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Full Length Research Paper

Parents-perceived and self-perceived anxiety in children with autism spectrum disorder

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Autism spectrum disorders (ASD) are characterized by a series of deficits in social interaction and communication and restricted, repetitive, and stereotyped behavior patterns. In addition, a high percentage of ADS is associated with anxiety disorders. The goal of this study is to assess the perception of anxiety in a group of children and adolescents with ASD and the anxiety their parents think their children have, through the Screen for Child Anxiety Related Emotional Disorder (SCARED). Participants were 38 children and 38 parents, one for each child or adolescent. The results indicate that parental perception of anxiety is always higher than that of their children in all factors, and this difference is significant in the factors of generalized anxiety, social phobia, and anxiety in general. The correlations between the children and parents' scores were high and significant in the factors of generalized anxiety, separation anxiety, and social phobia. The size of the sample and the lack of girls are mentioned as a limitation of the study.

Key words: Autism spectrum disorder, anxiety, inter-evaluator agreement, self-report.

INTRODUCTION

It is well known that children with developmental disorders have a higher risk of presenting symptoms of anxiety than typically developing children. White et al. (2009) performed a review, finding that between 11 and 84% of young people with ASD presented some deterioration due to symptoms of anxiety. This disparity of results is probably due to differences in sample size and the anxiety measurement employed. *The Statistical Manual for Mental Disorders-fifth edition* (DSM-5; American Psychiatric Association [APA], 2013) includes social anxiety as one of the characteristics of ASD. Recent research has shown that children with ASD often have clinically significant symptoms of anxiety (van Steensel et al., 2011). These authors estimated that 16.6% of persons with ASD under 18 years of age present anxiety, and between 30 and 50% are diagnosed with at least one anxiety disorder. They also showed that the most common anxiety disorder was specific phobia (30%), followed by obsessive-compulsive disorder (17%), social anxiety (17%), and generalized anxiety (15%). Costello et al. (2005) suggest that children with ASD are twice as likely to suffer from anxiety as typically developing children.

Few studies have used the information gathered through parents' reports of the anxiety that their children suffer. Thus, Magiati et al. (2014), using the Spence

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Children's Anxiety Scale - Parent Version (SCAS-P; Spence, 1997) and the Child Self-Report (SCAS-C, Spence, 1998), found agreement between caregivers and children about the anxiety symptoms displayed by the latter. Similar results were found in several studies (Li et al., 2011; Nauta et al., 2004; Whiteside and Brown, 2008) performed in Australia, Hong Kong, and the United States, using the same instrument, with normally developing young people with and without anxiety disorders. They are also consistent with those obtained by Blakeley-Smith et al. (2012) using the SCARED in samples of youth with ASD.

However, other studies (Renno and Wood, 2013) report that the agreement between parents' reports and the self-reports of their children with ASD tend to be fairly weak compared to normal population with anxiety (van Steensel et al., 2012). These authors also conclude that parents tend to report higher anxiety than their children do (Castro et al., 2015). The results seem to vary depending on the instrument used to measure anxiety. In a thorough review of the research in the past 23 years on anxiety in children and adolescents with ASD, Kreiser and White (2014) confirm that the measures used to evaluate anxiety in ASD have shown internal consistency.

Although significant differences in age and gender have been found in typically developing children with regard to anxiety disorders (Costello et al., 2005), these variables have rarely been examined in population with ASD. The results are contradictory because some studies indicate higher anxiety symptoms in older children compared with young children (Lecavalier, 2006), whereas others have not found them (Meyer et al., 2006). The types of anxiety disorder and their severity were found to be similar in children with ASD and in anxious children, but specific phobias were more frequent among children with ASD. In both groups, the children scored lower on separation anxiety disorder than their parents reported (van Steensel et al., 2012). In general, young people with ASD have difficulties to reflect on themselves and to identify and express their emotions (Baron-Cohen, 2002; Baron-Cohen et al., 1985; Losh and Capps, 2006; Quay and LaGreca, 1986) and therefore, researchers are reluctant to rely on young people's self-reports to meaningfully identify anxiety symptoms (Bellini, 2006; Chalfant et al., 2007; Reaven et al., 2009; Sofronoff et al., 2005; Wood et al., 2009). Some authors even advice caution because they found discrepancies between children's self-reports and reports issued by the parents in interviews (Mazefsky et al., 2011). Studies relating cognitive ability and anxiety in ASD have mostly focused on only children with "high functioning" autism, or on Asperger syndrome (White et al., 2009). Brereton et al. (2002) concluded that children with high functioning autism and Asperger syndrome have increased risk of developing symptoms of anxiety than those with a low performance level. In several studies, it was concluded that there were more anxiety symptoms in high functioning children than in children with an IQ below 70 (Mazurek and Kanne, 2010; Sukhodolsky et al., 2008; Weisbrot et al., 2005). However, according to the meta-analysis of van Steensel et al. (2011), anxiety disorders were more common in participants with a lower IQ. These inconsistent findings regarding anxiety and IQ may be attributable to the problems posed by the assessment of anxiety in children with low intellectual functioning (Hallett et al., 2013). According to these authors, people with an IQ of 70 or higher score significantly higher in anxiety than people with intellectual disabilities, suggesting that, even taking into account the more visible aspects of anxiety, children with high intellectual functioning present more anxiety than children with a lower IQ.

Given that undiagnosed or misdiagnosed anxiety disorders can increase anxiety symptomatology and thereby affect children's daily lives, producing important deterioration, interest in the assessment of symptoms of anxiety in children with ASD is growing (Merlo et al., 2005). In terms of intervention, cognitive-behavioral treatment has reduced anxiety (Reaven et al., 2009). These results are promising, especially given high rates of comorbidity between ASD and anxiety (Attwood, 2005; Bellini, 2004). They are also consistent with the results of other studies that are beginning to show the applicability of these techniques in people with ASD (Attwood, 2005; Chalfant et al., 2007; Sofronoff et al., 2005; Sze and Wood, 2007).

METHOD

Participants

The inclusion criteria for the study were: a) chronological age between 7 and 18 years; (b) confirmed diagnosis of ASD through the Autism Diagnosis Interview Revised (ADIR) (Rutter et al., 2003/2006) and the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 1999/2008); (c) language and speech assessed by means of the ADOS, Modules 3 and 4; and d) verbal IQ equal to or above 70 measured with the Wechsler Intelligence Scales -IV (Weschler, 1974/2005).

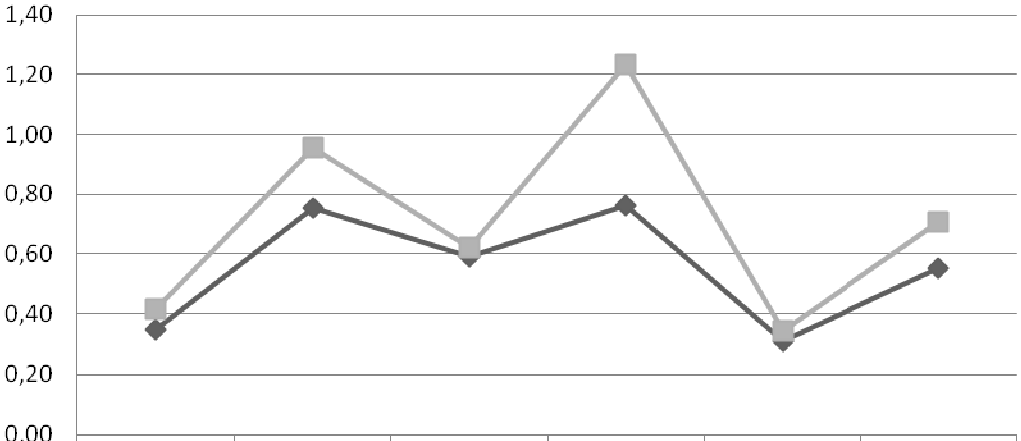
Participants were 38 children who met these inclusion criteria, of whom 36 are boys and 2 are girls (Table 1). The mean age is 12.15 years (*SD* = 2.86, age range 8 to 17). One parent of each child participated, 38 in total, 22 fathers and 16 mothers. The parents' mean age was 45.74 years (*SD* = 5.25, age range of 37 to 58).

Instrument

The SCARED in its 41-item version (Birmaher et al., 1999) is a self-report developed to assess a wide range of symptoms of anxiety in children from the general population, according to the *DSM-IV-TR* (APA, 2000). It is considered to be one of the best tools to discriminate anxiety from other disorders (Silverman and Ollendick, 2005). It was selected because it is short (41 items), there had been several prior versions that were improved, and it is completed on a Likert-type response format—which matches the learning style of people with ASD—, and there were psychometric data of its properties (Blakeley-Smith et al., 2012). It was adapted to the Spanish population by Domènech-Llabería (2002). In most

Table 1. Distribution of participants.

