacher stated, "they wear me out. I need a break." One seasoned teacher stated, "I don't get excited about it (planning time), but I welcome that time to plan." And finally, ECT were asked (Question 5) if there was no physical education teacher in their school, would they feel confident enough to teach an effective physical education lesson. From the ECT their responses, a majority of them answered this question in a tone of "no, I could not do it." One ECT stated, "No way, I wouldn't do the lesson justice." One ECT stated, "A professional who was specifically trained in health and physical education would provide a more thorough learning environment regarding physical education." Another ECT stated, "My expertise is in other areas. While I have knowledge of child development, I would not know where to begin to teach PE skills."

Discussion

The purpose of this study was to investigate ECT attitudes towards elementary physical education and the impact it has on ECT planning time. The results from the gathered data indicate the ECT find their planning time to be very important to them and the physical education class allows them time to plan lessons, contact parents and attend to other important business. Also, in this study, it was revealed that a majority of the ECT would not or could not teach an effective physical education lesson. This feeling resulted in the ECT having a greater respect and appreciation for elementary physical education in their schools and how it benefits their classroom teaching.

The first question of the survey asked the ECT if they personally know the physical education teacher in their school. Between the three states, over 90% of the teachers in Oklahoma and Utah personally know the physical education teachers. How well the ECT knows the physical education teacher was not known. Yet, the ECT knew them and the impact elementary physical education plays for both the students and the ECT. One ECT stated that she feels good knowing that her students are with Mrs. Jones (pseudonym), because "I know what kind of teacher she is, and what she has the kids doing. That lets me focus on what I need to do during my planning." Along this line of thought, question five asked the ECT if they could effectively teach physical education lessons. In reviewing the responses of the ECT, there was a sense of relief for the fact that they would not have the responsibility of teaching physical education classes and that having a physical educator made it possible to have planning time. One ECT stated, "No way would I have enough knowledge or time to do what our PE teacher does. She is awesome." Another ECT stated, "I am so grateful for someone to take my class, for the fact that I get to do what I want to do." These types of comments show support to what elementary physical educators do with students during the ECT planning time. Faucette and Patterson (1989) had similar results in their study. They found that ECT felt they could not successfully teach elementary physical education, for the fact that they

had not had training in college or no in-service training. For some of the ECT they stated that didn't like teaching physical education and would gladly have some else teach it.

Another point of discussion is that the ECT believes that having the students' physical education class allows them the time to attend to other classroom needs. (Question 2). A majority of the ECT from all three states felt that when their students' are in physical education class, it allows them the time to attend to other matters. Certain words or phrases used by the ECT, they were, "let's me regroup", "extremely valuable for planning", "my only time besides lunch and recess to plan", and "my planning time is priceless." Question three of the survey asked the ECT if they used their planning time effectively. The researchers found it interesting that the ECT did answer the yes or no statement, but their statements regarding this question were telling. Some of the ECT statements from this question were, "this allows me time to prepare for the next activity and clean up from the previous activity." Many of the ECT stated that they can "prepare lessons", "get organized", and "catch up on paper work." And a first year ECT stated, "I get last item things together or begin setting up for the next day."

And finally, ECT was asked if they look forward to the time they have to prepare for their class while their students are in physical education (Question 4). From this survey question, 90% of the ECT from Oklahoma, 71% from North Dakota and 56% from Utah look forward to their planning time. When looking over the data from this question, 23% of the ECT from Utah was neutral and 6% did not look forward to their planning time. To shed some light on the ECT attitudes regarding looking forward to planning time, the following statements were given. One ECT said, "I don't look forward to it, but I do appreciate the time to prepare." A second grade teacher stated, "I have ½ hour when my kids are in PE, no big deal." And a ECT that has taught for over 20 years stated, "I don't look forward to my planning time, yet, I am glad I have the time. I guess I have been teaching too long and have gotten use to having planning time." Even though some of these attitudes are not positive, as stated above, a majority of ECT does look forward to their planning time. A first grade teacher stated, "As a teacher I need every minute I can get!" One teacher stated, "We all need a moment to ourselves. We need time to do tasks that can't be done with children in our charge." And lastly, a fourth grade teacher stated, "I greatly look forward to this (planning) time. It is almost impossible to get anything done while they are here."

Analysis of the data suggests that elementary physical education is a big part of a student's education, ECT planning time allows them the time they need to attend to classroom work. And with there planning time the ECT know of the importance it is, thus they effectively use their planning time. The data also suggests that ECT have an attitude of appreciation towards the elementary physical educator in their school, along with appreciation for elementary physical education because it is the appointed time for students to be involved in a different type of student learning, giving the ECT time to use for planning and to attend to other business. The findings add to the literature of the importance of elementary physical education in the case that it helps ECT for more opportunities to better prepare lessons and other class materials for the benefit of educating their students. Also, these findings can be used to gain or maintain support from administrators and parents, as an added bonus to the importance of physical education in the elementary school setting.

Implications of the Study

After analyzing both sets of data, it does not come as a surprise that ECT like having, need, and want their planning time. This study shows the importance how elementary physical education benefits the ECT by allowing them some time for planning. Elementary physical educators need to talk with their administrators for the purpose of pointing out that elementary physical education does benefit the students. And it also benefits the ECT by allowing them to have the planning time they need to improve their teaching, prepare and plan lessons and activities to better help their students learn. It is the author's hope that principals and other school administrators will take the data from this study and educate other classroom teachers, school superintendents, parents and their community about the importance planning time can have on a students' education.

Another implication from this study that elementary physical educators should use in promoting their program to administrators, parents and school boards, is the respect ECT gives to elementary physical education. The ECT sees the value of elementary physical education. In many of the ECT comments given during this study, they voiced their attitudes in regards to elementary physical education as respectful and appreciative for what elementary physical educator does while the ECT utilizes their planning time. These attitudes point to the fact that elementary physical education plays an important role in an elementary school, and without elementary physical education present, it impacts more than just the students.

The hope is that when the elementary physical educator sits down and talks with the principal or another school administrator, they will have an open mind and give thoughtful consideration the positive benefits elementary physical education can play in allowing the ECT the planning time they need and desire for the purpose of creating, planning and preparing lessons and activities for student learning. These findings from this study can be beneficial to principals and other school administrators, for the purpose of showing the importance of elementary physical education and it's role of providing and encouraging the ECT planning time.

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International Electronic Journal of Elementary Education, 2012, 4(2), 377-394.

Investigating Nigerian Primary School Teachers' Preparedness to Adopt Personal Response System in ESL Classroom

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Received: June 2011 / Revised: October 2011 / Accepted: December 2011

Abstract

This study investigated the extent to which computer literacy dimensions (computer general knowledge, documents and documentations, communication and surfing as well as data inquiry), computer use and academic qualification as independent variables predicted primary school teachers' attitude towards the integration of Personal Response System in English as a second language (ESL) classroom. Seventeen (17) Nigerian primary school teachers trained on why and how to effectively use Personal Response System (PRS) in ESL classrooms was the sample for the study. Data for the study were gathered through the use of Clickers Attitude Questionnaire (CAQ), Teachers' Computer Literacy Questionnaire (TCLQ) and Computer Use Questionnaire (CUQ). Descriptive statistics such as simple percentage, mean and standard deviation, and inferential statistics such as Pearson Product Moment Correlation Coefficient, and Multiple regression were used for data analysis at 0.05 significance level. The results show that the teachers' computer literacy was more in the areas of documents and documentation as well as communication and surfing than in general knowledge and data inquiry. Further findings of the study indicated that general computer knowledge, documents and documentation, communication and surfing, and data inquiry combined to contribute to the prediction of teachers' attitude towards the integration of PRS. Relatively, documents and documentation dimension was the potent predictor, while data inquiry was not a significant predictor of the outcome variable. Similarly, computer use, computer literacy and academic qualification jointly contributed to the prediction of the teachers' attitude towards the integration of PRS in ESL classroom. Meanwhile, computer use made the most significant contribution to the prediction of teachers' attitude towards PRS integration, while academic qualification did not make any significant contribution to the teachers' attitude towards the integration of PRS in ESL classroom.

Keywords: Effective Teaching, Interactive Technology, English as A Second Language, Nigeria

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ISSN:1307-9298

www.iejee.com

Introduction

In the last decades, researchers and educators are having increased focus on technology integration in schools in order to transform the classroom from being teacher-centred to being student-centred. In view of this, Peake, Briers and Murphy (2005) remark that there has been an increase in the clamour for the integration of technological innovations into school curriculum. The impact of technology in education is more or less a burning issue to education researchers. Schools across the globe are adopting the integration of technology into instructional process because teachers and learners are beginning to gain access to a wide range of technological innovations than ever before. Continuous advances towards integrating technology into classroom are being made so as to help learners' better understanding of curricular contents (Croxwall & Cummings, 2000). Several innovative computer-linked technologies have been recorded to have been integrated into classrooms in developed countries. Such technologies include the Internet, tablet computers, digital photography journals, MP3, Interactive whiteboard, digital games, iPods etc (Friedman, 2006; Wozney, Venkatesh & Abrami, 2006).

In many developing nations such as Nigeria, various Information and Communication Technologies (ICTs) are being introduced in schools to facilitate effective teaching and learning. For instance, despite the fact that English is the official language and the language of instruction in schools, Ekpo, Udosen and Afangideh (n.d) note that one of the pedagogical issues facing the teaching of English as a second language in most Nigerian primary schools is little or no interaction among the learners and between the teacher and the learners. Though Oyetunde (2002) remarks that success in the subject is a key to success in education, getting a good job and a major pre-requisite to post-secondary education, Ekpo, Udosen and Afangideh (n.d) and Olaniyan and Obadara (2008) found that the teaching of the subject has characterised with stereotype mode of learning that renders learners passive, inadequate instructional resources and teachers' lack of creative ability to provide the right learning experiences that promote the learners' increased proficiency communicative skills. The resultant effect of learners' low facility in communicative competence has been reportedly reflecting in their low performances in school subjects over years (Adesemowo, 2005; Isiaka, 2007; Owuamanam & Owuamanam, 2004). However, Ybarra and Green (2003) reiterate the fact that students learning a new language need a technology-rich environment that promotes learners' acquisition of language through interactive communication. Mojgan, Kamariah, Wong, Bahaman and Foo (2009) argue that every teacher is expected to use ICT to enhance teaching and learning of all subjects because they keep learners engage during the lesson and make them active participants of instructional process.

One of the emerging educational reforms is the encouragement of collaborative learning among learners. According to Chai, Hong and Teo (2009), collaborative learning occurs when learners co-construct knowledge and meaning with little input from the teacher. Pynoo et al. (2011) are of the opinion that in modern day of technology advancement, in order to promote knowledge co-construction and improved interaction in the classroom, teachers need to update their knowledge and skills so as to integrate technological innovations such as Personal Response System in teaching and learning process. According to Pelton, Pelton and Epp (2009), Personal Response System is gaining a widespread acceptance in educational setting in view of its interactive nature. Its description by many researchers has attracted different names that do not distort its meaning and functions in instructional process. According to MacArthur and Jones, PRS has been portrayed as Audience Response System (ARS), Audience Paced Feedback (APF), Classroom Communication System (CCM), Voting Machines (VM), Students' Response System (SRS), and Electronic Voting Machine

(EVS). Trees and Jackson remark that a number of educators adopting PRS colloquially refer to it as "Clickers".

Meanwhile, Chu, Lu and Wann (2010) describe PRS as a remote control device which makes use of radio frequency (RF) information transfer. It is a device that permits immediate interaction between the teacher and the learners. The system consists of a handheld remote control which the audience or students use to respond to questions and a radio frequency information recorder plugged into USB port of a computer laptop or a desktop. Through the RF, data are collected, recorded for onward display on the projection screen in form of bar chart. In summary, the major components of PRS include a handheld remote control, a receiver, the software installed on the computer and a projection system. Evaluating the functional value of PRS, Trees and Jackson (2007) report that PRS is being adopted by educators in order to foster deeper learning and increase classroom interaction, provide opportunity for learners to contribute their viewpoint during teaching and learning and give teachers opportunities to immediately evaluate learners' performance through immediate feedback displayed on projection screen.

Published reports on the use of PRS since the start of 21st century indicate its effectiveness in the classroom (Crouch & Mazur, 2001; Pollock, 2005). Empirical research findings further revealed that students exposed to PRS are more engaged in the class (Siau, Sheng & Nah, 2006; Simpson & Oliver, 2007); students are more motivated in class discussion (Beatty, 2004); students are provided with a new dimension of interactivity (Siau, Sheng & Nah, 2006);students experience increased participation in class acticities (Trees & Jackson, 2007; 2008; MacArthur & Jones, 2008), students are provided with immediate feedback (Trees & Jackson, 2007). Earlier researches on teachers' attitude toward the use of PRS indicate that clickers are easy to use (Hoffman & Godwin, 2006). In a study of 659 students and 23 teachers Kay (2009) reports that attitude towards the use of PRS was influenced by gender. Mayer et al. (2009) also found that teacher had positive attitude towards the use of Personal Response System in large classes.

In an attempt to improve classroom interaction in Nigerian schools, lots of money is being expended on procuring technological hardware and software in schools as well as training teachers to effectively use the ICTs for instructional purposes. Unfortunately, education policy makers, curriculum developers and evaluators, the government at all levels, researchers and relevant stakeholders have seemingly given little attention to finding out the disposition of teachers towards integrating such prospective technological devices. According to Zhao and Cziko (2001), teachers are agents of change in relation to technological innovation integration in education. More importantly, ICTs may facilitate instruction but their potentials in education may become unrealisable if there is no change in teachers' pedagogical strategies that are dependent on teachers' support and right attitudes (Bangkok, 2004). Since teachers are the primary "gatekeepers" in terms of successful integration of technological initiatives in schools, their attitude is worth being studied because attitude is able to predict behavioural intention and actual behaviour. Teachers' attitudes whether positive or negative affect teachers' disposition towards the use of ICTs in schools. Teachers who believe that learners would learn better when they are exposed to the traditional "chalk and talk" method find it difficult to understand the need for students to explore the potential of computer-linked technologies for learning. Such ideology is a function of belief and attitude (Teo, Lee & Chai, 2007).