Participants	Mean age	Gender	*N*	%
Children	12.15	Boys	36	94.7
		Girls	2	5.3
Parents	45.74	Fathers	22	57.9



	Panic/ somatic (PN)	Generalized anxiety (GD)	Separation anxiety (SP)	Social phobia (SC)	School phobia (SH)	TOTAL
Children	0,35	0,75	0,59	0,76	0,31	0,55
Parents	0,42	0,96	0,62	1,23	0,34	0,71

Figure 1. Means by factors as a function of participants.

adaptations, an internal five-factor structure was found, like the original version, with good convergent and divergent validity (Birmaher et al., 1999): Panic/Somatic, Generalized Anxiety, Separation Anxiety, Social Phobia, and School Phobia. In all the studies, the psychometric properties of the four scales related to the anxiety disorders of the *DSM-IV-TR* are high (Hale et al., 2011), but School Phobia produces controversial results (Doval et al., 2011). The parent-child versions are identical in content, differing only in the use of the phrase "your child". Lecavalier et al. (2014) found partial support in their study for the use of the SCARED as a measure of anxiety in high-functioning children with ASD. According to Stern et al. (2014), it is a valid and clinically useful tool to assess anxiety in children and adolescents and the outcome of their subsequent treatment. Each item rates the frequency of each symptom over the past three months on a scale ranging from 0 to 2 points. The total score ranges from 0 to 82. A total score greater than 25 indicates clinically significant anxiety.

Design and procedure

Information was collected in two ways. The families were invited to participate in a briefing of the Asperger Association of the Canary Islands (ASPERCAN) about the study to be carried out, where they signed their consent. The SCARED for parents and children was distributed, to be filled in separately. We also visited a Medical Center specializing in ASD and informed the families, one by one, of the study, distributing the questionnaires and the informed consent form. In both cases, the families handed in questionnaires after a few days.

RESULTS

Figure 1 shows the mean scores (transferred to a single scale ranging from 0 to 2) of each of the factors of the SCARED, grouped by participants. As observed, the lines representing each group of participants are parallel, with the parents' perception of anxiety always being higher than that of their children.

We calculated symptom prevalence from the cut-off points for each factor and for the total score (Table 2). In the Total Anxiety factor, 34.2% of the children were above the cut-off point (≥ 25) compared with 68.4% of the parents. The Panic/Somatic factor showed that 23.7% of the children and 36.8% of the parents were above the cut-off point (≥ 7). In the Generalized Anxiety factor, 31.6% of the children and 52.6% of the parents were above the cut-off point (≥ 9). In Separation Anxiety, one half of the children and one half of the parents were both above the cut-off point (≥ 5). In Social Phobia, 26.3% of the children and 65.8% of the parents were above the

Table 2. Percentage of participants above the cut-off point of each factor.

SCARED factors	Children%	Parents%
Panic/somatic (PN)	23.7	36.8
Generalized anxiety (GAD)	31.6	52.6
Separation anxiety (SP)	50.0	50.0
Social phobia (SC)	26.3	65.8
School phobia (SH)	13.2	26.3
Total	34.2	68.4

Table 3. Mean difference between children and parents by factors.

SCARED factors	Children	Parents	*t*	*p*
Panic/somatic (PN)	4.50	5.42	-.965	.341
Generalized anxiety (GAD)	6.79	8.61	-2.531	.016
Separation anxiety (SP)	4.74	4.97	-.470	.641
Social phobia (SC)	5.34	8.63	-4.923	.000
School phobia (SH)	1.24	1.37	-.360	.721
Total	22.61	29.00	-2.511	.017

cut-off point (≥ 8). Lastly, in School Phobia, 13.2% of the children and 26.3% of the parents were above the cut-off point (≥ 3). Table 3 shows the mean difference between the children and parents. The differences in the Total Anxiety score were significant ($p < .017$). The parents obtained a total mean score of 29.00 versus the children's total mean score of 22.61. There were also a significant differences between children and parents in the factor of Generalized Anxiety ($p < .016$), where the parents obtained a mean score of 8.61 versus the children's mean score of 6.79, and in Social Phobia ($p < .000$), where the parents obtained a mean score of 8.63 versus the children's mean score of 5.34. In the remaining factors, no significant differences were found, although the parents' perception of anxiety was always higher than that of their children.

Analysis of the correlations between factors (Table 4) revealed differences in the number of significant correlations as a function of the type of participant (children or parents).

The Panic/Somatic factor had significant correlations with the rest of the factors, especially in the children, where the correlations ranged from $r = .581$ with Generalized Anxiety to $r = .484$ with School Phobia. In the case of parents, the correlations ranged from $r = .620$ with Separation Anxiety to $r = .293$ with Social Phobia. In addition to the above-mentioned correlation with the panic/somatic factor, generalized anxiety had significant correlations with the remaining factors both in children and parents. In the case of the children, the correlations ranged from $r = .660$ with Separation Anxiety to $r = .246$ with school phobia. In the case of the parents, the correlations ranged from $r = .319$ with Social Phobia to $r = .074$ with School Phobia.

Separation anxiety significantly correlated with social phobia and school phobia both in children and parents, in addition to its association with Panic/somatic and Generalized Anxiety. In the specific case of children, the correlations varied from $r = .422$ with social anxiety to $r = .234$ with school phobia. In the case of parents, the correlations varied from $r = .418$ with school phobia to $r = .254$ with social phobia.

Lastly, social phobia had significant correlations with school phobia in children ($r = .336$), besides with the aforementioned factors. In the case of the parents' reports, no correlations between this factor and school phobia was found ($r =. 166$)

Table 5 shows the correlations between the factors assessed by the SCARED and the participants' age. Although there was only one significant correlation, it can be observed that both in children and parents, the scores on the different factors correlated slightly and positively with age (except for one factor), such that higher age corresponded to more perception of anxiety, and vice versa. The only significant age-related correlation was with the Panic/Somatic factor ($r =. 405$) in children.

Lastly, Table 6 presents the correlation in each factor between parents and children. The correlation was high and significant in the factors of Generalized Anxiety ($r = .547$), Separation Anxiety ($r = .560$), and Social Phobia ($r = .484$). The correlation was positive but nonsignificant in the Panic/Somatic factor ($r = .179$) and the Total factor ($r = .319$). There was no correlation in School Phobia ($r = .007$).

DISCUSSION AND CONCLUSION

Given that the prevalence of anxiety in children with ASD is now recognized as a major public health problem (Simonoff et al., 2008), additional information about the assessment of these symptoms is needed. This study represents an important step in the consideration of self-reports of children with ASD and for the analysis of the possible agreement between parents and their children regarding perception of anxiety symptoms. The results of this study suggest that such parent-child agreement is limited. In all the factors, the anxiety levels perceived by the parents in their children are higher than those manifested by the children themselves. These differences were significant in the total score of Anxiety, the Generalized Anxiety factor, and the factor of Social Phobia. In the remaining factors, no significant differences were found, although the parents' perception of anxiety was always higher than that of their children. Based on the cut-off points for each factor, the prevalence of symptoms shows that in all the factors, the percentage of parents above the cut-off point is always greater than the percentage of children above this point except for the

Table 4. Correlations between the SCARED factors by participants and gender.

		Generalized anxiety (GAD)	Separation anxiety (SP)	Social phobia (SC)	School phobia (SH)
Children	Panic/somatic (PN)	.581**	.536**	.525**	.484**
Parents		.315	.620**	.293	.573**
Children	Generalized anxiety (GAD)		.492**	.660**	.246
Parents			.309	.319	.074
Children	Separation Anxiety (SP)			.422**	.234
Parents				.254	.418**
Children	Social Phobia (SC)				.336*
Parents					.166

*$p < .05$ (two-tailed). **$p < .01$ (two-tailed).

Table 5. Correlations between SCARED factors and the participants' age and gender.

		Panic/Somatic (PN)	Generalized Anxiety (GAD)	Separation Anxiety (SP)	Social Phobia (SC)	School Phobia (SH)	Total
Children	Age	.405**	.267	.018	.273	.069	.312
Parents		.002	.223	-.102	.117	.091	.100

**$p < .01$ (two-tailed).

Table 6. Correlations between children's and parents' factors of the SCARED.

SCARED factors	Parents-children correlation	*p*
Panic/Somatic (PN)	.179	.281
Generalized Anxiety (GAD)	.547	.000
Separation Anxiety (SP)	.560	.000
Social Phobia (SC)	.484	.002
School Phobia (SH)	.007	.965
Total	.319	.051

factor of Separation Anxiety which has the same percentages. There are notable differences in the factors of Social Phobia and Total Anxiety, where the percentage of parents above the cut-off point is twice that of the children above this cutoff point. Although parent-child agreement tends to be lower in the group of ASD, the correlations were nonsignificant in the group of children with anxiety disorders (van Steensel et al., 2012). These findings support the notion of Reaven et al. (2012) that the potential problems associated with the use of self-reports in children with ASD may be the same as those of samples without ASD. In our study, the correlations between children and parents' scores are high and significant in the factors of Generalized Anxiety, Separation Anxiety, and Social Phobia. The correlation is positive but nonsignificant in the Panic/Somatic factor and the Total Anxiety factor. There is no correlation between parents and children in the School Phobia factor. This study has several limitations that must be taken into account. First, little is known about the psychometric properties of anxiety measured in samples of children with ASD (White and Roberson-Nay, 2009). It is not yet clear whether anxiety measures designed for typical populations are reliable for all children with ASD, and hence, more studies are necessary. Generalization of the results of this study is limited by the relatively small sample, and because the girls are in a minority, even for people with ASD. However, we could justify the size and sex of the sample because the population with ASD without intellectual disabilities is still a minority, like girls

with ASD; in fact, girls with ASD with associated intellectual disabilities are more numerous than children.

Although anxiety disorders are characterized both by homotypal continuity (prediction of the disorder by the same disorder) and heterotypal continuity (prediction of the disorder by another disorder), certain anxiety disorders appear to covary more than others (Gregory et al., 2007). The Panic/Somatic and Separation Anxiety factors display a close developmental relationship, called the separation anxiety hypothesis (Klein, 1964; Silove et al., 1996). The two factors share common physiological disturbances, such as somatic symptoms (Pine et al., 2005; Slattery et al., 2002).