Earlier research indicate that teachers' attitude towards integrating new technology in education is influenced by some factors; teachers' characteristics such as age, gender, computer experience, self-efficacy, computer knowledge, mental models and social

demographic variables (Holden & Rada, 2007); gender (Venkatesh & Morris, 2000); compatibility degree of the technological innovation with the teachers' pedagogical beliefs (Zhao, Pugh, Sheldon & Byers, 2002); perceived usefulness and perceived ease of use (Raaji & Schepers, 2008); Siau, Sheng & Nah, 2006); perceived contextual value (Tzeng, 2011); subject disciple (Teo, 2008); anxiety, confidence and liking (Yildrim, 2000); general usefulness and behavioural control and pedagogical use of technology (Yuen & Ma, 2002). Meanwhile, studies have been conducted on how the above factors influence teachers' decision about whether to or not to integrate technology in the classroom. This study is however focused on computer literacy (CL), computer use (CU) and academic qualification in relation to teachers' attitude towards integrating Personal Response System in ESL classroom.

Successful integration of technological innovations in schools is more or less a reflection of teachers' level of computer literacy and frequency of computer use (Jenkins, 2009). Meanwhile, Kumar, Che Rose & D' Silva (2008) opine that successful teachers in the new millennium require the acquisition of relevant computer skills in order to effectively integrate new technologies in schools. The significance of computer literacy in teachers' use of technology is not a new issue because the ability to use computer-technologies has been emphasised to be a function of teachers' level of computer skills and knowledge (Lam, 2000; Oh & French, 2007; Shin & Son, 2007). Computer literacy involved individuals' ability to use various software applications to accomplish specific purposes within a time limit, being able to use Internet to search information, possession of different types of skills to do various programming activities (Croxall & Cummings, 2000; Jenkins, 2009). Meanwhile, Son & Robb (2011) further list level of technological awareness, knowledge of computer components, concept of data and programmes, ways of data computing, working on files, documents and pictures and working with multimedia and communication as major indicators of computer literacy. Previous studies indicate that there exists a relationship between computer literacy and level of technology use (Jenkins, 2009); teachers' computer literacy was determined by technical training attended (Keane, 2002; Redman & Kotrlik, 2004), and computer literacy is a key to successful use of technology (Eisenberg & Johnson, 1996).

Furthermore, teachers' ability to use computer-technology has been emphasised as a factor that influences their attitude towards integrating new technologies into school curriculum (Yushau, 2006). The way and manner ICTs are being utilised for instruction vary among teachers and schools. In developed countries, the use of technological devices has been taken as integral part of the school curriculum. However, in developing nations like Nigeria, uptake of technology in education is relatively low. Some teachers are still of the opinion that the conventional methods of teaching are still relevant and results-oriented in the present days of technological advancement. Sa'ari, Wong and Roslan (2005) assert that if teachers are reluctant to integrating technology in schools, the best thing to do is to look for ways of having their attitude changed.

In a study conducted by Son and Robb (2011) on 73 in-service Indonesian EFL teachers, it was found that lack of computer skills affected their intention to use computers. More than ever before, educators are showing interest in how teachers' use ICTs to facilitate instruction in primary education. However, more high school teachers with higher academic degrees have been reported to display positive attitude towards the use of computers in schools more than their colleagues at primary schools (Grant & Mims, 2010). Further findings on teachers' use of technology reveal that research favours teachers' use of technology for instruction and that teachers' limited access to ICTs affects effective use of computer-technologies (Ocak & Akdemir, 2008; Pelgrum, 2001); teachers' technology use correlates with their computer confidence level (Atkins & Vasu, 2000).

In order to understand teachers' technology use and acceptance, a well defined framework is important; hence this study was guided by the Technology Acceptance Model. The Technology Acceptance Model (TAM) developed by Davis (1989) is an adaptation of the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980) which is parsimoniously theoretical and empirically justified model developed to describe the use of technology. The model advocates that perceived usefulness and perceived ease of use are key primary indicators of attitude towards technology use (Kumar, Che Rose & D'Silva, 2008). In order words, TAM posits that technology users' attitude is determined by their behavioural beliefs about the consequences of the behaviour on the part of the individuals. Akpinar and Bayramoglu (2008) assert that TAM is a very influential theory in technology acceptance.

TAM explains the extent to which the perceived ease of use and perceived usefulness predict the attitude towards the use of a technology, while attitude towards use indicates users' intention to use, which then indicates the actual use of the technology. Over the years, several research were carried out on TAM and the findings indicate that perceived usefulness is a major predictor of intention to use technology, while perceived ease of use was the second determinant of intention to use technology (Shih, 2004). Perceived usefulness and perceived ease of use are integral process of using computer-technologies (Kumar, Che Rose & D'Silva, 2008), perceived usefulness positively correlated with behavioural intention to use technology (Chau & Hu, 2002; Todorova & Obsurg, 2009).

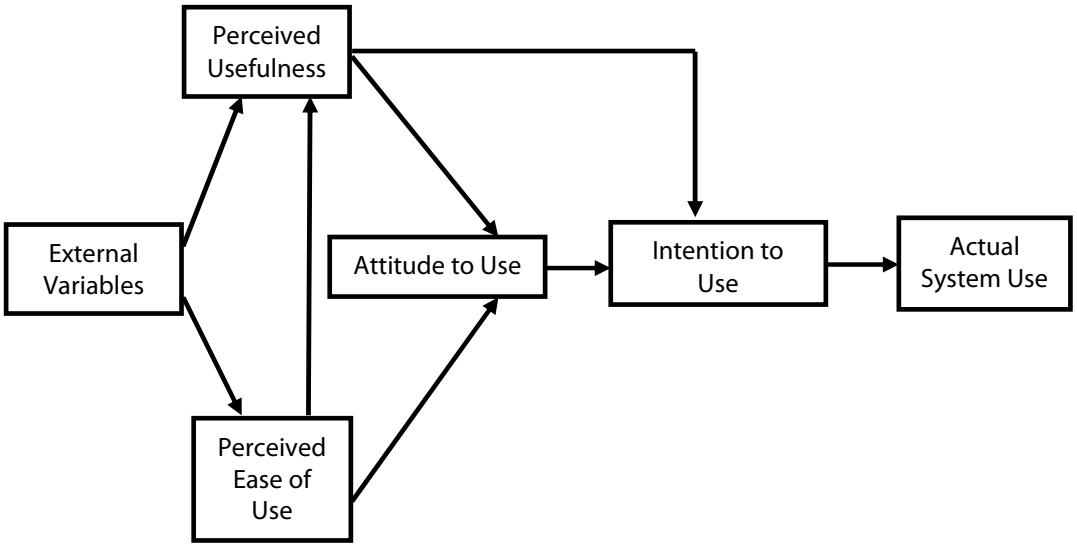

Figure 1. Technology Acceptance Model (Davis, 1989)

Empirical research have been conducted in developed countries (United States of America, Canada, Australia, Malaysia and United Kingdom) about integrating of PRS and assessing the effectiveness of Personal Response System in school curricular subjects like astronomy, geometry, physics, mathematics, engineering etc. However, regarding the use of PRS in enhancing effective teaching and learning, there is no known published piece of information on the use of PRS in ESL classroom at the primary education level. The use of PRS for teaching and learning is new in Nigerian education system. Meanwhile, Teo, Lee and Chai (2007) emphasises that attitude to technology is a key indicator of technology usage, but there is a dearth of research on teachers' attitude towards the use of an interactive technology like PRS. This study therefore is carried out to investigate the impact of computer

literacy, computer use and academic qualification on teachers' attitude towards the use of PRS in ESL classroom.

Objectives of the Study

The focus of this study was to investigate Nigerian primary school teachers' attitude towards accepting and integrating Clickers in English language classroom to improve the communicative skills of the learners. This study was guided by three research questions:

1. What is the overall profile of ESL primary school teachers' computer literacy and computer use?
2. What are the combined and relative contributions of computer literacy dimensions to the prediction of teachers' attitude towards the potential use of clickers in ESL classroom?

What are the combined and relative contributions of academic qualification, computer use and computer literacy to the prediction of teachers' attitude towards potential use of Clickers in ESL classroom?

Method

Design

The study was a descriptive study reporting data collected to investigate the extent to which computer literacy dimensions, computer use and academic qualification as independent variables predicted primary school teachers' attitude towards the integration of Personal Response System in ESL classroom.

Participants

Seventeen (17) teachers randomly selected from 7 primary schools in Ijebu-North local government of Ogun State, Nigeria constituted the sample for this study. All the teachers were selected for a 7-day training programme on effective use of Clickers in teaching English as a second language (L2). The major aims of the training included the following: to provide the rationale for the integration of clickers into ESL classrooms; to facilitate teachers' effective integration of clickers into ESL classrooms and to provide the techniques and procedure involved in the integration of clickers in ESL classrooms. In the sample used for this study, there was 1 (5.9%) Master degree holder, 9 (52.9%) Bachelor degree holder and 7 (41.2%) Nigerian Certificate in Education holders. Furthermore, there were 10 female participants (58.8%, M = 65.04, 6.53) and 7 male participants (41.2%, M = 66.00, SD = 5.03). The Mean Age and the Standard Deviation of the participants were 26.2 and 6.37 respectively.

Instruments

Data for this study were collected quantitatively through the use of Clickers Attitude Scale, Teachers' Computer Literacy Questionnaire and Computer Use Questionnaire.

Clickers Attitude Scale

Clickers Attitude Scale was developed for this study based on reviewed literature (Gefen & Straub, 2000; Selwyn, 1997; Teo, Lee, Chai & Wong, 2009) on measurement items for TAM constructs (perceived usefulness, perceived ease of use, behavioural intention and attitude). The scale had two sections (A and B). Items in section A elicited participants' demographic data while the 21 items in section B were raised to examine teachers' attitude based on TAM constructs. Items were rated using four-point Likert scale ranging from strongly disagree (1) to strongly agree (4). Furthermore, items in section B of the instrument were modified in

such a way to reflect the use of PRS rather than computers. The overall Cronbach's alpha coefficient reliability of the measured constructs was .79.

Teachers' Computer Literacy Questionnaire

The Teachers' Computer Literacy Questionnaire (TCLQ) developed at the University of Oregon was adapted for this study in view of the relevance and suitability of the items for collecting data on teachers' computer literacy level. TCLQ was used to measure and identify teachers' level of computer literacy under different dimensions. The original instrument containing 40 items was modified with a slight modification to the title instrument changed from Computer Literacy Survey to Teachers' Computer Literacy The instrument had two sections. The first section contained items that elicited respondents' demographic data, while the second section contained the 40 items with 10 items in each sub-scale of the four literacy dimensions examined in this study. The computer literacy dimensions were General Computer Knowledge, Documents and Documentation (word processing), Communication and Surfing (email, computer conferencing, and the Web), Data Inquiry (data bases and search engines). The total score of the entire 40 items was used as the computer literacy score. The Cronbach's alpha of the instrument yielded .89. Respondents' responses were rated using a 3-ponit Likert scale of 3 to 1 ranging from 2 = Yes, 1 = not sure, but likely and 0 = no or unlikely.

Computer Use Questionnaire

Computer use Questionnaire was self-designed by the researcher. The instrument was developed after a review of literature on computer use (Ocak & Akdemir, 2008; Kumar, Che Rose & D'Silva, 2008; Teo, 2008). The instrument contained items requiring information on participants' number of years in computer usage, frequency of computer use within a week, a month and in a year. There were also 5 items that further gathered data on how participants' use of computers. The items were "I am a computer user", "I am an effective computer user", "I use computers at home", "I use computers at school" and "I do not use computers. Respondents answered "Yes" or "No" to the items to indicate their level of computer usage. The Cronbach's alpha coefficient reliability of the instrument was .71.

Validity of Instruments

In order to ascertain the validity of all the instruments, the items of the instruments were reviewed by a group of four experts: two lecturers of educational technology, a quantitative methods researcher and a psychometrician. Before the final draft of the instruments were eventually produced, suggestions of the above mentioned experts were given due consideration and necessary corrections were made

Procedure

A set of the Interwrite Radio Frequency (RF) Personal Response System received as a long-term loan from eInstruction was used for a 7-day training of the teachers in September, 2010. The training of the teachers took place in one of the classrooms at a primary school at Ijebu-North local government in Ogun State, Nigeria. At the commencement of the training, teachers were told that their participation was voluntary and that whoever wanted to withdraw could do so at any time. All participating teachers were made to voluntarily fill, sign and return the teachers' consent form. This was done to ensure that the teachers were willingly and positively disposed to participating in the training. The training was lasted 5 hours in two sessions daily with 30 minutes break time in-between. The instrument used included a set of PRS, a laptop using the Microsoft PowerPoint programme, a data projector and a projection screen. In order to ensure teachers' mastery of the techniques for effective use of Personal Response System, all the teachers were given the opportunity to have

practical demonstration of the knowledge gained during the training on the fifth and sixth days of the training. The teachers' attitude questionnaire was administered to all the teachers two days to the end of the training. There was 100% return of the questionnaire from participants.

Five participants were randomly selected for the oral face-to-face interview. Questions of the interview elicited teachers' further beliefs on how the clickers could be effectively used to improve pupils' communicative competence in ESL classroom as well as their intention to use clickers in future to support teaching and learning. Meanwhile, it was emphasised that data gathered from the participants would be confidentially and anonymously used for research purposes.

Results

Table 1. *Descriptive statistics and reliability coefficient for computer literacy dimensions (n = 40)*

Subscale	No of items	Mean	*SD*	Alpha
Document and documentation	10	21.7978	6.08868	.90
Communication and surfing	10	19.0895	5.62692	.85
Data inquiry	10	17.4343	5.52248	.84
General computer knowledge	10	14.4081	4.50337	.80

Overall computer literacy was measured in terms of general computer knowledge, document and documentation, data inquiry and communication and surfing. The participants scored highest in documents and documentation (M = 21.80) followed by the communication and surfing (M = 19.08). General computer knowledge subscale had the least score (M = 14.41) while data inquiry subscale scored higher than general computer knowledge subscale (M = 17.43). The means indicate that the participants were more skilled in documents and documentation, and communication and surfing than they were in general computer knowledge and data inquiry.

Teachers' overall profile of computer use was measured by examining the frequency of computer usage and level of using computers. The results are presented in Tables 2 and 3 below:

Table 2. *Frequency of Computer Usage*

		f	*P*
How often do you use computers?	Not at All	3	16.7
	A few times a Year	6	33.3
	A few times a Month	5	27.8
	A few times a Week	3	16.7
How long have you been using computers?	4-5 Years	1	5.6
	2-3 Years	7	38.9
	1 Year or less	9	50.0

As indicated in Table 2, regarding teachers' overall profile of computer use, majority of the teachers (33%) rarely use computers in a year. More teachers use computers a few times per month (27.8%) compared to those who claimed to use computers a few times a week and those who do not make use of computers at all. Similarly, half of the sampled teachers

indicated they had up to one year experience of computer usage, while less than 6.0% of them reported to have had 4-5 years of computer use.

Table 3. *Level of Using Computers*

	Yes		No	
	f	*P*	*f*	*P*
I am a computer user	9	52.94	8	47.06
I am an effective computer user	1	5.81	16	94.18
I use computers at home	6	35.29	11	64.71
I use computers at school	2	11.76	15	88.24
I do not use computers	3	17.65	14	82.35

Table 3 shows that over 50% of the teachers had opportunities to use computers at one time or the other. However, only one teacher was relatively competent in using computers. The results further show that not too many of the teachers had reasonable access to computers either at home or in the school. 3 (17.65%) of the teachers also indicated that they do not use computers at all. The implication of the results in Tables 2 and 3 is that majority of the teachers are familiar with computers but they are not frequent and competent users of computers.

Table 4. *Descriptive Statistics and Correlations Matrix for the Relationship Between Computer Literacy Dimensions and Teachers' Attitude To PRS*

	A	B	C	D	E
A. Attitude to Clickers			.446*		
B. General Computer Knowledge			.928*	.679*	.585*
C. Documents and Documentation	.446*	.928*		.626*	.598*
D. Data Inquiry		.679*	.626*		.646*
E. Communication and Surfing		.585*	.598*	.646*	

** $p < .05$*

The results in Table 4 showed the relationship among the computer literacy dimension subscales shown in Table 1. The outcome of the Pearson correlation analysis indicated that teachers' attitude towards clickers use significantly and positively correlated with documents and documentation computer literacy dimension, while general computer knowledge correlated positively and significantly with documents and documentation, data inquiry and communication and surfing computer literacy dimensions. Furthermore, there was a significant positive correlation between data inquiry computer literacy dimension and documents and documentation computer literacy dimension. All subscales correlate significantly and this suggests that the four elements were fairly independent to be used as measurement of computer literacy as well as independent variables for the study.

The results in Table 5 revealed that the independent variables (general computer knowledge, documents and documentation, data inquiry and communication and surfing computer literacy dimensions) jointly contributed a coefficient of multiple regression of .739 and a multiple correlation square of .652 to the prediction of primary school teachers attitude towards clickers' use in teaching English as a second language. By implication, 73.9% of the total variance of the dependent variable was accounted for by the combination of the four independent variables.

Table 5. *Model Summary, Coefficient and T-Value of Multiple Regression Analysis of Computer Literacy Dimensions and the Outcome Measure*

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	*t*	Sig.
(Constant)	63.957	3.409		18.759	.000
General Computer Knowledge	-.198	.401	-.208	-.495	.630
Documents and ocumentation	1.309	.417	1.268	3.138	.009
Data Inquiry	-.353	.234	-.336	-1.508	.157
Communication and Surfing	-.904	.264	-.701	-3.424	.005
Model Summary Multiple R^2 = .739 Multiple R^2 (Adjusted) = .652 Standard Error Estimate = 3.42782 F = 8.488 Sig. = .002					

a. Dependent Variable: Attitude to Clickers
$p < .05$

Moreover, the results further showed that the analysis of variance of the multiple regression data produced an *F*-ratio value significant at 0.05 level ($F_{(4,12)} = 8.488$; $p < .05$). The results of the relative contributions of the independent variables to the prediction of teachers' attitude towards the use of clickers in ESL classroom was that documents and documentation was the potent significant positive contributor to the prediction of teachers' attitude towards the use of clickers in ESL classroom (β = 1.268, t = 3.138, p = .009), while communication and surfing made the next significant but negative contribution to the prediction of the dependent variable (β = -.701, t = -3.424, p = .005). However, general computer knowledge and data inquiry dimension did not make any significant contribution to the prediction of teachers' attitude towards the use of clickers in ESL classroom.

Table 6. *Descriptive Statistics and Correlations Matrix for the relationship between the Predictor variables and the Outcome Variable*

	A	B	C	D
A. Attitude to Clickers			.448*	
B. Computer Literacy			-.692*	
C. Computer Use	.448*	-.692*		
D. Academic Qualification	-	-	-	
Mean	65.4375	72.7297	3.5294	2.5882
SD	5.80914	19.03173	1.00733	.71229

*$p < .05$

The results in Table 6 indicated the means and standard deviations of teachers' attitude to clickers, computer literacy, computer use and academic qualification variables. Meanwhile, the results indicated that attitude to clickers (M = 65.4375, SD = 5.81), computer literacy (M = 72.7297, SD = 19.03), computer use (M = 3.5294, SD = 1.01) and academic qualification (M = 2.5882, SD = .71). The results of the Pearson correlation also indicated that there was a significant positive correlation between computer use and teachers' attitude to clickers,

while a negative but significant correlation existed between computer use and computer literacy. Meanwhile, teachers' academic qualification did not significantly correlate with other variables.

Table 7. *Model Summary, Coefficient and T-Value of Multiple Regression Analysis of Computer Literacy, Computer Use, Academic Qualification and the Outcome Measure*

	Unstandardized Coefficients		*Standardized Coefficients*		
	B	*Std. Error*	*Beta*	*t*	*Sig.*
(Constant)	*23.664*	*9.982*		*2.371*	*.034*
Computer Literacy	*.242*	*.078*	*.794*	*3.098*	*.008*
Computer Use	*5.990*	*1.415*	*1.039*	*4.232*	*.001*
Academic Qualification	*1.161*	*1.574*	*.142*	*.738*	*.474*

Model Summary
Multiple R^2 = .593
Multiple R^2 (Adjusted) = .499
Standard Error Estimate = 4.11377
F = 6.302
Sig. = .007

a. Dependent Variable: Attitude to Clickers
$p < .05$

The results in Table 7 showed that a combination of the independent variables (computer literacy, computer use and academic qualification) contributed a coefficient of multiple regression of .593 and a multiple correlation square of .499 to the prediction of teachers' attitude towards the use of clickers in ESL classroom. The implication of this result is that 49.9% of the total variance of teachers' attitude towards the use of clickers in teaching English as a second language was accounted for by the combination of computer literacy, computer use and academic qualification. The result further showed that the analysis of variance of the multiple regression data produced an F-ratio of 6.302 was significant at 0.05. Meanwhile, the results further showed that teachers' academic qualification did not make significant contribution to the prediction of their attitude towards the use of clickers in ESL classroom. In any case, computer use made the most significant contribution to the prediction of teachers' attitude towards the use of clickers in ESL classroom (β = 1.039, t = 4.232, p = .001), while computer literacy made lesser significant contribution to the prediction of teachers' attitude towards the use of clickers in ESL classroom (β = .794, t = 3.098, p = .008).

Discussion

Overall, the results of this study showed that the teachers' computer literacy tilted towards general computer knowledge as well as documents and documentation than data inquiry and communication and surfing. The teachers could be generally regarded to be average computer literates who probably understand the basic theoretical principles of computer usage rather having the necessary technical and practical operational skills that could enhance their effective and efficient use of computers. In fact, the teachers' seeming average level of computer literacy could be attributed to the availability and accessibility to computers at the cyber cafes, private small-scale computer business-centres and those possibly available at few computer training centres or workshops they had attended. In the same vein, teachers' low level computer literacy could be attributed to the extent to which

they individually explored computers for personal purposes that required their paying more attention to the very basics of computer applications like word-processing, spreadsheets and possibly presentation tools than taking advantage of computers for tasks and activities related to data inquiry, communication and surfing. In consonance with the outcome of this study, Slaouti and Barton (2007) and Theng Lau and Sim (2008) also found that teachers were more competent in word-processing than using computer programmes.

Another outcome of this study was the joint contribution of the computer literacy dimensions (general computer knowledge, documents and documentation, data inquiry and communication and surfing). The observed ($F_{(4,12)} = 8.488$; $p < .05$) is a reliable evidence that the combination of the computer literacy dimensions in the prediction of teachers' attitude towards the use of Personal Response System from all indications was not by chance. It is therefore evidently clear that the coefficient of multiple regression of .739 and a multiple R square of .652 indicate the extent and magnitude of the relationship between computer literacy dimensions and teachers' attitude towards the potential use of Personal Response System in ESL classroom. Meanwhile, the strength of the joint predictive power of the independent variables (computer literacy dimensions) on the prediction of the teachers' attitude towards the use of Personal Response System was very strong and significant at 73.9%. Although, there might be other variables which may require further investigations about their contribution to the prediction of teachers' acceptance and use of Personal Response System in ESL classroom, but the degree of prediction made by the variables of this study could be substantive enough to assert that teachers' potential use of PRS is predictable by a combination of the computer literacy dimensions. However, there seems to be a dearth of research conducted on the predictive power of computer literacy dimensions used in this study on teachers' intention to use PRS.

One of the outcomes of this study indicated that documents and documentation dimension of computer literacy was the potent predictor, while communication and surfing was the least significant predictor of teachers' attitude towards the use of PRS in ESL classroom. Teachers' positive attitude towards using PRS may probably be attributed to the fact that the use of PRS requires users' demonstration of presentation tools (PowerPoint) and word-processing skills, which many teachers seem to possess or perceive to possess. This research finding corroborates the earlier research outcome that teachers' attitude towards the use of ICT was greatly determined by their competence in creation and manipulation of files and folders, saving, deleting and printing documents skills (Intaganok, Waterworth, Andsarachulamanee, Grasaresom & Homkome, 2008). Furthermore, the outcome of this study was in congruence with the finding of Cuckle, Clarke and Jenkins (2000) which reported that teachers' proficiency in word-processing and presentation tools puts them at vantage position in adopting ICT in schools. Similarly, lending credence to the outcome of this study, Theng Lau and Sim (2008) also submitted that above the use of online demos, hypermedia and multimedia and statistical tools, teachers competence in word-processing provoked their use of computers.

The results of this study further revealed that general computer knowledge and data inquiry dimensions did not make significant contribution to the prediction of teachers' attitude towards the use of Personal Response System in ESL classroom. This outcome is not surprising because by informal observation, many computer users seem not to be interested in having deep understanding and knowledge, acquisition of technical skills about computer hardware and software. Such notion is often held probably because the general belief is that acquiring such skills should be the concern of computer technology specialists, engineers and technicians, rather average users of computer-technology for personal and instructional purposes who are not and should not be saddled with responsibility of computer

maintenance. The outcome of this study contradicts the findings of Rilling, Dalman, Dodson, Boyles and Pazvant (2005) and Vannatta and Fordman (2004) who reported that teachers' decision to use computer-linked technologies is dependent on the quality of their computer technical knowledge and skills. Also, the finding of Intaganok, Waterworth, Andsarachulamanee, Grasaresom and Homkome (2008) which reported that teachers' negative attitude towards the use of ICT was orchestrated by lack of computer general knowledge and technical skills was at variance with the outcome of this study.

Another finding of this study showed that a combination of computer use, computer literacy and academic qualification significantly contributed to the prediction of teachers' attitude towards the use of Personal Response in ESL classroom. The observed F-ration value of 6.302 is reliable evidence that the combination of computer use, computer literacy and academic qualification as independent variables to predict teachers' attitude towards the use of Personal Response System in ESL classroom was not accidental. The results further showed that the coefficient of multiple regression of .593 and a multiple R square of .499 indicate the magnitude of the relationship between computer use, computer literacy, academic qualification, computer literacy and teachers' attitude towards the use of Personal Response System in ESL classroom. Meanwhile, the strength of the predictive power of the combined independent variables (computer use, academic qualification and computer literacy) on the outcome variable is strong and significant at 49.9% to show the linear relationship between the three predictor variables and the total variance in teachers' attitude towards the use of PRS in ESL classroom.

In examining the relative contributions of computer use, academic qualification and computer literacy to the prediction of the outcome variable, this study found that only computer use and computer literacy made significant contribution to the prediction of teachers' attitude towards the integration of PRS in ESL classroom. The implication of this outcome as supported by earlier research (Ocak & Akdemir, 2008; Jenkins, 2009) is that a strong association tend to exist between computer literacy, computer use and readiness to integrate technology. Meanwhile, the contribution of computer use to the prediction of teachers' attitude towards the integration of PRS in ESL classroom was higher than that of computer literacy.