In our study, multiple significant correlations were found in the children between all the factors of the SCARED except for the factor of School Phobia, which does not correlate significantly with the factors of Generalized Anxiety, Separation Anxiety, and Social Phobia. In the case of parents, fewer significant correlations between factors are observed than those found in the children. The factors of Social Phobia and Generalized Anxiety have the fewest significant interactions with the other factors.

The correlations between age and the different factors measured by the SCARED are low or very low both in children and in parents. There was only one significant and high correlation in children with the Panic/Somatic factor. Similarly, other authors (Birmaher et al., 1997; Compton et al., 2000; Essau et al., 2002; Hale et al., 2005; Ogliari et al., 2006; Su et al., 2008) point out that although the Separation Anxiety decreases as adolescents mature, other anxiety disorders increase with age.

As mentioned in the introduction, anxiety disorders are one of the most common concurrent conditions and can be an important factor, as they interfere significantly with school and social adaptation (Leyfer et al., 2006). Anxiety is sometimes associated with an increase in aggression and it reduces participative relations in social activities (Selles and Storch, 2012). Cognitive-behavioral treatments are considered the most effective psychosocial interventions (Fortea et al., 2008; Walkup et al., 2008). These individuals should be treated as soon as possible (Narbona and Crespo, 2012), focusing on the areas of altered development (Martos and Llorente, 2013), while involving the parents in the establishment of the goals to be achieved (Lord and Bishop, 2010). Family schools are also important because improvements have been observed in the reduction of parents' stress, as well as in their perception of their responses to their children's behavior and, significantly, in their assessment of the quality of the time shared by parents and siblings (Ayuda et al., 2012). Therefore, and taking into account that the visual channel is preferred for information processing of people with ASD, we should make use of augmentative communication systems combining speech with visual supports (Fortea et al., 2015).

Conflict of Interests

The authors have not declared any conflict of interests.

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Preschool children's skills in solving mathematical word problems

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This study aims to investigate the mathematical word problem-solving skills of preschool children 5-6 ages. To achieve this objective, the data were collected in four preschools (n=162). A mathematical word problem test was used as data collection tools. In this study, it was found that the children's skills at solving mathematical word problems based on addition and subtraction were at a medium level. In terms of sub-categories, the children were found to do better with result-unknown problems but to have difficulties with initial-unknown problems. The most difficult problem type for the children was the compare category. Next, it was found that the children's achievement was higher when they were addressed with "you-language", with you the second person singular form in Turkish. Gender was found to be an inefficient variable. However, it was observed that the children's achievement increased as they grew older. As a result, it is not only result-unknown problems they have but also different examples from other categories in preschool.

Key words: Preschool period, problem solving, mathematical word problems.

INTRODUCTION

Problems are difficult situations that a person has not previously encountered and feels unprepared to solve. For preschool children, the world is new; as a result, each new situation that they encounter is in fact a natural problem. When children in this period of life first come across a new situation, they primarily wonder about it. Thereafter, however, they approach this situation with more flexibility and reason (NTCM, 2008).

Problem solving opens a new horizon in children's mathematical thinking and presents them with opportunities to understand mathematics. Consequently, problem-solving skills are an important tool to evaluate children's mathematical thinking (Charlesworth and Leali, 2012).

According to National Council of Teaching of Mathematics (NCTM, 2000), students should be acquainted with new information through problem-solving skills from preschool until the end of secondary school, improve their mathematical problem-solving skills, use different strategies to solve problems and implement their already-acquired knowledge in new and different situations. In other words, it has been noted that problem solving is at the centre of mathematics teaching. Similarly, De Corte et al. (2000) claim that inclusion of verbal problems into the school curriculum is potentially important as they show children when and how to implement their mathematical knowledge into daily life situations.

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Carpenter et al. (1985) mention that children can analyze some simple word problems such as addition and subtraction before they start their formal education. They add that children can make use of their fingers, physical objects around them or very sophisticated counting strategies in order to understand the relationships given in problems. However, the mathematical problems that preschool children must solve are limited with respect to age characteristics. These children do not need to know mathematical symbols (+, -, =). They can only answer certain problems that are correctly formulated in word form. For example, a child may not solve the operation 3+2=?; however, he can easily answer a word problem such as "Adam has 3 marbles. He wins 2 more in the game. How many marbles does he have now?"

Mathematical word problems

Solving mathematical word problems helps children make connections between conceptual and mathematical knowledge. Through problem solving, they can easily establish and develop these connections. These problems teach students to make use of the knowledge and skills that they have learned in school while solving problems in their real lives. According to the revision of the related literature (Nesher et al., 1982; Carpenter and Moser, 1981; Nesher, 1980; Van De Walle, 2001), the researchers categorized the verbal problems related to addition and subtraction in terms of the relationshops they were based on. In line with their analysis of prior research Nesher et al. (1982) said that they can group word problems semantically in three groups: combine, change and compare. This categorization was handled differently in the past research. To exemplify; combine problems were referred as "static" by Nesher (1980) and as "part-part-whole" by Carpenter and Moser (1981). Also, change problems were called as "joining and separating² by Carpenter and Moser (1981) and as dynamic by Nesher (1980). In this research, the explanation by Van De Walle (2001, p. 109) was followed as it extensively covered all other groupings. Therefore, in line with this explanation; word problems were grouped in four as joining, separating, part-part-whole and comparing. In expressing these problems, there are three elements: beginning, change and conclusion. The problems were sub-categorized when one of these elements was unknown. The explanations related to this categorization and sub-categories were given below:

Join problems: In these problems, there are three amounts: the initial, the change (the part being added or joined) and the result (the amount that results from the operation). One of these may be the unknown element in the problem. The sub-categories and examples based on them are as follows:

Join: Result unknown: Sara had 3 marbles. Eren gave her 4 more. How many marbles does Sara have altogether?
Join: Change unknown: Sara had 3 marbles. Eren gave her some more. Now Sandra has 7 marbles. How many did Eren give her?
Join: Initial unknown: Sara had some marbles. Eren gave her 4 more. Now Sandra has 7 marbles. How many marbles did Sara have to begin with?
Separate: In separate problems, the initial amount is the whole or the largest amount, whereas in join problems, the result is the whole. In separate problems, the change means the difference in a quantity from the initial quantity. The sub-categories and related examples are as follows:

Separate: Result unknown: Sara had 7 marbles. She gave 4 marbles to Eren. Now Sandra has 7 marbles. How many marbles does Sara have now?
Separate: Change unknown: Sara had 7 marbles. She gave some to Eren. Now Sandra has 3 marbles. How many did she give to Eren?
Separate: Initial unknown: Sara had some marbles. She gave 4 to Eren. Now Sandra has 3 marbles left. How many marbles did Sara have to begin with?

Part-part-whole problems: Part-part-whole problems involve two parts that are combined into one whole. The combining may be a physical action or a mental combination in which the parts are not physically combined. The sub-categories and related examples are as follows:

Part-part-whole: Whole unknown: Eren has 3 yellow marbles and 4 blue marbles. How many marbles does he have?
Part-part-whole: Part unknown: Eren has 7 marbles. Three of his marbles are yellow marbles, and the rest are blue marbles. How many blue marbles does Eren have?

Compare problems: Compare problems involve the comparison of two quantities. The third amount is not actually present but is the difference between the two amounts. However, the third amount is the difference between the two already-given amounts. The sub-categories and the related examples are as follows:

Compare: Difference unkown: Eren has 7 marbles and Sara has 4 marbles. How many more marbles does Eren have than Sara?

Compare: Larger unknown: Eren has 3 more marbles than Sara. Sara has 4 marbles. How many marbles does Eren have?

In the related literature, studies about pre-school children's problem solving skills are available (Altun et al., 2001; Carpenter et al., 1983; Carpenter et al., 1993; Davis and Pepper, 1992; Manchesa et al., 2010; Monroe, and Panchyshyn, 2005; Patel and Canobi, 2010; Tarım, 2010; Tarım and Artut, 2005). However; it has been thought that more studies about preschool children skills in problem solving are needed. In Turkey, no studies investigating pre-school children's addition-subtraction based mathematical word problems in line with the categories mentioned above have been found. Therefore, it has been thought important to consider the children's all answers to all problem categories regarding age factor.

In relation to this, Cummins et al. (1988) state that word mathematical problems are clearly demanding for children to solve. They claim that this can derive from the difficulty in understanding abstract or ambiguous language, so it was thought that it can be important to investigate the effect of the language used during the presentation of the problems on the children's performance of word mathematical problems.

In line with this background, the research questions of this study are as follows:

1.What is children's general achievement of word mathematical problems based on addition and subtraction ?
2.How is the children's general achievement of word mathematical problems based on addition and subtraction in terms of gender and age ?
3.What is the children's' achievement of problems with small numbers and problems with large numbers in each category ?
4.What is the children's achievement of problem solving for the problems in each category in terms of the language used (you-language, show-language) ?

METHOD

Sample

The sample of this study was children 5-6 ages attending four preschools in a city in the South of Turkey. Children between 5-6 years of age were divided into three groups according to months (60-66 months, 67-70 months, 71 months and older). Their problem-solving skills were analyzed in detail. One hundred sixty-two children (88 girls and 74 boys) participated in the study, which aimed to investigate the children's skills relating to word mathematical problems. Furthermore, because one of the main objectives of this study was to analyze whether the method of presenting problems in class affected children's achievement, 16 children (10 girls and 6 boys) were interviewed. The children were, on average, 68 months old and were not yet literate. Table 1 gives information on the ages and genders of the children in the study.