That computer use is the potent predictor of the teachers' attitude towards the use of PRS is quite interesting because one would have expected that teachers' level of computer literacy should be a motivator towards their use of technology and a further decision as whether to or not to integrate computer-linked technologies into instruction. The outcome of this study was at variance with the finding of Berner (2003) who found computer literacy as the most potent contributor to users' attitude towards the use of ICT. Similarly, Mojgan, Kamariah, Wong, Bahaman and Foo, (2009) reported that computer literacy was a pre-requisite above other factors to determining computer use and not the other way as found in this study. It is obvious that many 21st century teachers are familiar with the basic principles of computer operation. Therefore, that computer use had an edge over computer literacy in predicting teachers' attitude toward the integration of PRS in classroom in this study could probably be associated with the teachers' observed and experienced simplicity and ease of use associated with PRS technology in the classroom. Also lending support to the outcome of this study, Rakes and Casey (2000) found that computer use greatly affects teachers' attitude towards technology integration.

It is important to note that academic qualification did not any significant contribution to teachers' attitude towards the integration of PES technology in ESL classroom. Of course, if learners at all levels of education are becoming computer aficionados, there is therefore no

excuse for any 21st century teacher irrespective of academic attainment or qualification to display negative perception and attitude towards emerging instructional technologies. However, the outcome of this study was not supported by Bauer and Kenton (2005) who found that teachers of higher educational qualification were more positively disposed than those who were lesser educationally qualified.

Conclusion

In the last few years, several studies have been conducted on the use and users' attitude towards the use Personal Response System at the secondary and post-secondary education levels. Many of these studies included samples in developed countries such as Canada, United Kingdom Australia, United States of America and South Africa. By introducing Personal Response System to African primary school teachers and measuring teachers' attitude to PRS technology integration in classroom where English would be taught as a second language, this study contributes to the understanding of the fact that the simplicity of technology use would rather place teachers' ability to use computers for instruction above mere acquisition of computer technical skills to influence positive attitude towards technology integration in educational system. At the same time, with no significant contribution of academic qualification to the prediction of teachers' attitude to PRS integration, the study also brings to rest the unnecessary importance attached to differentials in teachers' attitude to technology integration based on academic qualification and educational attainment. It is therefore obvious that the complexity and difficulty level of technicality involved in technology operation triggers differences in attitude to technology use among the less, averagely and highly educated people.

Further research should be conducted in order to compare the attitude of ESL teachers with those of other subjects in all primary schools in Ogun State, and among all teachers across all states in Nigeria. Similarly, comparative studies among different levels of education system and between/among different countries on teachers' attitude towards the integration of PRS should be carried out by other researchers.

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International Electronic Journal of Elementary Education, 2012, 4(2), 395-405.

Literacy and Technology: Integrating Technology with Small Group, Peer-led Discussions of Literature

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Received: November 2011 / Revised: February 2012 / Accepted: March 2012

Abstract

This review examines research of computer-mediated small group discussion of literature. The goal of this review is to explore several instructional formats for integrating print-based and new literacies skills. First, the theoretical foundations for the shift from teacher-led to student led discussion are outlined. Research exploring ways in which technology has been infused into several common elements of literature discussion groups are presented next. Benefits and challenges of such integration are highlighted and suggestions for future research are presented.

Keywords: Subjects: Educational Technology; Adolescent Literature; Computer-Mediated Discussion; Collaborative Learning, Discussion Groups

Introduction

The purpose of this article is to provide a review of the literature concerning integration of literacy and technology in the context of small group, peer-led literature study. First, an overview of key studies outlining the rationale for moving from teacher-led to peer-led discussions will be presented and the theoretical foundations for such a shift will be put forth. Next, the literature describing the common key principles and components of several peer-led literature study structures (literature circles, book clubs, etc.) will be presented alongside their benefits and challenges. Third, current practices and applications of the integration of technology with these structures will be examined in light of the emergent theory of the new literacies. Suggestions for further research will be discussed.

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ISSN:1307-9298

www.iejee.com

Peer-Led Discussion of Literature

A variety of terms and structures have been used when referring to peer-led discussion of literature. Eeds and Wells (1989) introduced the concept of *grand conversations* to describe their proposed goal of the discussion of literature. They called for a departure from teacher-led interactions that followed a pattern of teacher initiation, student response, and teacher evaluations, otherwise known as IRE, toward small, student-directed literature study groups. Several scholars and practitioners put forth different terms and models to promote similar structures of organization to use in pursuit of these grand conversations. Short and Pierce (1990) and Daniels (2002) call such groups *literature circles.* Wiencek and O'Flahavan (1994) use the term *conversational discussion group* while Raphael and McMahon (1994) call their literature discussion groups *book clubs.* At the heart of each is a belief that peer discussion holds a central and valuable place in literacy development (Almasi, O'Flahavan & Arya, 2001). This belief is supported by and rooted in Vgotsky's (1978) theory of social development which regards teaching and learning as interactive and social in nature and highlights the role of talk in sharing knowledge and constructing meaning. Such practices are also consistent with Rosenblatt's (1976) transactional theory of literacy that suggests meaning resides not in a text, but in the reader and how the reader interprets it.

Though there are a number of differences between these various literature study groups, at their core they share a number of key principles and practices:

1. Small discussion groups are organized around (student) chosen texts.
2. Written or drawn notes guide reading and discussion.
3. Discussion groups meet, where the students lead and the teacher serves as facilitator.
4. Readers share learning with a wider audience.

There is a large body of research focusing on the benefits of peer discussion of literature. Research supports the idea that small-group, student-directed discussions of literature can increase comprehension, engagement, and critical thinking skills (Almasi, 1995; Eeds & Wells, 1989; Klinger, Vaugh, & Schumm, 1998). Short (1997) noted that literature circles promote positive attitude toward reading as well as an increased ability to read critically.

Peer-discussion of literature is not without its challenges. Larson (2008) asked a group of pre-service teachers about their perceived challenges of traditional peer-led discussion groups. Findings included shy students feeling uncomfortable sharing, students goofing around and getting off topic, and students who come to the discussions unprepared. Wolsey (2004) adds that students may have a tendency to do what they think the teacher wants, rather than focus on what they are interested in discussing. Daniels (2002) suggests that a major challenge to successfully instituting practices rooted in reader response theory is increased pressure to gear curriculum towards isolated knowledge and skills that can be evaluated using standardized tests.

New Definitions of Literacy – New Classroom Practices

Though much of the research concerning the lopsided ratio of teacher to student talk was conducted over twenty years ago, recent researchers have observed the same skewed ratio in today's classrooms and have suggested that the accountability movement and its increased pressure on the curriculum has resulted in classrooms where students are given even less of a voice (Grisham & Wolsey, 2006). Adding to these pressures already acutely felt by classroom teachers is the "changing literacy landscape" created as new technologies, particularly those clustered around the Internet, rapidly emerged and became a central part

of our lives (Reinking, 1998; Leu, Kinzer, Coiro, & Cammack, 2004). In addition to the traditional print-based literacies, today's teachers are now tasked with exposing students to, and supporting students in, their use of new literacies practices including the "skills, strategies and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of out personal and professional lives," (Leu et al., 2004, para. 9.)

According to the International Reading Association (2009), to be considered fully literate, students "must become proficient in the new literacies of 21st-century technologies" (para. 1). However, many teachers feel overwhelmed already by the task of teaching traditional print-based skills and believe they lack the time and resources to teach additional digital literacy skills (Hutchison & Reinking, 2010). It becomes important, therefore, for teachers to find ways to use the time and resources currently available to them to simultaneously teach both print-based and digital literacy skills. Several researchers have explored ways in which these new literacies might be "intertwined with tried-and-true literacy practices" (Larson, 2008, p.122). Classroom teachers are using a variety of formats and technologies, many of them loosely structured as some form of a technology-enhanced peer-led discussion group. Although a review of literature found no current studies discussing the integration of technology within all the components of a literature discussion group outlined above, some have addressed each issue separately.

Text Selection

A review of the literature uncovered few examples of studies in which electronic books or online texts were used. Most of the studies read involved students using traditional printed texts. One exception was Larson (2008) who used electronic books while instituting what she refers to as an Electronic Reading Workshop. Students read electronic books from computer screens in order to exploit their user-friendly editing tools which allow the reader to highlight text, cross words out, insert "sticky notes" or attach files, and make audio recordings (Larson, 2008). The study produced mixed results. Pre-service teachers participating in the study rated the experience as a positive one overall, but all 22 participants still favored reading traditional print books. Some noted that reading on the computer felt restricting and time-consuming.

Preparing for Discussion

Larson (2009) had fifth grade students prepare for literature discussion by keeping electronic response journals in a word-processing program. Students were given approximately 30 minutes to read and respond in their electronic journals. In a similar study 22 pre-service teachers also kept electronic response journals prior to holding small group discussions in both synchronous and asynchronous formats. Carico and Logan (2004) paired up university students taking an adolescent literature course with 8th grade students and had them exchange emails about common texts prior to meeting with others online with other pairs from the same group to discuss their responses in a synchronous chat-room like setting. Students in Simpson's (2010) study completed "rap sheets" (scaffolded worksheets) prior to composing emails to be sent to an online moderator who would share the information with other classes reading the same book.

Student-led Discussion of Text

Asynchronous Formats. Threaded discussion groups are a common element to several studies exploring the integration of technology and student-led discussion of text (Beeghly, 2005; Bowers-Campbell, 2011; Grisham & Wolsey, 2006; Moreillon, Hunt, & Ewing, 2009; Simpson, 2010; Walker, 2010). An *electronic threaded discussion group* is a group of people who

exchange messages about topics of common interest" (Grisham & Wolsey, 2006, p. 651). A string of postings on the same topic is referred to as a thread. Because these discussions happen asynchronously, individual readers have the time to reflect on the text that they've read, as well as other student responses, before constructing their own response without worrying about being interrupted by other group members (Wolsey, 2004). As Grisham and Wolsey (2006) note, "Asynchronous communications are interactive, like discussions, but thoughtful, like written discourse.

Sometimes referred to as bulletin boards, threaded discussion groups have been used as a platform to discuss literature in several studies. Beehgly (2005) used threaded discussions groups available on Blackboard (a course software management system provided by the university for instructors' use) in an effort to enhance conversations in their courses about books, meet the needs of individual students, and foster classroom community. In other cases the threaded discussion groups were one component of a larger technology piece. For example, Moreillon, Hunt, & Ewing (2009) instructed students to include a threaded discussion group as one element of the wikis they created to organize, discuss and present their responses to texts. Students were to reflect on their reading, discuss it with others in groups via a threaded discussion board, and then use additional web 2.0 tools to construct and publish their understandings of the elements of literature with respect to each title. Social networking websites such as Facebook and Goodreads have also been used to host discussions of literature (Stewart, 2009; Walker, 2010).

Synchronous Formats. Real-time, online chats are another format for electronic discussion being explored by several researchers (Carico & Loagan, 2004; Day & Kroon, 2010; Larson, 2008; Scharber, 2009; Stewart, 2009). Discussion groups can meet in an online chat-room and exchange ideas simultaneously, similar to a face-to-face conversation but without the need to actually be in the same physical place.

There are a number of platforms which provide opportunities for students to engage in online, real-time chats. Some, like Facebook, were designed as social networking sites. Carico and Logan (2004) utilized a MOO (Multi-user, Object-Oriented environment), which is an online, text-based environment where multiple members can "meet" at the same time. Moodle (www.moodle.org) is an open-source classroom management software that includes forms for both threaded discussions and online chats and can be used to host an online book club (Scharber, 2009).

Blended Formats. A review of the literature identified several studies that incorporated both asynchronous and synchronous formats in their discussions of literature (Larson, 2008; Scharber, 2009, Simpson, 2010; Stewart, 2009), some of which included alternating rounds of traditional and technology-enhanced discussion groups (Day & Kroon, 201;). Day and Kroon planned and organized three rounds of literature circles along with three rounds of face-to-face meetings. They used Think Quest, a website designed for school use which includes a forum for threaded discussions. Interestingly, students in this study used threaded discussions in real-time time to discuss novels. (Kroon & Day, 2010). Simpson (2010) studied a group of students engaging in a "book rap" which involved individually completing a series of scaffolded worksheets to prepare for in-class discussions with their teachers and peers before creating a shared or individual email message to be sent to an online moderator. This moderator would then make all the emails available to be read by students in other classrooms participating in the same "rap."

Sharing learning with a wider audience

Students participating in traditional face-to-face small group literature discussions organized around a common text often participate in some sort of literature extension project at the

end of the discussion group. These extension projects offer another opportunity for teachers to integrate technology into their traditional literacy practices. A review of the literature identified a number of studies that included a technology-based project (Day & Kroon, 2010; Larson, 2008; Moreillon, Hung, & Ewing, 2009). Larson (2008) reports that students worked collaboratively to create multi-media literature extension projects which reflected their personal interests and incorporated a variety of technological components including PowerPoint slides, hyperlinks to Internet resources, sounds, digital photography, scanned documents, and voice recordings. Day and Kroon (2009) instructed students to consider color, symbols, tone, images, photographs, music, videos, movement, and powerful quotes and words to describe their novels in completing these projects.

Benefits of Integrating Technology and Peer-Led Discussion

Ability to connect to readers outside the classroom

Participating in technology-enhanced discussions of literature provides students the opportunity to connect with readers from outside the classroom, the school, the state, and even the country. Stewart (2009) points out that online literature circles allow students who are not in the same class or on the same schedule to have the experience of interacting with other students in a forum centered on their reading. Castek, Bevans-Mangelson, and Goldstone (2006) suggest further that online book clubs could be composed of students and classrooms from around the world, exposing students to other cultures as well as other ideas. Anderson and Elloumi (2004) suggest that this ability to gain perspectives and responses to literary texts from peers located in another time and place adds an essential layer to the individual students' learning.

Provides written discussion transcripts for analysis by students and/or teachers

Transcripts of threaded discussions or online chats can be saved and/or printed and offer teachers and students an opportunity to reflect and analyze their discussions. Larson (2008) found that although initial threaded discussions were stilted and disjointed, once students were provided printed transcript summaries of the discussion sessions and asked to evaluate them, discussions showed a marked improvement. Another useful feature of many message boards is their ability to track statistics on students' use. Teachers can access information about the number and length of posts of individual students, for example, and use this data to motivate or guide students towards writing more effective posts (Larson, 2009). Moreillon, Hunt, & Ewing (2009) also commented on the benefits of being able to access a history of the activities of group members. They found that one benefit of using wikis is their "history" function which allows teachers (and other group members) to see exactly who is participating, what their contributions are, and when they made them. This allows both teachers and participants to gain a sense of who is "pulling their weight" and give them the opportunity to assert pressure in order to engage reluctant members.

Engagement/Motivation

A number of scholars cite increased engagement and motivation as key benefits of integrating technology and peer-led discussion of literature (Carico & Logan, 2004; Day & Kroon, 2010; Larson, 2008; Moreillon, Hunt, & Ewing, 2009). In describing their work with using wikis, Moreillon, Hunt, & Ewing (2009) state that boosting students' motivation and engagement as well as deepening comprehension were central to their work. Day and Kroon (2010) found that their students' excitement and motivation to participate in online book clubs was sustained throughout the entire school year over several texts and rounds of discussion.

Giving voice to marginalized students

Online discussion, whether asynchronous as in threaded discussions or synchronous, as in online chats, provides opportunities for participation by all students, some of whom might feel reluctant to participate in face-to-face discussions. Larson (2009) suggests that conducting discussion groups using an asynchronous threaded discussion on a message board may help students who are shy, are struggling readers, or are linguistically diverse, as they these groups may hesitate to contribute in a traditional format but are likely to benefit from being able to take more time to formulate and post responses.

Asynchronous discussions provide all group members an opportunity to be heard without being interrupted. (Grisham & Wolsey, 2006). In online chats, text can be entered simultaneously and everyone who can use a keyboard has an equal chance to be heard (Carico & Logan, 2004). Kroon and Day (2010) found that students who were not regular contributors to classroom discussions actively participated in online discussions.

Develops new literacies skills

Technology-enhanced discussion of literature provide ample opportunities for students to develop a number of new literacies skills such as the ability to decode color, icons, and images (Grisham and Wolsey, 2006; Scharber, 2009), the chance to experiment with hyperlinks, digital documents, photographs, video files, and music and voice recordings (Larson, 2005; Scharber, 2009) and their effects on communication. As Norton-Meier (2004) points out, participants in chat rooms (or other asynchronous forms of computer-mediate discussion) experiment and play with creating icons, shortened sentences and invented spellings, but must also show an understanding of the conventions of language or risk losing their message. Moreillon, Hunt, and Ewing (2009) found that using wikis to support literature discussion afforded them the opportunity to teach lessons about netiquette, elements of design, and fair use to improve their students' ability to successfully and ethically communicate in a digital environment. Literature discussion groups also provide a safe environment for what is, for many young learners, their first exposure to chatting (Scharber, 2009).

Fosters classroom community and social interaction

Results of numerous studies support the belief that online literature discussions have the potential to build a sense of community and foster social interaction. (Beeghly, 2005; Carico & Logan, 2004; Grisham and Wolsey, 2006; Larson, 2008; Larson, 2009; Moreillon, Hunt, & Ewing, 2009; Wolsey, 2004). Students in Larson's (2008) study found that a threaded discussion group provided a safe environment for group members to get to know each other and also share their thoughts about the book. Fifth graders in Larson's (2009) study indicated that they valued replies from their classmates by thanking students for replying to their prompts, and giving praise to peers who posted interesting ideas or new viewpoints. They also asked for clarification from each other when vague or confusing prompts and replies were posted. Moreillon, Hunt, & Ewing (2009) found that using wikis to create a multimedia archive of the individual and shared meanings created around common texts provided opportunities for community-building and collaborative partnerships that will be essential in a 21st century participatory culture.

Gives students time to think before responding

Asynchronous forms of online literature discussion, in particular, offer students the "luxury of time" in reflecting about and responding to literature and to the ideas of others (Beeghly, 2005). Larson (2009) found that students carefully read the posts of their classmates and thought about the opinions presented before submitting replies which not only included

evidence of responding deeply to the literature but also of a careful consideration of multiple perspectives. Beeghly (2005) notes that the format of an online, asynchronous conversation provides students with time to think before responding, time to gather and organize their thoughts, and time to voice those thoughts fully without interruption.

Improves Learning

The integration of Information Communication Technologies (ICTs) with traditional literacy practices provides opportunities for knowledge sharing between students (Schraber, 2009), and studies support the belief that online discussions improve students' communication skills (Carico & Logan, 2004; Larson, 2008; Schraber, 2009). Carico and Logan, 2004 found students who participated in online chats showed evidence of making personal connections to literature, reflecting on the content of what is read, and reflecting on reading strategies. Online book discussions have also been shown to improve critical thinking skills (Grisham & Thomas, 2006, Simpson, 2010). Simpson (2010) measured students' developing critical awareness through increased use of meta-language in blended face-to-face and online collaboration and found students made gains in critical thinking skills and suggests that such a blended environment could support students with a range of abilities.

Challenges of Integrating Technology and Peer-Led Discussion

Hard to interpret tone

When conversations are written rather than spoken, the lack of body language and facial expressions can cause some difficulties in interpreting tone of voice (Larson, 2008). Students often mediate this problem through the use of emoticons and other "chat-room" language. Initially teachers in the Larson (2009) study initially gave directions that only standard English was to be used in the online discussions, but after further reflection decided that the students' use of invented spellings, symbols, emoticons, and other "chat-room" language ultimately enhanced the conversations by adding voice and expression. They pointed out that students' face-to-face discussion of literature often uses informal language, hand gestures, body language, and facial expressions and came to believe that these same "tools" ought to be available in online communications. Grisham & Wolsey (2006), Leu et al., (2004) and Norton-Meier (2004) all support the idea that the strategic use of symbols and icons as well as the placement of text and images play a part in communicating a message in on online environment.

Issues of speed

The speed at which online discussions take place proved to be a challenge for participants in several studies. Day and Kroon (2010) note that online conversations occur faster than face-to-face ones because multiple discussion threads around the same book can occur at the same time. Some students found it difficult to determine which messages connected and which didn't. Both typing speed and reading speed proved to be a challenge for some learners (Day & Kroon, 2010).

May be distracting initially

The novelty of using computers and webpages to discuss literature, while motivating for many students, can also be distracting. Day and Kroon (2010) found that students initially fixated on the entertaining aspects of working on computers and engaged in several off task behaviors, and their reading responses remained at a very surface level. Addressing the issue with the students, analyzing sections of discussion transcripts, and working together to brainstorm solutions helped to get students back on track. Grisham & Wolsey (2006) noted that students initially spent a lot of time formatting their messages, but become more

engaged in the discussion themselves as the year proceeded and formatting concerns consumed less and less of their time.

Issues of access

Larson (2008) found that issues of access to a computer and/or an internet connection when not at school was a concern for some students, suggesting that scheduling issues and time management are important to consider when implementing activities that occur online.

Discussion

Summary of main findings

Research supports the idea that small-group, student-directed discussions of literature can increase comprehension, engagement, and critical thinking skills (Almasi, 1995; Eeds & Wells, 1989; Klinger, Vaugh, & Schumm, 1998). According to the International Reading Association (2009), to be considered fully literate, students "must become proficient in the new literacies of 21st-century technologies" (para. 1). Because many teachers feel overwhelmed already by the task of teaching traditional print-based skills and believe they lack the time and resources to teach additional digital literacy skills, it becomes important to find ways to use the time and resources currently available to them to simultaneously teach both print-based and digital literacy skills. Several researchers have explored ways in which these new literacies might be "intertwined with tried-and-true literacy practices" (Larson, 2008, p.122). Classrooms are using a variety of formats and technologies; many of them loosely structured as some form of a technology-enhanced peer-led discussion group. Some have integrated technology into the process of selecting and reading texts (Larson, 2008), some have utilized technology as a means of preparing for literature discussions (Caricon & Logan, 2004; Larson, 2009; Simpson, 2010), others have utilized technology to mediate the discussions themselves using an asynchronous format (Beeghly, 2005; Bowers-Campbell, 2011; Grisham & Wolsey, 2006; Moreillon, Hunt, & Ewing, 2009; Simpson, 2010; Walker, 2010), a synchronous format (Carico & Loagan, 2004; Day & Kroon, 2010; Larson, 2008; Scharber, 2009; Stewart, 2009), or some combination (Larson, 2008; Scharber, 2009, Simpson, 2010; Stewart, 2009). Still others have used technology to develop powerful multi-media projects as a way of extending the discussions and sharing knowledge with a wider audience (Day & Kroon, 2010; Larson, 2008; Moreillon, Hung, & Ewing, 2009).

These studies support the belief that technology-enhanced, small-group, peer-led discussions of literature have the potential to connect students to readers outside the classroom (Anderson & Elloumi, 2004; Castek, Bevans-Mangelson, & Goldstone, 2006; Stewart, 2009), provide written records of classroom discussion which can be analyzed by teachers and students (Larson, 2008; Larson, 2009; Moreillon, Hunt, & Ewing, 2009), increase motivation and engagement (Carico & Logan, 2004; Day & Kroon, 2010; Larson, 2008; Moreillon, Hunt, & Ewing, 2009), give voice to marginalized students (Carico & Logan, 2004; Grisham & Wolsey, 2006; Kroon & Day, 2010; Larson, 2009), develop new literacies skills (Grisham & Wolsey, 2006; Larson 2008; Moreillon, Hunt, & Ewing, 2009; Scharber, 2009) foster classroom community and social interaction (Beeghly, 2005; Carico & Logan, 2004; Grisham and Wolsey, 2006; Larson, 2008; Larson, 2009; Moreillon, Hunt, & Ewing, 2009; Wolsey, 2004), meet individual needs by providing time to think (Beeghly, 2005; Larson 2009), and improve student learning (Carico & Logan, 2004; Grisham & Wolsey, 2006; Larson, 2008; Schraber, 2009; Simpson, 2010). These studies also point out several challenges to consider when implementing such practices including the difficulty of interpreting tone online (Larson, 2008; Larson, 2009), the ways in which reading and typing speed can affect performance (Day & Kroon, 2010), the distractions that can result from the novelty of using computers and webpages and issues of access (Day & Kroon, 2010; Grisham & Wolsey, 2006).

Suggestions for Further Research

In-depth examination of the quality of the computer-mediated discussions is recommended. Many of the studies documented in the literature provide a brief look at the overall structure of a technology-enhanced literature discussion group, but few focus on the quality of the discussions themselves. What do these conversations reveal about the ways students collaboratively construct meaning?

A comparative study of a traditional peer-led discussion group and a technology-enhanced discussion group should be conducted. Though a number of studies discussed in the review of literature explore similarities between face-to-face and online discussion of literature, few were structured in ways that allowed the two to be directly compared. To learn more about the effects of integrating technology into a small group, peer-led discussion of literature, a comparative study between the two formats should be conducted. How do these two different contexts affect the way students respond to literature and collaboratively construct meaning?

Needs of individual students as they relate to learning in an online environment must be considered. Numerous studies described computer-mediated discussion of literature as social and collaborative. Leu et al (2004) suggests that as the new literacies become dependent on social learning strategies, teachers must be aware that socially skilled learners will likely have an advantage over more independent learners. How is the experience of discussing literature online different for learners with different learning styles?

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International Electronic Journal of Elementary Education, 2012, 4(2), 407-415.

Is the Earth Flat or Round? Primary School Children's Understandings of the Planet Earth: The Case of Turkish Children

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Received: November 2011 / Revised: February 2012 / Accepted: March 2012

Abstract

The purpose of this study is to explore primary school children's understandings about the shape of the Earth. The sample is consisted of 124 first-graders from five primary schools located in an urban city of Turkey. The data of the study were collected through children's drawings and semi-structured interviews. Results obtained from the drawings showed that only one third of the participants have drawn scientifically acceptable images of the earth. However, the subsequent semi-structured interviews revealed that more children have scientific knowledge about the shape of the Earth. The results also revealed that cartoons, story books and daily life experiences are the reasons for children's misconceptions.

Keywords: Drawings of earth, children's drawings, children's conceptions of planet Earth

Introduction

Over the past four decades, children's understanding of natural phenomena has become one of the major issues in science education. Research has revealed that children experience difficulties when learning scientific concepts (Abrams 1997; Posner et al., 1982) and they possess scientifically inaccurate or incomplete conceptions about the world (Clement, 1982; Henriques, 2002; Osborne & Wittrock, 1983; Posner et al., 1982). Different terms have been used to refer this type of knowledge- such as preconceptions (Ausbel, 1968), misconceptions (Novak, 1987); alternative framework (Driver & Easley, 1978), children's science (Gilbert, Osborne & Fensham, 1982), naïve beliefs, (Caramazza, McCloskey & Green, 1981) mental models (Collins & Gentner, 1987; White & Fderiksen, 1986), folk theories (Kempton, 1987), and intuitive theories (McCloskey & Kargon, 1988). Although different kinds of terms have been used to define unscientific theories, there is a general agreement that this intuitive

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ISSN:1307-9298

www.iejee.com

knowledge provides explanations of natural phenomena which are frequently different from the currently accepted scientific definitions. Children's conceptions are formed by daily life experiences, perceptions, cultural influences and language use long before they begin formal education (Duit & Treagust, 1998; Vosniadou & Brewer, 1994). Children's misconceptions are pervasive, stable and resistant to change (Haslam & Treagust, 1987; Osborne, 1983). Moreover, they may block understanding of scientific concepts and hinder further learning (Hewson & Hewson, 1983; Shuell, 1987). For meaningful learning to occur, children should relate new knowledge with previously learned ones (Duit & Treagust, 1998). Thus, misconceptions should be taken into consideration in all stages of formal education to eliminate the old ones and to prevent the development of similar ones.