As seen in Table 1, while the children 67-70 months old were mostly girls, the numbers of girls and boys in the other age groups were nearly equal.

For detailed interviews, a total of 16 children from different achievement levels were chosen from 162 children by the teachers: 5 children from the low level, 6 children from the mid-level and 5 children from the high level.

Data collection tools

A word mathematical problem test was used as a data collection tool. The problem test was prepared by the researcher herself, referring to the related literature and including all the problem categories (Carpenter and Moser, 1981; Van De Walle, 2001). This test was presented to 5 experts in the field of mathematics teaching and 3 preschool teachers to obtain their feedback. The test was revised to incorporate their comments and then finalised.

In the joint category of the problem test, there are 24 items (Appendix 1): 10 in the join category, 4 in the separate category, 4 in the part-part-whole category and 6 in the compare category. Problems in each category were presented in two different ways; with small numbers and big numbers. For example; 5 of the 10 problems in the join category were based on small numbers (the numbers from 1 to 5) and the other five were based on large numbers (one of the numbers in the problem was five or higher). Also, the problems were organized in a way that their results would be 10, the highest.

Table 2 shows the categories and sub-categories in the problem test and the symbolic models of the problems. The KR-20 value of the mathematical word problem test was estimated as 0.90.

Cummins et al. (1988) state the difficulties children experience in understanding the expression in the problem cause children to face with word mathematical problems. Therefore; the way that the problems in the problem test of this study was presented was changed and administered to 16 children. By doing so, it was aimed to determine the effect of the language used and the way the problems was presented on the children' understanding of the problems and their problem solving skills.

This problem test given above was presented differently and re-administered to 16 children. The problems that could not be solved in their initial versions were re-asked to the same children using "you-language". "You-language" (with you the second person singular form in Turkish) is the language adaptation of the problem, focusing on the child as an active doer of the operation. If this method did not work, the problem was re-asked using "show-language". "Show-language" is a way of guiding the child to use his fingers or other objects to visualise the mathematical operation in the problem.

Data collection

The data collection was conducted in two phases. In both phases, the children were individually interviewed in quiet classrooms in their schools. During the interviews, some objects (counting blocks and beans) were available for the children to use to solve word mathematical problems. Before the children were interviewed, a short introductory speech was given to help them understand the process. Each phase is explained below.

In the first phase, the problems in the problem test were verbally asked to the children. Before the researcher asked the question, she gave instructions, such as "You can use your fingers or counting blocks to answer the questions." The child answered the question using any objects that he wanted or through mental calculation. The researcher recorded the children's answers on a form. The interviews lasted 30-35 minutes. Correct answers were coded as "1". Incorrect answers were coded as "0". Partially correct answers were also coded as "0".

The aim of the second phase was to determine whether the way

Table 1. The gender and age characteristics of the children (n=162).

Age group	Gender				Total	
	Female		Male			
	F	%	F	%	f	%
1 (60-66 months)	20	43	26	57	46	100
2 (67-70 months)	45	65	24	35	69	100
3 (71 months and older)	23	49	24	51	47	100

Table 2. The structure of the problems in the problem test

Main category	Sub-category	Problem no	Symbolic model
Joint	Result unknown	1	1+3=?
		3	4+2=?
		7	2+3=?
		9	5+3=?
		11	4+5=?
		13	3+6=?
	Initial unknown	2	?+3=4
		4	?+3=7
	Change unknown	15	2+?=5
		18	3+?=8
Separated	Initial unknown	5	?-1=4
		6	?-3=5
	Change unknown	8	4-?=1
		10	7-? =2
Part-part-whole	Whole unknown	12	2+3=?
		17	3+5=?
	Part unknown	14	1+?=4
		16	3+?=8
	Difference unknown	19	3-2=?
		20	6-3=?
Comparism	Larger unknown	21	?-1=2
		24	?-2=3
	Smaller unknown	22	5-?=3
		23	7-?=4

of presenting the problems to children influenced their problem-solving achievement. Sixteen children participated in this phase. The steps were as follows:

Step 1. The problems are read as they are in the problem test. The children are not given any clues. If the child is able to solve the problem, his method of solving it is recorded. The number of times that the question is read to the child is also recorded. If the child cannot solve the problem, then the child proceeds to the next step.

Step 2. The problem is asked to the child using “you-language”. For example, "Eren had 1 balloon, . Sara gave him 3 more. How many balloons does Eren altogether?"

This problem is reformulated as follows:

Table 3. The Kruskall Wallis Test results of the problem test total scores according to age

Age	n	Mean of the rank	sd	χ^2	Significant difference
1 (60-66 months)	46	73,33	2	7,24	3>1, 3>2
2 (67-70 months)	69	76,50			
3 (71 months and older)	47	96,84			

"You had 1 balloon. Then, I gave you 3 more balloons. How many balloons do you have now?"

next step.

Step 3. The problem is asked through "show-language". *The problem is reformulated as follows:*

"Eren had 1 balloon. Show me (through fingers or counting objects). Then, Sara gave him 3 more balloons. Show this to me, too. How many balloons does Eren have now?
If the child gives the correct answer, the next problem is asked. If the answer is not correct, the child is regarded as unsuccessful in solving this problem.

Data analysis

The data based on 162 children were statistically analysed. Because the normality assumption was not met in the data obtained, non-parametric tests were used for the analysis of the data. The Mann-Whitney U test was used to compare the children's total scores according to gender. The Kruskall Wallis test was used to compare the total scores with regard to age groups. For descriptive purposes, frequencies and percentages were calculated for some variables.

To describe the interview data with 16 children, frequencies and percentages were calculated. Questions 9, 21, 22, 23 and 24 were not considered because they could not be answered by the children.

FINDINGS

First, the data based on the problem test administered to 162 children were analysed. The data analysis showed that the mean score of 24 problems was 12.59 (SS=4.99). The means of the children's scores were, respectively, 6.04 (SS=2.34) of 10 join problems, 2.74 (SS=1.17) of 4 separate problems, 3.00 (SS=1.30) of 4 part-part-whole problems and .79 (SS=1.39) of 6 compare problems.

No significant difference was found in the total scores on all the questions between girls and boys (U=2999.50, p>.05). Consequently, gender was not considered in the follow-up analysis. Table 3 notes the findings of the Kruskall Wallis test by age group.

As seen in Table 3, a significant difference was observed in the children's scores from the problem test by age group (Chi-square (2)=7.24, *p=.03*). Children 71 months and older were found to have better results than children 60-66 and 67-70 months old. Tables 4, 5, 6 and 7 show the percentages of correct answers to the problem test by age group.

Table 4 shows that the children mostly gave correct answers to result-unknown questions. Taking a closer look at this group, it is observed that the achievement scores were higher with the problems with smaller numbers than the problems with larger numbers. The achievement scores were very low with the initial-unknown problems. In general, it was found that the scores improved as the children grew older.

As seen in Table 5, in the sub-categories of the separate problems, more mistakes were found in the initial-unknown problems than in the change-unknown problems. Especially in the initial-unknown problems, the percentage of correct answers was low when the problems included larger numbers. Similarly, in the change-unknown sub-category, the achievements were higher on the problems including small numbers than on those with large numbers. In a general sense, the percentage of correct answers increased in the separate category as the children grew older.

As Table 6 shows, in both sub-categories of the part-part-whole category, the percentage of correct answers to the problems with small numbers was higher than those to the problems with large numbers. Additionally, children 60-66 and 67-70 months old gave similar numbers of correct answers; however, children 71 months old and older gave more correct answers. Additionally, it was found that the percentage of correct answers was similar in problems of part-unknown and whole-unknown.

Table 7 shows that the percentage of correct answers was quite low in all the age groups and in each sub-category of compare problems. Although the difference was small, there were more correct answers in each sub-category of compare problems with small numbers. The incorrect answers in the compare category were then examined, and it was observed that most of the children could identify which quantity was the greater of two but could not identify to what extent the quantity was greater or smaller than the other.

As for the influence of the problem presentation on the children's problem-solving achievement, the interview

Table 4. The frequencies and percentages of answers to the join problems according to age.

Category	Sub-category	Symbolic model		60-66 months (n=46)	67-70 months (n=69)	71 months and older (n=47)
Join	Result Unknown	1+3=?	f	45	66	45
			%	97.8	95.7	95.7
		4+2=?	f	38	61	43
			%	82.6	88.4	91.5
		2+3=?	f	41	63	43
			%	89.1	91.3	91.5
		5+3=?	f	35	60	40
			%	76.1	87.0	85.1
		4+5=?	f	27	43	35
			%	58.7	62.3	74.5
		3+6=?	f	22	38	33
			%	47.8	55.1	70.2
	Initial Unknown	?+3=4	f	14	15	17
			%	30.4	21.7	36.2
		?+3=7	f	11	9	6
			%	23.9	13.0	12.8
	Change Unknown	2+?=5	f	19	31	27
			%	41.3	44.9	57.4
		3+?=8	f	13	21	19
			%	28.3	30.4	40.4

Table 5. The frequencies and percentages of the answers to the separate problems according to age.