Astronomy is one of the oldest and the most popular science field that involves many concepts that can be incorrectly interpreted and learned by children. Astronomy takes an important place in science education because it has a relation with the Earth, space and nature. Conceptual understanding about the shape of the Earth, including alternative conceptions has been studied with educational researchers for many times. Children's drawings have been frequently used as a methodological means for their understanding of the concept Earth (Nussbaum & Novak, 1976; Sneider & Pulos, 1983; Vosniadou & Brewer, 1992). Research in this area revealed consistent results across different countries and cultures. However, this knowledge was also inconsistent with the scientific ones. In their study, Vosniadou and Brewer (1992) determined five types of unscientific models of the Earth. Researchers defended that flat Earth, rectangular Earth and the disc Earth are the initial models that children use before they receive information about the planet Earth. When children obtain some information about the shape of the Earth, they usually try to assimilate new information with their preexisting schema and they develop synthetic models such as the dual Earth and the hollow Earth. In the hollow Earth model, children represent the Earth spherical with a flat surface with people inside it whereas in the dual Earth children draw two earths; one being a flat surface on which people live and the other round and located in the sky. These findings are consistent with the findings from different cultures (Brewer et al., 1987; Samarapungavan, Vosniadou & Brewer, 1996; Sneider & Pulos, 1983; Vosniadou & Brewer, 1990; 1992). Although there exist some cultural variaties, research demonstrates a universal tendency for young children to believe that the world is flat or flattened.

A number of recent studies have raised doubts about the mental models obtained from the previous research studies. Schoultz, Saljö, and Wyndhamn (2001) used interviews to explore children's conceptions about the shape of the Earth. In their study, researchers reported that even young children have scientific conceptions about the Earth's shape. Additionally in various studies researchers asked children, to select the plastic model representing the Earth's shape (Nobes et al., 2003; Panagiotaki, Nobes & Banerjee, 2006) and to select pictures that represented their view of the Earth (Straatemeier, van der Maas, & Jansen, 2008). In all these studies, researchers have reported that they have found little or no evidence of naïve mental models. Thus, they concluded that children have more knowledge about the Earth than the mental theorists indicated. Obtaining different results directed researchers to think about the instruments used to determine children's conceptions about the shape of the Earth. Siegal, Butterworth and Newcombe (2004) argued that using children's drawings might lead to overrepresentation of a flat Earth concept among children due to the difficulties in drawing a sphere. Moreover they also questioned whether a drawing of a person standing on a flat surface indicated that children believe that the Earth is flat.

Children's cognitive development can be studied by many approaches such as open-ended questions, two-tier diagnostic tests, concept maps, word association tests etc. Children usually experience difficulties in expressing their thoughts and their explanations are easily

affected by the types of questions asked and researcher's attitudes. For these reasons, using these data collection methods bring some deficiencies together. Additional to these tools, using children's drawings to probe their understandings can provide fruitful information about their representational world (White & Gunstone, 2000). Children's drawings have been a focus of research for many decades. Drawings are usually used for cognitive, personality and diagnostic assessment (Knoff & Prout, 1985; Naglieri, 1988). Previous research studies proved that drawings can be used to provide rich data on children's understandings of various science concepts; such as water cycle, groundwater, rivers, mountains, and their alternative conceptions (Bar, 1989; Coates, 2002; Cuthbert, 2000; Edens & Potter, 2003; Golomb, 1992; Hayes, Symington & Martin, 1994; Moline, 1995; Rennie & Jarvis, 1995; Sneider & Pulos, 1983; Stromment, 1995; van Meter, 2001; Vosniadou & Brewer, 1992). Reith (1997) explains that "drawings are believed to reflect the subject's mental representations and conceptual knowledge about the objects they draw. Drawings become more accurate and detailed as children's mental models of the world become more extensive and differentiated." (p. 61). Previous research studies also revealed that using drawings to elicit children's understanding would have some limitations. Chidren's drawing abilities limit what they produce in their drawings. Understanding a concept, or having a scientific knowledge about it, does not necessarily mean children can and they will draw it accurately (Arnold, Sarge & Worrall, 1995). In his study, which is focusing on biodiversity, Strommen (1995) found that children tended to draw multiples of a single type of animal or plant rather than different species, although they knew names of different kinds of animals and plants. Additionally, especially in the early childhood, children's drawings may be misinterpreted by the researchers due to the lack of clarity in the images. Because of these limitations researcher prefer to use interviews in conjunction with drawings. This combined methodology have been used successfully to explore children's ideas about concepts such as technology (Rennie & Jarvis, 1995), water cycle (Dove, Everett & Preece, 1999) and evaporation (Schilling, McGuigan & Qualter, 1993). In the current study, researcher preferred to use this data collection method to overcome the deficiencies that may come up with using either methods alone.

Aim of the Study

Astronomy is an important component of the Turkish science and technology curricula throughout different grade levels. The current curricula include concepts about solar system, movements of the sun, earth and moon, formation of a day and seasons, shape and size of the planet Earth. Understanding the shape of the Earth is a part of the 4th grade Turkish science curriculum. As a part of the science curriculum, students are expected to define the shape of the Earth, give some daily life examples supporting the spherical shape of the Earth and realize that in the history, people have naïve theories about the shape of the world. Turkish children faced with the formal instruction about the shape of the earth for the first time in the fourth grade. Thus, for an effective instruction to occur, it is important to determine children's (pre-) conceptions about the shape of the Earth.

With this respect, the purpose of this paper is to investigate Turkish first grade children's conceptual knowledge about the Earth's shape. The purpose was to understand the nature of children's initial knowledge about the shape of the Earth. The study reported in this paper sought to specifically examine the data gathered from the primary school children with the following research question in mind: How do first-graders conceptualize the shape of the Earth?

Method

Sample

The research was carried out in the fall semester of 2011-2012 academic year. A total of 124 first-graders at five primary schools in an urban area of Turkey have attended the study. The children were between 6 to 8 years old with a mean age 7.4. (sd= 5 months).

Procedure

The data of the study were collected by children's drawings. Drawing is a powerful qualitative tool to determine how children explain and construct ideas and concepts. Not to cause any confusion whether they were required to draw the Earth from the global perspective or the local perspective, the researcher invited children to draw the Earth as if they were watching it from the space and write what is happening. As some of the earlier mentioned litterature have revealed, when children are asked to include people and the sky in their drawings, they experience confusion about the perspective in their drawings. For this reason, the researcher only focused on children's conceptions about the shape of the Earth. The drawings were completed within a requlars lesson which lasted in 40 minutes. Children were asked to work individually and not to perceive the task as a test with right or wrong answers. Children were provided a drawing sheet to work on it and allowed to use any colours of crayons. Since children at these ages may lack adequate writing skills, additional information was gathered by interviewing the children while they were drawing the Earth. This method was preferred as data collection technique to prevent the probability of losing children's considerations during the drawing process. Drawing tasks in combination with an interview provided an opportunity to utilize two methods of determining students' understanding about the shape of the Earth. While they were drawing, children were interviewed in a semi-structured way and the discussions were typed. For the interview, questions are designed according to the child's own interest, but they also focused on the children's understanding of the Earth and their choice of pictorial convention. Sometimes, it was difficult to determine the images children drew on their working sheet. Interview questions were also used to clarify these ambiguous images. Additionally, children were also asked the source of their knowledge. Initial questions in the interviews aimed at understanding what images the children have drawn in their drawings. Follow up questions were used to clarify the responses which are difficult to understand. To elicit further information the children were given the opportunity to tell more about their drawings.

Analyses

Visual and verbal data were analyzed by content analysis techniques (Ball & Smith, 1992; Banks, 2001). Before coding, the researcher overviewed all the drawings and read the transcriptions of interviews to get general ideas and to determine meaningful data units. Then, a list of codes was created by noting all the features included in the drawings and interviews. Throughout the analysis this list was revised as new features were identified. After coding the data, categories were emerged. The codes were compiled into categories; i.e. codes were organized under related categories. The researcher overviewed all the transcripts again to validate the appropriateness of codes and categories emerged. The data obtained from drawings and interviews were read and coded by another researcher; a specialist in primary school education. Inter-rater reliability was calculated as 89%.

Findings

Drawings of Spherical Earth: The largest group of participants (*n* = 51, 41.13%) drew this version of the Earth. In their drawings they usually included a spaceship coming closer to the Earth, some other planets and stars (see Figure 1). They usually included an astronout inside or sometimes outside the spaceship. Children drew the spherical Earth and coloured the surface of it with brown and blue. When children were asked why they have used these colours for the surface, they replied that from the space, the surface of the Earth seems mostly blue, and this colour represents oceans and seas. However, there are also brown areas representing the land where people live on it. Children drawing spherical Earth did not include people in their drawings. When they were asked why they did not draw any people, they replied *"It's not possible to see people living on the Earth from the space"*. In their drawings, although children drew the shape of the Earth as a circle to represent its spherical shape, they drew the stars with a star polygon with five corners. Additionally, some of them drew the Moon in their drawings however in its waxing crescent phase. When the researcher asked the reason of drawing the Moon in that way, children replied that Moon has several phases and it is possible to observe the phases of the moon from the space. Children were also asked about the real shapes of the stars. All of the children including stars in their drawings replied that they don't know the exact shape of the stars. They also replied that in their story books, stars are drawn with a star polygon. And when they look up the sky at night, they can see the sparkling stars. Based on these information they concluded that probably stars do not have a regular shape like the planets have.

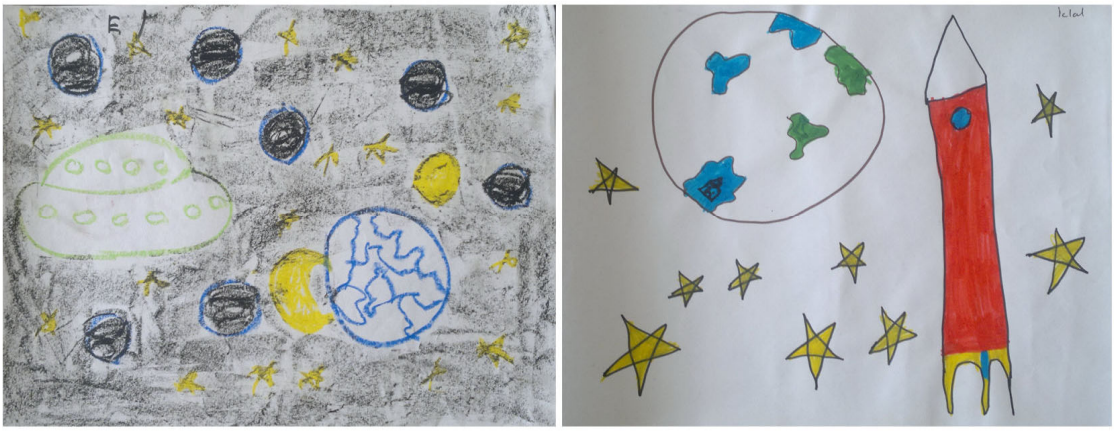

Figure 1. *Example Drawings of Spherical Earth*

Drawings of Flat Earth: Nearly 21% of children; that is 26 of them, drew a flat Earth. They showed one or more people, usually with buildings, mountains or trees. In all of the drawings people stood on a straight line representing that children believe that the Earth's shape is a plane or a disk. All of these pictures were similar to the children's drawings that Vosniadou & Brewer (1990, 1992) have interpreted as indication for flat Earth mental models. All children drawing flat Earth showed evidences of spherical earth during the interviews. First, they were asked about the shape of the earth. All the children replied: *"The earth is round"*. When they were asked why they did not draw a circular shape, children replied that in this way: *"It is not possible to see the people living on the Earth"*. They made comments that in order to show the people, mostly themselves or their families, they had to draw the Earth in this way. Some of the children (11 of them, 8. 87%) commented that although the Earth is round in shape the lands in which people live on are flat. The tendency among this subgroup of participants with regard to their conception of Earth is this: The Earth looks straight and flat when we look

at our surroundings. They also expressed that we can see the Earth's roundness in downhill slopes. This finding is consistent with what Nussbaum (1985:179) found in his studies: Children who said that the Earth was round, but who believed that we lived on a flat Earth, explained the Earth's roundness by saying "The Earth's roundness is just the roads' curves' or 'The Earth's roundness is just the mountains' shapes". These findings shows that children cannot differentiate the astronomical conceptual framework of the planet Earth from the common sense framework of the Earth as nearby surroundings.

Figure 2. *Example Drawings of Flat Earth*

Drawings of Dual Earth: These pictures were drawn by 47 (37.90%) of the participants. In their drawings they drew both the scientific and the flat versions of the Earth. The subsequent interviews revealed that none of them believes in the existence of two Earths; one which we live on and the other which is a planet in the sky. Children were asked the reason for drawing two earths, instead of one. They replied that although they knew that the Earth is round, and there is only one Earth we live on, they also wanted to draw their home places with an Earth representation. The dual Earth pictures show separate views of the same earth, from the two different perspectives.

Figure 3. *Example Drawings of Dual Earth*

Discussion and Conclusion

This paper has presented data and discussed the the views of 124 Turkish first-graders about the planet Earth. Based on the results obtained from the children's drawings, it was able to

identify two alternative models of the earth: the flattened Earth and the dual Earth. Nearly 60% of the participants drew the unconventional scientific version of the Earth. The drawings show some variety among them however, they can easily be grouped into the alternative models of the Earth defended by the mental theorists. These findings are consistent with the results of prior research claiming that children have difficulty in understanding that the Earth is spherical and form various misconceptions regarding its shape (Nussbaum, 1979; Nussbaum & Novak, 1976).

By considering the results obtained from the interviews, however, it can be reported that children have some scientific knowledge about the shape of the Earth. The findings from this study seems to indicate that drawings provide a powerful tool to explore the children's consception of the Earth, but the information one can get from the drawings and the subsequent conversations about the drawings should be interpreted and used very carefully. Moreover, when the children were given the opportunity to give an account for the source of their knowledge about the Earth, Moon and the stars, almost all of the children said that they have seen how the earth is seen from the space on TV - mostly from cartoons and in their story books. Those of the children who represented the stars with a star polygon also replied that in their daily lifes they observe the stars as tiny and shiny dots in the sky. Thus, one may say that cartoons, the story books and the daily life experiences are the reasons for their misconceptions.

Exploring children's misconceptions about the nature and natural phonemenons and the sources of their knowledge may strengthen the teachers' effords to improve their teaching practices with regard to science concepts. For meaningful learning to take place, teachers should consider what knowledge the learner already possesses (Gunstone, 1990). Knowing children's (pre-) conceptions will provide the teachers information about the children's mental models that they have constructed before the instruction. By this way it will be possible to create instructional methods, strategies and aids that may help the students to change the wrong mental models and construct meaningful and useful ones. To understand the natural world, children should be provided conditions for developing positive experiences, imagination, increased sense of wonder, creativity and observation skills. Science educators, should create such learning environments in which the children meet challenges that can encourage them to activate and evaluate what they already know in the light of scientific knowledge that they encounter in the school. By this way it will be possible to promote a conceptual development which is consistent with our existing scientific knowledge about the nature.

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International Electronic Journal of Elementary Education, 2012, 4(2), 417-426.

Using Cover, Copy, and Compare Spelling With and Without Timing for Elementary Students with Behavior Disorders

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Received: December 2011 / Revised: February 2012 / Accepted: March 2012

Abstract
The purpose of this study was to determine the effectiveness of cover, copy, and compare (CCC) procedures on spelling performance with two students. The participants were two elementary students enrolled in a self-contained behavior intervention classroom. A multiple baseline design across participants was employed to evaluate the effects of CCC on time to completion and words spelled correctly. Improvements in all measures were found when CCC was in effect. The participants enjoyed the procedures and each improved their spelling over baseline performance. The applicability of CCC across academic contexts and for students with behavior disorders was discussed.

Keywords: elementary students with severe behavior disorders, spelling, core words, timing, cover, copy, and compare, single case research designs

Introduction

Spelling remains an important skill to teach in the schools (Graham, Harris, Fink-Chorzempa, & Adkins, 2004; McLaughlin, Weber, & Barretto, 2004). As described by Wanzek, Vaughn, Wexler, Swanson, Edmonds, and Kim (2006), spelling requires the learner to match the sounds of language with the appropriate letters in right order to correctly and reliably convey messages in text. Effective spelling can heighten decoding skills and spelling-sound knowledge. Spelling skills can further improve instruction in alphabetic understanding as well as reading (Graham, Harris, & Fink-Chorzempa, 2002). As discussed in Santoro, Coyne,

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ISSN:1307-9298

www.iejee.com

and Simmons (2006), the literature suggests that the actual process of spelling involves the critical integration of phonological and alphabetic skills required during reading acquisition.

Several procedures have been found to be effective for improving skills in spelling (McLaughlin et al., 2004). As noted by Wanzek et al. (2006), the use of computer-assisted instruction can produce improved spelling of words in context. Using a computer cannot only increase the motivation of a student, but it allows for direct and personalized instruction, specifically for students with LD. Computer based instruction (CBI) was evaluated by Mayfield, Glenn, and Vollmer (2008) as a method to teach spelling to two 6th graders. A voice recording of each word was presented as a prompt for the students to type the word. CBI training procedure was used for error correction; which consisted of prompt fading, systematic review of errors and practice. Their results indicated a need for several 15-minute training sessions to occur in order for each participant to score 100% for each word set. However data for maintenance phase resulted in an average performance of 93% across all word sets. These overall results helped establish the effectiveness of a computerized spelling program for average learners. Spell checkers are part of most word processing programs. With the use of such features, some may view spelling as no longer an important skill. Unfortunately, spell check programs are not all that accurate in finding and correcting spelling errors in composition (Wissick, 2005).

Class-wide peer tutoring (CWPT) review and practice procedures have been implemented to improve the spelling skills with both students with disabilities and students at-risk for school failure (Swanson & Greenwood, 1996). Karagiannakis (2008) evaluated the use of CWPT with a group of 40 boys, some with behavior problems. She reported that the CWPT procedure had a positive impact, not only with subject matter areas in academics, but also the participants' self-concept, social status, and on-task behavior. Results of this research showed significant academic improvements, as well as gains in social functioning with CWPT.

Cover, copy, and compare (CCC) is a strategy that has been used to improve accuracy and fluency, as well as demonstrating maintenance across students, academic skill domains, and settings (McLaughlin & Skinner, 1996; Skinner, McLaughlin, & Logan 1997). Skinner et al. defined the steps of CCC as: (1) looking at the academic stimulus, (2) covering the stimulus, (3) responding by copying the stimulus, and (4) evaluating the responses by comparing it to the original stimulus. Cates, Dunne, Erkfritz, Kivisto, Lee, and Wierzbicki, (2007) assessed the effects of a CCC procedure and a constant time delay procedure on the acquisition, subsequent maintenance, and adaptation of acquired spelling words to oral reading passages. The results of Cates et al. suggested that the combined use of CCC and time delay was effective; however the CCC procedure resulted in higher levels of maintenance for some of their participants. Cieslar, McLaughlin, and Derby (2008) evaluated the effects of (CCC) procedure to improve both spelling and math performance with a freshman with behavior disorders enrolled in a special education classroom setting. A functional relationship between their procedure and an increase in both mathematics and spelling performance was found. Carter, McLaughlin, Derby, Schuler, and Everman (2011) implemented CCC in a self-contained classroom for high school students with severe behavior disorders. The effects of CCC were evaluated with combination multiple baseline and reversal design. They found that CCC was effective to increase the spelling accuracy of the 240 commonly used words. The return to baseline did not decrease the spelling performance for two of their three remaining participants. The subsequent replication of the CCC procedures maintained high student spelling performance. Stading, Williams, and McLaughlin (1996) evaluated the effects of CCC on the mastery of multiplication facts with a third grade girl with learning disability in a home setting. Their results indicated CCC was successful in improving

multiplication skills in a home setting. Lastly, Skinner, Belfiore, and Pierce (1992) assessed the effect of CCC with behavior disorder students. The results of their research suggested that the CCC procedure was an effective method in increasing the geography accuracy of students with behavior disorders.

The use of timing has been suggested as a way to improve the academic fluency of students. Typically, a teacher or student uses some device to monitor the time required to complete an assignment or task. These data are then entered on a data form or graphed. Van Houten and colleagues (Van Houten, Hill, & Parson, 1975; Van Houten & Thompson, 1976) were able to improve student performance with timing, public posting of results, and feedback. This was accomplished with little additional classroom resources (Van Houten et al., 1975). Other educational researchers have also supported the use of timing to improve student academic performance. Simply informing students their performance will be timed can improve student performance (Van Houten et al., 1975; Rhymer, Dittmer, Skinner, & Jackson, 2000). Finally, timing can improve student performance without the use of feedback, public posting, or consequences (Miller, Hall, & Heward, 1995; Rhymer et al., 2000; Rhymer, Henington, Skinner, & Looby, 1999; Rhymer, Skinner, Henington, D'Reaux, & Sims, 1998; Skinner, Fletcher, & Henington, 1996). Often students with behavior disorders are slow to complete tasks, and maybe addition of some form of timing could increase their time to completion.

The purposes of the present research were three-fold. First, we wanted to extend and replicate the use of CCC to elementary students with severe behavior disorders. Second, we wanted to increase the accuracy of our participants to spell words thought to be important for each grade level in the school district in which they were enrolled. Third, we wanted to examine the effects of timing on an academic task. We did so by measured by time to complete the spelling task with one of our participants.

Method

Participants and Setting

The master teacher and the first author selected the two participants. They were chosen because of their spelling errors on written assignments. Participant 1 had been enrolled in special education since preschool. He was a 6th grader at the time of the study and had been placed in a behavior instruction special education classroom since 1st grade. This participant had an IEP for all academic areas, for behavior, and for speech. He had been diagnosed with having apraxia and received 1 hour of speech per week at school and also 1 hour per week outside of school. Based on the *Woodcock Johnson Tests of Achievement (WJ III)* (Woodcock, McGrew, & Mather, 2008). Participant 1 read at approximately a 1st grade 8-month level. He was in the process of mainstreaming into his regular education class at the time of the study.

Participant 2 had an IEP goal for behavior and also for the academic area of writing. He was in the 3rd grade at the time of the study and had been in the behavior intervention special education classroom for 3 years. Based on standardized testing (Woodcock et al., 2008), Participant 2 read at approximately a 2nd grade 6-month level. While Participant 2 needed additional instruction with spelling and he also is a slow worker. The first author and classroom staff wanted to decrease the amount of time it took him to complete his spelling tasks. It was also a goal to have this reduction in time to completion generalize to taking less time to independently complete his the CCC sheet.

Both participants in this study were enrolled in the same self-contained special education classroom. This elementary school was located in a low-socioeconomic area in a large urban city in the Pacific Northwest. There was an average of 10 students enrolled in the classroom.

The academic performance of the class ranged from the 2nd to 6th grade level in reading, math, and written communication. Most students left the classroom at various times during the day to attend other classes such as band, PE, and library. There were two certified teachers in the classroom and three qualified instructional aides as well as the first author. She was a full-time student teacher in the classroom at the time of the study. Instructional formats included individual time, small group, and whole group. The first author worked with the participants at various times during the school day. Participant 1, whom had mainstreamed into his regular education classroom, was typically taught spelling in the afternoons on Tuesdays and Thursdays. Participant 2 was taught spelling prior to or toward the end of reading time, which occurred in the morning just before lunch. Spelling sessions lasted anywhere from 15 to 40 minutes. Other students as well as two or three adults were present in the room when data collection took place.

Materials

A variety of materials were utilized during the study. These included two pieces of blank lined paper for the pre-test and post-test, a CCC table on a sheet of printer paper, a list of core words each for grades 1 and 3, a timer for measuring time to completion, and preferred rewards such as candy, chips, or a granola bar.

Dependent Variables and Measurement

The dependent variable measured in this study was the number of words spelled correct on pre- and posttests. For Participant 2, an additional dependent variable was measured, that of time to completion. This was defined as the time it took to complete his spelling tasks. The participant was timed during the pre-test and if he decreased his time during the posttest, he would earn a reward. His reward was a piece of candy from a bag. All sessions were scored using a list of all the words. Corrects were marked with a + sign in the column next the word if they correctly spelled that word, a – sign was used to indicate a word had been misspelled. The date for each column of data points was written at the top of the end column.

Experimental Design and Procedure

A single case multiple baseline design across participants (Kazdin, 2010) was used to evaluate the effectiveness of the CCC procedure on spelling core words.

Baseline. During baseline, each participant was administered a spelling test using 10 core words taken from the grade level core word list appropriate for that student based on his current level determined by standardized achievement scores. Baseline data were taken for three days for Participant 1, and two days for Participant 2. During these sessions, each participant was given a piece of lined paper with the numbers 1 through 10 printed in the left margin. The researcher orally administered each participant his 10 words chosen of the core word list. No feedback was provided to the participants during baseline. Beginning at Session 6, the time to completion baseline for Participant 2 was taken.

CCC. After baseline, the CCC procedure was implemented. During the first session, each participant was given a pretest using the same words given during the baseline sessions. Beginning on Session 6, Participant 2 was timed during the pretest and told if he decreased his time to complete his the posttest, he would earn an award. After the pretest the participant was provided with a CCC worksheet. The student read the first word in the first column; next they copied the word into the next column. After the participant copied the word it was covered using a blank sheet of paper. Next, each participant wrote this word from memory in the CCC column. Once they finished writing the word, the blank sheet of paper was removed and the participant compared the spelling of the word they wrote from

memory to the word given in the first column. If they misspelled the word, they were required to write the correct spelling in the final column provided. After this error correction procedure, they moved to the next word. This condition was in effect for 11 to 17 sessions.

Interobserver Agreement

Interobserver agreement was collected using a blank data-scoring sheet that was identical to the primary data sheet. Either the master teacher or an instructional aide was given the spelling tests to be checked. The same scoring procedure using the + or – signs was employed. These spelling tests scores were masked. This allowed the scoring to be independent each time reliability of measurement was taken. Reliability was taken for 50% of the total amount of sessions performed with Participant 1 and for 53% of the total amount of sessions performed with Participant 2. The agreement quotient was computed by dividing the number of agreements by the number agreements plus disagreements multiplied by 100. The mean agreement was 96% for Participant 1 with a range of 90 to 100%. The mean agreement for participant 2 was 96% with a range of 70 to 100%. Two adults in the classroom independently but simultaneously recorded the amount of time required for Participant 2 to complete his posttest. The smaller number of seconds was divided by the larger and multiplied by 100. Overall agreement for time to completion ranged from 98 to 100% with an overall mean of 99%.