Category	Sub-category	Symbolic model		60-66 months (n=46)	67-70 months (n=69)	71 months and older (n=47)
Separated	Initial Unknown	?-1=4	f	31	47	45
			%	67.4	68.1	95.7
		?-3=5	f	11	22	21
			%	23.9	31.9	44.7
	Change Unknown	4-?=1	f	37	57	43
			%	80.4	82.6	91.5
		7-? =2	f	33	56	42
			%	71.7	81.2	89.4

data with 16 children were analysed. Table 8 illustrates the distribution of the answers.

As observed in Table 8, half of the children's answers were wrong. Then, the correct answers were considered, and it was found that 18% of the children could not solve the problems in their first reading but could solve the same problem when "you-language" and "show-language" were used.

Table 9 gives descriptive information about the method of presenting the problems along with the children's achievement.

A close look at Table 9 reveals that the answers of the low-achieving children were (91%) incorrect. However, when the problems were asked through "you-language" and "show-language", correct answers at the rate of 8% were obtained. Half of the answers of the medium-

Table 6. The frequencies and percentages of the answers to the part-part-whole problems according to age

Category	Sub-category	Symbolic model		60-66 months (n=46)	67-70 months (n=69)	71 months and older (n=47)
Part-part-whole	Part Unknown	2+3=?	f	36	51	41
			%	78.3	73.9	87.2
		3+5=?	f	31	45	38
			%	67.4	65.2	80.9
	Whole Unknown	1+?=4	f	36	53	44
			%	78.3	76.8	93.6
		3+?=8	f	26	47	37
			%	56.5	68.1	78.7

Table 7. The frequencies and percentages of the answers to the compare problems according to age.

Category	Sub-category	Symbolic model		60-66 months (n=46)	67-70 months (n=69)	71 months and older (n=47)
Comparism	Differences Unknown	3-2=?	f	9	14	15
			%	19.6	20.3	31.9
	Result unknown	6-3=?	f	9	9	11
			%	19.6	13.0	23.4
	Larger Unknown	?-1=2	f	11	15	6
			%	23.9	21.7	12.8
		?-2=3	f	3	6	2
			%	6.5	8.7	4.3
	Smaller Unknown	5-?=3	f	5	2	3
			%	10.9	2.9	6.4
		7-?=4	f	4	2	2
			%	8.7	2.9	4.3

Table 8. The distribution of the children's answers regarding the method of presenting the problems

	Incorrect	First reading	Second reading	"You-language"	"Show-language"	Total
f	146	63	27	24	28	288
%	51	22	9	8	10	100

achieving children (45%) were incorrect; however, when the problems were presented through "you-language" and "show-language", correct answers at the rate of 26% were received. As for the answers of the high-achieving children, the correct answers were at the rate of 42% at the end of the first reading and 23% at the end of the second reading. When "you-language" was used, 8% of the answers were correct, and when "show-language" was preferred, 11% were correct. In terms of the structures of the problems, Table 10 shows the distribution of the children's answers according to the method of problem presentation.

When the structures and methods of presenting the problems were considered together, it was observed that some of the children gave correct answers when the problems were presented by means of "you-language" or "show-language". Especially when we recalled that the numbers of correct answers to part-part-whole and

Table 9. The distribution of the answers based on the presentation method according to achievement level.

Achievement level		Incorrect	First reading	Second reading	"You-language"	"Show-language"	Total
Low	f	82	1	0	4	3	90
	%	91	1	0	5	3	100
Medium	f	49	24	7	13	15	108
	%	45	22	7	12	14	100
High	f	14	38	21	7	10	90
	%	16	42	23	8	11	100

Table 10. The distribution of the children's answers based on the problem presentation method according to the problem structure

			Incorrect	First reading	Second reading	"You-language"	"Show-language"	
Main category	Sub-category	Symbolic model	f	f	f	f	f	Total
Join	Result unknown	1+3=? 4+2=? 4+5=? 3+6=?	20	24	6	7	7	64
	Initial unknown	?+3=4 ?+3=7	23	3	3	3	0	32
	Change unknown	2+?=5 3+?=8	20	5	3	0	4	32
Separate	Initial unknown	?-1=4 ?-3=5	16	7	3	6	0	32
	Change unknown	4-?=1 7-? =2	14	7	4	3	4	32
Part-part-whole	Whole unknown	2+3=? 3+5=?	11	11	3	3	4	32
	Part unknown	1+?=4 3+?=8	19	3	0	2	8	32
Compare	Difference unknown	3-2=? 6-3=?	23	3	5	0	1	32

separate problems (68 correct out of 128 answers) were low, we could infer that nearly half of these answers were given by means of "you-language" and "show-language".

DISCUSSION AND CONCLUSION

This study investigates 60-78-month-old preschool

children's word mathematical problem-solving skills. In the study, it was found that in a general sense, children's achievement related to word mathematical problem-solving skills was at a medium level. In a study by Carpenter et al. (1993), it was observed that preschool children were considerably good at problem solving.

In addition, in the current study it was found that the children gave more correct answers for each category as they grew older. Olkun and Toluk (2002) conducted a similar study with primary school children and found that the students' achievement improved with their grade level. It can be concluded that achievement in problem solving is linked to age.

In this study, no relationship was observed between gender and children's problem-solving success. From this perspective, the results of this study support the findings of parallel studies in the field (Hyde et al., 1990; Lachance and Mazzocco, 2006; Unutkan, 2007).

As for the problem categories, the children were in general good at joint, separated, and part-part-whole problems but were low-achieving with comparism problems. In solving comparism problems, most of the children were able to show two quantities through counting blocks but were not capable of indicating which quantity was greater or less than the other. On that point, we can conclude that the problems given to children in that age group should be limited to which quantity is more or less. The results of this study are in line with the findings in the related literature. (Altun et al., 2001; Mamede and Soutinho, 2012; Nesher et al., 1982). Mamede and Soutinho (2012) in their similar study with 4-6 months old children found that the children had difficulties in solving compare problems.

With respect to the sub-categories of the problems, it was observed that the children made more mistakes with initial-unknown problems than with result-unknown problems. They tried to solve the problems through direct modelling, using counting objects or trial and error. The reason for the children's failure with initial-unknown problems may be that they could not determine how many counting objects they needed to use initially (Wan de Well, 2001, p.148). Olkun and Toluk (2002) conducted a similar study with primary school students. They concluded that the book that they analysed in their study included initial-unknown problems based on addition, suggesting that using these types of problems can be one of the reasons for receiving more correct answers. Wan de Well (2001, p.148) noted that in most books, there was simply more emphasis on join and separate problems with result-unknown structure. One of the reasons why the children failed in the other problem categories may derive from their lack of frequent exposure to these other problems.

In terms of the numbers in problem statements in each category, the children demonstrated high achievement with the problems including small numbers. This result also indicates that not only the structure of the problem but also the numbers used in the problem can influence its difficulty level. Therefore, it is recommended that numbers in problems be compatible with children's cognitive development regarding numbers. Hamann and Ashcraft (1986; cited Clements and Sarama, 2014, p. 337) stated that some problems are more challenging owing to the larger numbers they include. They also stated that, such difficulties are often greater than they should be because they are not exposed to larger single-digit numbers.

When the content of the problems is formulated considering the children's surroundings, children better understand the structure of the problems and see the relationships between the given pieces in the problem, which helps them overcome any difficulty (Outhred and Sardelich, 2005; Monroe and Panchyshyn, 2005).

The results of this study indicate that the method of presenting problems ("you-language"-"show-language") was helpful in guiding the children to the right answers. Similarly, Pape (2003) stated that the language used for solving mathematical word problems of the children is effective on problem-solving success, and Reusser and Stebler (1997) stated that the changing on presentation structure of problem; in other words, changing words used while expressing the problems affect the difficulty of the problem. It is possible that the children related the problems to their own lives when they were addressed with "you-language". In the same way, the "show-language" may have helped the children make complex problems more concrete so that they understood and solved the problems successfully.

As a result, it was concluded that the academic attainment of children 60-78 months old was medium level in solving word mathematical problems based on addition and subtraction. They were better at result-unknown problems, whereas they had difficulty with initial-unknown problems. The children experienced the greatest difficulty with comparing problems. Gender was found to have no effect on the children's problem-solving levels; however, age appeared influential. As the children grew older, their achievement increased. The method of presenting the problems was also found to affect the correctness of the children's answers. Although the children were not good at giving correct answers in part-part-whole and separate problems, half of their correct answers were given when the questions were asked through "you-language" and "show-language".

In this context, it is highly recommended to include not only result-unknown problems but also different examples from other categories in class and to consider children's cognitive developmental readiness when choosing actual numbers in problem statements. Additionally, teachers can be advised to use different methods of presenting problems to their students. For further studies, we suggest focusing on the effects of different methods on

children's problem-solving achievement. The effects of different problem presentation methods can also be analysed with a larger sample. Finally, in this study different content of formulation of problems, the presentation by diagrams, the use of material, etc. are not examined. The follow-up studies can concentrate on these aspects. However, the study was carried out for Turkish children, the results can not be generalized to other countries.

Conflict of Interests

The author has not declared any conflicts of interest.

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Appendix. Problem Test

Problem 1 (Join-result unknown-(1+3=?)). Eren had 1 balloon. Sara gave him 3 more. How many balloons does Eren altogether?

Problem 2 (Join-initial unknown-small numbers-(?+3=4)). Eren had some marbles. Sara gave him 3 more. Now Eren has 4 marbles. How many marbles did Eren have to begin with?

Problem 3 (Join-result unknown-(1+3=?)). Eren had 4 balloons. Sara gave him 2 more. How many balloons does Eren altogether?