Results

Participant 1

Accuracy in baseline for Participant 1 was low (*M* = 15%; range 10 to 20%). With the implementation of the CCC procedure, Participant 1 increased his performance by correctly spelling seven words on his first posttest.

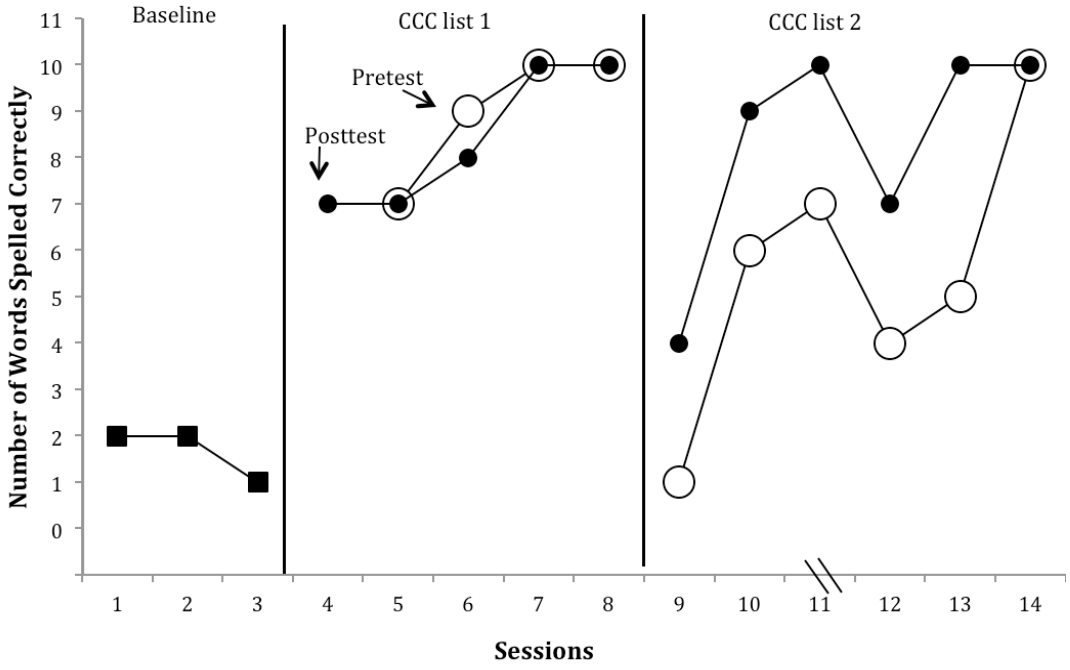

Figure 1. The number of words spelled correctly during, baseline, cover, copy, and compare for Participant 1. Open circles are weekly pretest scores and closed circles are posttest scores.

The last baseline data was used as a pretest prior to the CCC procedure being implemented. Therefore the first data point during the CCC procedure was used as a posttest score. Participant 1 continued to increase the number of words he spelled correctly. Once the participant had correctly spelled all 10 of the words for two consecutive posttests, a new list from his core word list was created. When List two was first introduced (Session 9), his number of correct words decreased to near baseline levels. However, after the CCC procedure he steadily increased his performance. Between Sessions 11 and 12 there was a no instruction for approximately 15 days. Due to this loss of instructional time, our participants performed at lower levels than they had prior to the break. After the first session of CCC following the break, the participant steadily increased his amount of words spelled correctly and within a couple sessions had mastered the second word list. Due to the student correctly spelling all 10 words on two consecutive posttests, the researcher finished data collection for Participant 1.

Participant 2

In baseline the mean percent correct was low (*M* = 25; range 20 to 30%). When the CCC

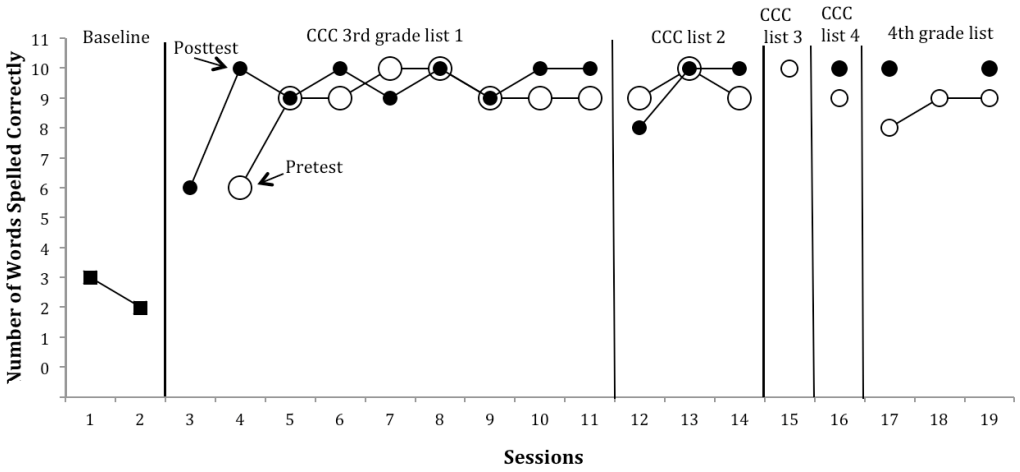

Figure 2. The number of words spelled correctly during, baseline, cover, copy, and compare with Participant 2. Open circles are weekly pretest scores and closed circles are posttest scores.

was implemented, the number of correctly spelled words increased. Again, the first data point during the CCC procedure was taken as a posttest since his last baseline point was used for the pretest. After the first CCC session, the participant had doubled the number of words spelled correctly. During session 4 the participant had scored the same on his pretest has he had done on the last posttest but after the CCC procedure he was able to spell all 10 words correctly. For the remainder of the sessions, Participant 2 continued to spell 80 to 100% of the words correctly. Overall his data was stable but it was not until the 10th and 11th sessions that he scored a 10 consecutively on the posttests. After this, the researcher constructed a second list to use with the same core word list. The participant scored a 9 on the pretest and an 8 on the posttest with this new list of words. This list was only used for two more sessions due to the participant correctly spelling all the words on both posttests. A third list was then constructed from the same core word list. The participant correctly spelled all 10 words on the pretest; therefore the researcher did not implement that CCC procedure or give the posttest for this list. A fourth list was then developed with all new words from the core word list. The participant correctly spelled 9 words on the pretest and 10 words on his posttest. Because the participant's performance with these core words, it was decided to use core word list for the next grade level. The final list used was comprised

using the 4th grade core word list. The participant correctly spelled 8 words on the pretest with this list and 10 on the posttest. Two more sessions were conducted using this list of words. Our participant had mastered this list in just two sessions. Data collection ended for Participant 2 when the first author's student teaching was completed.

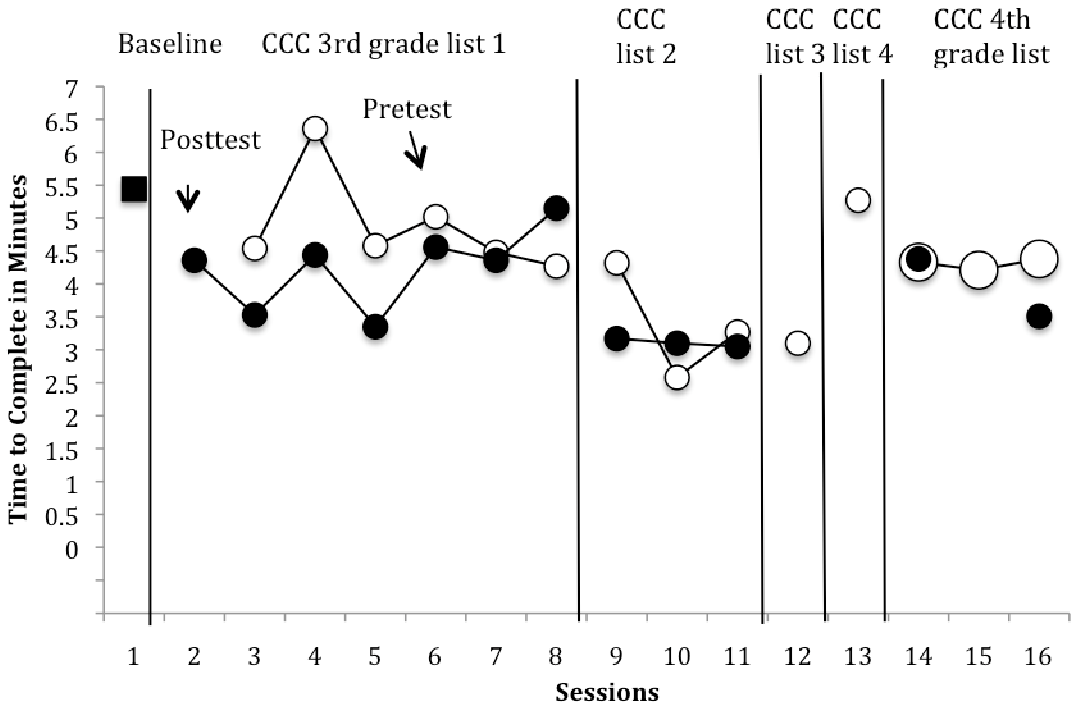

Figure 3. The amount of time in minutes (speed) required for Participant 2 to complete his pre- and post-testing.

For Participant 2, time to completion was assessed beginning on Session 6. A decrease in total amount of time it took to complete his posttest was found. However, his pretest only slightly increased from that recorded in baseline, which was less than 6 minutes. The average time spent on his pretests was 4 minutes and 41 seconds. The average time spent on his posttests was approximately 3.91 minutes. His time to completion for his pretests remained stable, while his posttest timings showed a decreasing trend.

Discussion

The overall results of this study indicated that using the CCC procedure for spelling improved the accuracy of spelling for two students placed in a behavior instruction classroom. Their performance steadily improved with use of CCC. The present outcomes replicate previous research using CCC for students with behavior disorders (Cater et al., 2011; Cieslar et al., 2008; Skinner et al., 1994) and that reported with students with other disabilities (Cates et al., 2007; Murphy et al., 1994). In the present investigation, the researcher was able to effectively employ CCC in an elementary special education classroom for students with severe behavior disorders.

Although the participants were both successful in using the CCC, their performance varied widely. It can be assumed that Participant 1 had less stable data because of the amount of time he spent in the general education classroom. Participant 1 spent less time working with the first author and had a considerable length of time where he was unable to practice his spelling words because his was not in the special education classroom. Participant 1 appeared to be affected by his apraxia. This made it much more difficult for him to sound

out his words as he was trying to spell them. Knowing this, the first author spent considerably more amount of time in spelling with Participant 1 than Participant 2. Even when the first author spent more time with him, his apraxia still affected his outcomes.

Participant 2 successfully increased the number of words he spelled correctly, but did not make large gains in decreasing the time he took him to complete his tests. While the reward was a motivation for the participant, he also had to be reminded when taking his tests that he was wasting time with such behaviors as erasing letters to make them more eligible, or repeating the word over to himself out loud instead of writing the word at the same time. Participant 2 seemed to have difficulty verbally spelling the word as he wrote it. Often, he would say the correct letter, but write a different letter. He would have to erase his error and begin to spell the word again. Participant 2 completed 19 sessions and was able to master four lists of words from the 3rd grade core word list and 1 list from the 4th grade core word list. These results suggest the CCC procedure was effective in improving the spelling for this student.

There were limitations in present investigation. These included, the amount of time available to work with Participant 1. Since he was being mainstreamed out of the behavior intervention classroom, the first author had less available time to work with him. Using a participant from the classroom that remained full time in the self-contained classroom would have avoided any long breaks in between sessions. For Participant 2, the study helped to increase his spelling skills, but the sessions often took away time from his reading instruction. While Participant 2 was in the classroom for a considerable amount of the day, due to his slow working habits, the first author had to determine times when she would be able to work for a longer periods of time with him. Another possible limitation was the amount of time preparing and scoring both the tests and each of the participant's CCC sheet. Since the participants had anywhere from 2-5 lists of words throughout the study, it required the researcher writing in the words on the CCC sheet and also developing several data sheets for both primary and reliability data collection. One way to improve the time spent on preparation would be to develop several lists of words prior to beginning the CCC procedure. When a participant mastered one list, the next list would already be generated and available for implementation and use.

The cost of this study was minimal due to the fact most of the materials were already available in the classroom. The first author only had to provide the preferred item as rewards for Participant 2. The cost of the reward was quite low when one considers its effects on his performance. Both participants appeared to enjoy the procedures and did present in any behavioral issues during them. They each enjoyed sharing their success with their classroom teachers. Participant 2 even asked to be able to take home his results to show his mother how well he was improving in his spelling skills.

The implications of the present research are several. First, a classroom teacher can implement CCC in their classroom. Second, data collection and analysis can occur within a typical teaching environment. As we accomplished for Participant 2, we were able to add an additional contingency and evaluate its effects during ongoing our classroom research. Third, it appears that CCC should be considered as an intervention that can be an easily implemented self-tutoring or self-management strategy in either a special education or general education classroom setting. Finally, CCC was again shown to be an effective academic intervention in an elementary classroom. This replicates much of our classroom research (Carter et al., 2011; Cieslar et al., 2010; Membrey McLaughlin, Derby, & Antcliff, 2011; Murphy et al., 1990; Skarr, McLaughlin, Derby, Meade, & Williams, in press; Stading et al., 1996) and that of other researchers (Cates et al., 2009; Skinner et al., 1992, 1996).

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