Problem 4 (Join-initial unknown-large numbers-(?+3=4)). Eren had some marbles. Sara gave him 3 more. Now Eren has 7 marbles. How many marbles did Eren have to begin with?

Problem 5 (Separate-initial unknown-small numbers-(?-1=4)). Eren had some marbles. He gave 1 to Sara. Now Eren has 4 marbles. How many marbles did Eren have to begin with?

Problem 6 (Separate-initial unknown-large numbers-(?-3=5)). Eren had some marbles. He gave 3 to Sara. Now Eren has 5 marbles. How many marbles did Eren have to begin with?

Problem 7 (Join-result unknown-small numbers-(2+3=?)). Eren had 2 balloon. Sara gave him 3 more. How many balloons does Eren altogether?

Problem 8 (Separate-change unknown-small numbers-(4-?=1)). Eren has 4 balloons. He gave some to Sara. Now he has 1 balloon. How many balloons does Eren have now?

Problem 9 (Join-result unknown-large numbers-(5+3=?)). Eren had 5 balloon. Sara gave him 3 more. How many balloons does Eren altogether?

Problem 10 (Separate-change unknown-large numbers-(7-?=2)). Eren has 7 balloons. He gave some to Sara. Now he has 2 balloons. How many balloons does Eren have now?

Problem 11 (Join-result unknown-large numbers-(4+5=?)). Cookie Monster had 4 cookies. Then it bought more 5 cookies. How many cookies does Cookie Monster have now.

Problem 12 (Part part whole -whole unknown-small numbers-(2+3=?)). Sara has 2 apples and 3 oranges.. How many fruits does she have ?

Problem 13 (Join-result unknown-large numbers-(4+5=?)). Cookie Monster had 3 cookies. Then it bought more 6 cookies. How many cookies does Cookie Monster have now.

Problem 14 (Part part whole -part unknown-small numbers-(1+?=4)). Sara has 4 fruits. One of her fruits is an apple, and the rest are oranges. How many oranges does Sara have?

Problem 15 (Join-change unkown-small numbers-(2+?=5)) Eren had 2 liras. Sara gave him some more. Now Eren has 5 liras. How many did Sara give him?

Problem 16 (Part part whole -part unknown-large numbers-(3+?=8)). Sara has 8 fruits. Three of her fruits are apple, and the rest are orenges. How many yellow orenges does Sara have?

Problem 17 (Part part whole -part unknown-large numbers-(3+5=?)). Tarkan has 3 yellow marbles and 4 blue marbles. How many marbles does Tarkan have?

Problem 18 (Join-change unkown-large numbers-(3+?=8)). Eren had 3 liras. Sara gave him some more. Now Eren has 8 liras. How many did Sara give him?

Problem 19 (Compare-difference unknown-small numbers-(3-2=?)) Eren has 3 liras and Sara has 2 liras. How many more liras does Sara have than Eren?

Problem 20 (Compare-difference unknown-large numbers-(6-2=?)) Eren has 6 liras and Sara has 3 liras. How many more liras does Eren have than Sara?

Problem 21 (Compare-larger unknown-small numbers-(?-1=2)) Sara has 2 more liras than Eren. Eren has 1 liras. How many liras does Sara have ?

Problem 22 (Compare-Smaller unknown-small numbers-(?-1=2)) Eren has 3 more liras than Sara. Eren has 5 liras. How many liras does Sara have ?

Problem 23 (Compare-Smaller unknown-large numbers-(?-1=2)) Eren has 4 more liras than Sara. Eren has 7 liras. How many liras does Sara have ?

Problem 24 (Compare-Larger unknown-large numbers-(?-2=3)) Eren has 3 more liras than Sara. Sara has 2 liras. How many liras does Eren have ?

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Educational Research and Reviews

Full Length Research Paper

Examining Social Studies and science and technology preservice tearchers' epistemological beliefs regarding different variables

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The purpose of this study is to determine epistemological beliefs of pre-service teachers who attend social studies and science and technology teaching programs; and to investigate how these beliefs varies regarding grade level, gender and departments. The sample of the study is composed of 300 social studies, 260 science and technology pre-service teachers who attended Ataturk University Kazım Karabekir Education Faculty in 2013-2014 academic year. In the study, Epistemological Beliefs Scale that developed by Schommer (1990) and adapted to Turkish by Deryakulu and Öztürk (2005) was used. According to the research findings it is determined that there are significant differences in epistemological beliefs of social studies and science and technology teachers regarding the variables of gender, department and grade level. Significant differences were found regarding gender in favor of females; between first and fourth grades social studies pre-service teachers, in favor of first graders; between first and fourth grades science and technology pre-service teachers, again, in favor of first graders. Regarding department variable it is determined that first grade social studies pre-service teachers have more sophisticated epistemological beliefs than fourt grade social studies pre-service teachers and both first and fourth graders of science and technology teaching department.

Key words: Epistemological beliefs, pre-service teacher.

INTRODUCTION

When changing and developing education understandings are historically examined we see many essential changes. The most important change of the last years is to internalizing the learner centered education philosoph. When we analyze the roots of this understanding we see some study areas that affect constructuvist approach which is popular in last years. One of these most affective inderdisciplinary areas is epistemology. With the integration of philosophy and education areas with eachother, studies on knowledge and learning increase and the epistemology concept appears as newly realized study area with its importance and place (Demir and Akınoğlu, 2010). Epistemology consists of episteme and logos words in Greek (Buehl and Alexander, 2001). Today, acknowledgements of nature of the knowledge and knowing (Hofer, 2001), and the process of gaining

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knowledge (Schommer, 1994) are described with the term epistemology. Epistemology is a philosophical movement that inquiring knowledge and grounded on individual's personal interpretations and epistemological beliefs on how individual learns and teaches. Epistemological belief is used for determining viewpoints on what is knowledge based on reality; how is it learned and taught; how to determine the accuracy of different and discordant knowledge; how to evaluate new knowledge; and how to understand substantial decisions that affect their own and others' lives (Kuhn 1991; King and Kitchener, 1994). The concept epistemology is inquired by Perry at first. He took attention to four different positions related with epistemological beliefs during pre-service teachers' training. Perry explains these situations as dualism, multiplism, relativism, and commitment. Dualistic individuals think that absolute rights and wrongs regarding nature of the knowledge and believe that knowledge come only from experts or authorities. When they think with multiplistic viewpoint in the next stage, they belive that some rights and wrongs could not be known in an absolute way and for this reason knowledge includes both ultimate truths and personal beliefs together. The other level individuals will take place in is relativistic view point. In this stage a substantial change comes up at individual epistemological mentality. Beyond their intuitions and personal opinios, individuals think that knowledge actualizes by constructing the meaning. There is no absolute truth anymore. Because, truth changes relatively depends on individuals' personal interpretations. In the last stage, commitment, relalive thinking is still the key feature. But particular beliefs are more important than others and it is believed that commitment is actualized in more flexible manner (Brownlee, 2003). Because of the effectiveness of individuals' beliefs on their behaviors and decisions, the belief concept has too often being emphasized in last years (Brown and Cooney, 1982). Individuals are classified in terms of having beliefs as developed or undeveloped. Individuals who have undeveloped epistemologic beliefs believe that knowledge is simple, consist of absolute facts and transferred by an authority. Individuals who have developed epistemologic beliefs on the other hand are tend to believe that knowledge is more complex and relative, its truthfulness depends on the context and rather than transferred facts by an authority, a continuously changing construct depents on social interactions (Bromme et al., 2010).Besides, students who have developed epistemological belifs use numereous and more qualified cognitive knowledge processing strategies; metacognitively control their learning level of teaching materials more often and correctly; show more academic success; having more academic attitudes to school; believe the usefulness of education more; and construct more complex, deep and sophisticated opinions (Deryakulu and Büyüköztürk, 2005). Students' undeveloped epistemological beliefs prevent the cricical aspects of learning. On the contrary, developed beliefs expedite high level learning and critical thinking (Schommer, 1994). For this reason, it is emphasized that epistemological beliefs have important effects on learning and teaching processes of individuals (Schommer, 1990; Deryakulu, 2004). The tendency in education about beliefs is to evaluate beliefs as factors conduct our behaviors. Based on the hypothesis beliefs could be changed, students to be more affective learners and actualize more qualified learnings can be provided and their academic success could be affected in a positive way and more importantly they could be more competent for lifelong learning and successful in various stages of their life. If we look from teachers' aspect, by having teachers more sophisticated epistemological beliefs, we can make them improve their professional development more effectively and arrange more effective learning environments for their students (Karhan, 2007).

Epistemological beliefs are one of the most important cognitive variables that affect learning-teaching processes. Research findings prove that epistemological beliefs are an important element of students' learning (Hofer, 2001). Epistemological beliefs affect students' academic success both directly and indirectly by the effect on their learning approaches (Cano, 2005). Researches also show that epistemological beliefs have important effect on person's cognitive and metacognitive process (Schommer, 1994) and students' motivation style to learn (Paulsen and Feldman, 1999).

Epistemologic belief has such a remarkable impact on students' learning that it has been investigated according to diffferent variables. There are several researches about gender variable (Chan and Elliot, 2002; Chan, 2003; Conley et al., 2004; Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Kurt, 2009; Gürol et al., 2010; Aypay, 2011; Önen, 2011; Özkal et al., 2011; Demir, 2012; Köse and Dinç, 2012; Saban and Yüce, 2012; Şeref et al., 2012; Taşkın, 2012; Tümkaya, 2012; Bayrak, et al., 2013; Biçer et al., 2013). The studies examining epistomologic belief with department variable were conducted (Chan, 2003; Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Can and Arabacıoğlu, 2009; Kurt, 2009; Tümkaya, 2012). There are also studes investigating epsitemologic belief based on level of grades (Işıksal et al., 2007; Aypay, 2011; Önen, 2011; Şeref et al., 2012; Aydemir et al., 2013) In the present study, epistomologic belief of prospective social studies teachers and prospective science teachers was investigated in terms of aforementioned three variables in detail.

Purpse of the study

The main purpose of this study is to determine the changing of social studies and science and technology

Table 1. Epistemological Attitude Scale's and its subdimensions' disparities based on gender.

Variable	Group	N	M	Sd	df	t	p
EBS	Female	277	121.22	20.65	558	2.44	**.015**
	Male	282	125.63	21.91			
Factor 1	Female	277	61.88	10.49	558	2.32	**.020**
	Male	282	64.01	11.10			
Factor 2	Female	277	21.61	6.36	558	2.47	**.014**
	Male	282	32.98	6.74			
Factor 3	Female	277	27.72	5.89	558	1.78	.074
	Male	282	28.63	6.11			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

pre-service teachers' epistemological beliefs regarding gender, grade level and departments.

METHODOLOGY

Research design

This correlational study was designed by quantitative approach. Researchers attempt to explore relationship between independent variable and dependent variable in quantitative research (Cohen et al., 2000). As a general rule, explaining or comprehending complicacies of existent phenomenon is aimed in correlational researches (McMillan and Schumacher, 2006).

Exploring individual differences on variables is also applied in correlational study (Barker et al., 2002). Based on the nature of correlational study, gender, grade level and course type are assessed as a source of individual differences and differences in epistemological with regard to the gender and grade level are investigated.

Population and sample

The population of the study is composed of social studies, and science and technology pre-service teachers who attended Ataturk University Kazım Karabekir Education Faculty in 2013-2014 academic year. The sample of the study is composed of 300 social studies pre-service teachers (150 first graders and 150 fourth graders) and 260 science and teachnology pre-service teachers (150 first graders and 110 fourth graders). There are 278 female and 282 male students in the study group.

Data collection tool

Epistemological Beliefs Scale is developed by Schommer (1990) and adapted to Turkish by Deryakulu and Öztürk (2002). Adapted scale consists of three factors and 35 items. Afterwards, to determine how the Epistemological Belif Scale's three factor construct appropriate is, confirmatory factor analysis is made. For each factor in the scale Cronbach alfa internal coefficient of consistence accounted as in turn 0.84, 0.69, 0.64 and for the whole, 0.81. According to exploratory factor analsis results 24th item was extracted and the 10th item removed to second factor from the first. The scale is three factored, consisting of 34 item and five likert type.

Data analysis

The independent t test and one way ANOVA were applied to compare the mean value of epistemological based on gender, grade level and course type. Overall, these analyses were conducted via SPSS 17.0.

FINDINGS

In this part of the study statistical findigs of the change of social studies and science and technology pre-service teachers' epistemological beliefs regarding gender, grade level and departments took place (Table 1).

As seen in Table 1 students' epistemological beliefs ($t_{(558)}$= 2.44, p< .05), factor 1 scores ($t_{(558)}$= 2.32, p< .05) and factor 2 scores ($t_{(558)}$= 2.47, p< .05)differed significantly according to gender. With regard to the results of independent t test, performed to determine which groups these differences originate from, epistemological beliefs scores (M = 125.63, Sd = 21.91), factor 1 scores (M = 64.01, Sd = 11.10) and factor 2 scores (M = 32.98, Sd = 6.74) for male students were higher than those of female students. Therefore, these results were commented as the source of observed differences (Table 2).

According to results of independent t test, students' epistemological beliefs ($t_{(558)}$= 2.62, p< .05), factor 1 scores ($t_{(558)}$= 2.71, p< .05) and factor 2 scores ($t_{(558)}$= 2.60, p< .05) differed significantly with regard to the type of department. Epistemological beliefs scores (M = 126.01, Sd = 23.51), factor 1 scores (M = 64.29, Sd =

Table 2. Epistemological Attitude Scale's and its subdimensions' disparities based on program type.

Variable	Group	N	M	Sd	df	t	p
EBS	Social	300	121.28	19.13	558	2.62	.009
	Science	260	126.01	23.51			
Factor 1	Social	300	61.82	9.40	558	2.71	.007
	Science	260	64.29	12.17			
Factor 2	Social	300	31.64	6.56	558	2.60	.010
	Science	260	33.08	6.55			
Factor 3	Social	300	27.82	6.33	558	1.58	.113
	Science	260	28.63	5.61			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

Table 3. Epistemological Attitude Scale's and its subdimensions' disparities based on grade level.

	Source of Variance	SS	df	MS	F	p	Bonferroni Test
EBS	Between groups	68031.47	3	22677.15	67.15	.000	1-2, 1-3, 1-4, 3-4,2-3
	Within groups	187756.34	556	337.69			
	Total	255787.82	559				
Factor 1	Between groups	13465.72	3	4488.57	47.74	.000	1-2, 1-3, 1-4, 2-3, 3-4
	Within groups	52268.75	556	94.00			
	Total	65734.48	559				
Factor 2	Between groups	5582.45	3	1860.81	55.33	.000	1-2, 1-3, 1-4, 2-3, 2-4
	Within groups	18696.23	556	33.62			
	Total	24278.68	559				
Factor 3	Between groups	4978.56	3	1659.52	60.42	.000	1-2, 1-3, 1-4, 2-3, 2-4, 3-4
	Within groups	15270.43	556	27.46			
	Total	20248.99	559				

EBS: Epistemological Belief Scale; SS: Sum of Squares, MS: Means of Squares, df: degrees of freedom.

12.17) and factor 2 scores (M = 33.08, Sd = 6.55) for the science teaching students were higher than the social studies students. In addition results indicated that there were not significantly differences in factor 3 according to the type of department ($t_{(558)}$= 1.58, p> .05).

One-way analysis of variance was used to determine whether epistemological belief scores, factor 1, factor 2 and factor 3 scores varied with grade level or not (Table 3). The results of one way analysis of variance indicated significant differences among groups for epistemological belief scores ($F_{(3,556)}$= 67.15, p<.001), for factor 1 scores ($F_{(3,556)}$= 47.74, p<.001), for factor 2 scores ($F_{(3,556)}$= 55.33, p<.001), and for factor 3 scores ($F_{(3,556)}$= 60.42, p<.001). Bonferroni post hoc analysis was employed to investigate those groups among which there was a difference. According to the results of Bonferroni analysis, those differences stem from lower scores of 1th grade social studies students than 4th grade social studies students, 1th and 4th grade science teaching students for all subscales and total scale. Additionally, epistemological belief scores, factor 1, factor 2 and factor 3 scores for 4th grade social studies students were higher than 1th grade science teaching students. Finally, epistemological belief scores, factor 1, factor 2 and factor

Table 4. Epistemological Attitude Scale's and its subdimensions' disparities based on social studies first and fourth graders.

Variable	Group	N	X	Sd	df	t	p
EBS	Social 1	150	107.09	8.76	298	19.16	.000
	Social 4	150	135.48	15.89			
Factor 1	Social 1	150	55.59	6.40	298	15.28	.000
	Social 4	150	68.04	7.65			
Factor 2	Social 1	150	27.62	5.20	298	13.40	.000
	Social 4	150	35.66	5.18			
Factor 3	Social 1	150	23.87	5.22	298	13.82	.000
	Social 4	150	31.77	4.57			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

Table 5. Epistemological Attitude Scale's and its subdimensions' disparities based on science and technology first and fourth graders.

Variable	Group	N	X	Sd	df	t	p
EBS	Science 1	150	122.46	22.12	258	2.88	.004
	Science 4	110	130.86	24.55			
Factor 1	Science 1	150	62.63	11.56	258	2.59	.010
	Science 4	110	66.56	12.66			
Factor 2	Science 1	150	31.96	6.37	258	3.30	.001
	Science 4	110	34.62	6.49			
Factor 3	Science 1	150	27.86	5.18	258	2.58	.010
	Science 4	110	29.67	6.02			

EBS: Epistemological Belief Scale; M: Means, Sd: Standard Deviation, df: degrees of freedom.

3 scores for 1th grade science teaching students were lower than 4th grade science teaching students. These results could be assessed as the source of observed differences (Table 4).The independent t test was employed to explore whether or not there were significant differences between 1th and 4th grade students' scores for social candidates. The results of independent t test demonstrated there were significant differences between 1th and 4th grade social studies students' EBS scores ($t_{(298)}$= 19.16, p< .001), factor 1 scores ($t_{(298)}$= 15.28, p< .001), factor 2 scores ($t_{(298)}$= 13.40, p< .001) and factor 3 scores ($t_{(298)}$= 13.82, p< .001).Epistemological belief scores(M =135.48,Sd=15.89), factor 1 scores (M = 68.04, Sd = 7.65), factor 2 scores (M = 35.66, Sd = 5.18) and factor 3 scores (M = 31.77, Sd= 4.57)for 4thgrade students were higher than those of other 1th grade students scores (Table 5).

There appeared significant differences between1th and 4th grade science teaching students' EBS scores ($t_{(258)}$= 2.88, p< .05), factor 1 scores ($t_{(258)}$= 2.59, p< .05), factor 2 scores ($t_{(258)}$= 3.30, p< .05) and factor 3 scores ($t_{(258)}$= 2.58, p< .05). Moreover, epistemological belief scores (M =130.86, Sd= 24.55), factor 1 scores (M = 66.56, Sd = 112.66), factor 2 scores (M = 34.62, Sd = 6.49) and factor 3 scores (M = 29.67, Sd= 6.02) for 4thgrade students scores were higher than those of other 1th grade students scores.

RESULTS AND DISCUSSION

While epistemological beliefs affects people's all

decisions and the reasons of the behaviors because of these decisions for their life, their epistemological beliefs' formation and development are also affected by mental development, culture, family, environment, age, education level, learning area and gender (Deryakulu, 2004; Bayrak et al., 2013). This study is made to put forth the social studies and science and technology pre-service teachers' epistemological beliefs differentiated or not regarding gender, grade level and departments. Obtained findings showed that there are significant differences in socal studies and science and technology pre-service teachers' epistemological beliefs regarding gender, departments and grade level. Obtained results are presented below in details.

When we examine the distribution of epistemological beliefs, male students' points are higher than the females'. If we think that low points mean maturity of the epistemological beliefs according to scale, we can say that female students' epistemological beliefs are more mature than male students'. The least maturity that female pre-service teachers show is the dimension learning depends on effort (first dimension). But the most maturity that female pre-service teachers show is the dimension learning depends on ability (second dimension). This result is similar to Köse and Dinç (2012)'s and Gürol et al (2010)'s studies that done with pre-service teachers. The least maturity that male pre-service teachers show like females is the dimension learning depends on effort. But the most maturity that female pre-service teachers show is the dimension there is only one truth (third dimension). In this study when we look at female and male pre-service teachers' points related with the subdimensions in comparison; it is determined that in Learning Depends on Effort and Learning Depends on Ability dimensions, there is significant differences in favor of female pre-service teachers. It is determined that in these two dimensions males' points are higher than females'. That means females have more sophisticated beliefs than males. While we encounter the studies with different epistemological studies and samples show females have higher degree epistemological beliefs (Deryakulu and Büyüköztürk, 2005; Terzi, 2005; Kurt, 2009; Önen, 2011; Saban and Yüce, 2012; Taşkın, 2012; Şeref et al., 2012); there are also some studies show that males have higher degree epistemological beliefs (Gürol et al., 2010, Aypay, 2011; Özkal et al., 2011; Bayrak et al., 2013). On the contrary, there are studies put forth that epistemological beliefs do not differ regarding gender variable (Chan and Elliot, 2002; Chan, 2003; Conley et al., 2004; Demir, 2012; Tümkaya, 2012; Biçer et al., 2013). As it seen, in terms of the relationship between gender and epistemological beliefs there are many contradicting research results in the literature. The reason of the inconsistencies might be cultural factors, studying with different sample groups, using different data collection tools, and intergroup differentiation of pyscometric features in measurements (Yeşilyurt, 2013).

At the and of the statistical analyses, regarding department variable it is determined that there is significant differences between social studies and science and technology pre-service teachers' scientific epistemological belifs in the dimensions of Learning Depends on Effort and Learning Depends on Ability, in favor of social studies pre-service teachers. In these two dimensions it is determined that science and technology pre-service teachers' points are higher than social studies pre-service teachers. That means social studies pre-service teachers have higher level matured epistemological beliefs. There is no significant difference determined in the last dimension: There is Only One Truth. When we examine the researches in the literature we see different results between the department variable and the subdimensions of epistemological beliefs. Terzi (2005)'s research show that social studies pre-service teachers have more positivist science understanding than the science-literature students.

Deryakulu and Büyüköztürk (2005) proved that social studies and classroom teaching students have more maturated epistemological beliefs comparing with Computer Education and Instructional Technology students. Can and Arabacıoğlu (2009) in their study with mathematics and science education pre-service teachers, found significant differences in favor of mathematics pre-service teachers. Tümkaya (2012) determined that social, science and health sciences students have different epistemological belifs in all three dimensions. In the first dimension, social sciences students are higher than science and healt science students; in the second dimension heath science students are higher than social sciences and science students; and in the third dimension science students are higher than health sciences and social sciences students in terms of sophistication of epistemological beliefs. Kurt (2009) determined that students in quantitative areas have more sophisticated beliefs than students in qualitative areas. But in contrast with the studies like above, there are studies in the literature show no significant difference in epistemological beliefs of students in different departments (Chan, 2003).

According to another study there are significant differences between epistemological belief levels and grade variable in terms of both in groups and between groups. At the end of the statistical analyses, the significant difference is like that: For all the sub dimensions and the general results of the Epistemological Beliefs Scale first grade social studies pre-service teachers' points are lower than fourth grade social studies pre-service teachers' and both first and fourth grade science and technology pre-service teachers' points. When the scale's point scoring system is taken into consideration this result shows that there is a significant difference in favor of social studies pre-service teachers and they have more sophisticated belief than

the other groups. According to one between groups statistical result, for the all three sub dimensions, fourth grade social studies pre-service teachers' points are higher than first class science and technology pre-service teachers'; and for this reason, they have less sophisticated epistemological beliefs than first grade science and technology pre-service teachers. According to one another between groups result, first grade science and technology pre-service teachers' points are lower than fourth grade science and technology pre-service teachers. That means they have more sophisticated beliefs than fourth grade science and technology pre-service teachers. In group statistical analyses show following results: total epistemological beliefs points and for all three sub dimensions there is significant difference in favor of first grade science and technology pre-service teachers. The points of first grade science and technology pre-service teachers are significantly lower than the points of fourth grade science and technology pre-service teachers. According to this result it could be said that first grade science and technology pre-service teachers' epistemological beliefs are more sophisticated than fourth graders'. While literature supports our results for the dimension Learning Depends on Ability, contradicts with the other two dimensions. It could be thought that the reasons of lower level of epistemological sophistication of fourth graders are preparing lots of central examinations like KPSS and ALES, by doing that getting far from those terms' courses relatively, and as last grade students overcome by languor psychologically. When the studies related with epistemological beliefs in literature are examined from the point of grade variable, we come across many studies that support our resuts (Şeref et al., 2012; Aydemir et al., 2013); but on the other hand, there are some contradicting studies (Işıksal et al., 2007; Aypay, 2011; Önen, 2011) in the literature.

When epistemological beliefs and its sub dimensions are examined it is seen that different results are obtained and there is no consistency. The reason of this might be many environmental factors like different teachers, accordingly different teacher attitudes, difficulty level of the course, perceived class atmosphere, study and evaluation contidions (Tümkaya, 2012), methods and strategies that teachers use in classes, school's facilities, and general success level of class.

Implications

1. Course contents should be revised in Education faculties and and given place to implementations for developing these beliefs.
2. When the literature is examined it could be seen that there are limited number of qualitative studies. For this reason it must be concentrated on qualitative studies also for reaching detailed results for the reasons of students' epistemological beliefs.
3. And lastly, for students to have sophisticated epistemological beliefs, at least starting with the elementary education, multidirectional, quizzical, critical and creative thinking activities should be chosen and students should be directed to make researches.

Conflict of Interests

The author has not declared any conflicts of interest.

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Pre-service music teachers' piano performance self-efficacy belief inversely related to musical performance anxiety levels

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Many factors affect piano performance, including students' self-confidence and self-efficacy about playing an instrument. This study assessed piano performance self-efficacy beliefs in pre-service music teachers studying at the music education department of education faculty of Uludag University to a certain relationships between the strength of their self-efficacy and music performance anxiety. For this purpose, the piano performance self-efficacy scale and 'Kenny's musical performance anxiety inventory' were used. The data obtained via the scales completed by 129 students were analysed using SPSS 16.0. Independent groups t-tests were used to test the significance of the difference between genders on the dependent variables. In the multiple comparisons, Anova was used for parametric distributions and the Mann Whitney-U test was used for non-parametric distributions. To test if the conflict resolution method scores differed according to the variables, the independent groups t-test was used. Male pre-service music teachers' piano performance self-efficacy (general scale score mean) was significantly higher than female students' general scale score mean; female students' music performance anxiety levels were higher than those of the male students; both the self-efficacy beliefs and the music performance anxiety levels of 3rd year students have higher means than that of other grades; the general high school graduate pre-service music teachers had higher piano performance self-efficacy beliefs and musical performance anxiety levels compared with the fine arts high school graduate pre-service music teachers. There was a significantly negative relationship between the musical performance anxiety scale and the student teachers' piano performance self-efficacy beliefs. Finally, various suggestions were made to increase pre-service music teachers' piano performance self-efficacy beliefs and decrease their musical performance anxiety levels.

Key words: Piano performance self efficacy, musical performance anxiety, music education, piano education, pre-service music teacher.

INTRODUCTION

In Turkey, music teachers are trained in the 4-year undergraduate programs of the fine arts education departments of the education faculties of various 25 Turkish universities. 'Piano education and teaching' forms

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the basis of music education programs and covers technical exercises and etudes sample works from Turkish and world composers, educational music samples, piano literature and learning-teaching techniques in school music education (YÖK, 1998).

According to Gün and Yıldız (2014), an effective piano performance is based on a complex structure where musical and technical difficulties are addressed holistically. In addition to the musical and technical challenges of piano performance student's self-confidence and self-efficacy beliefs about playing a musical instrument are thought to influence both technical and aesthetic mastery of their instrument (Gün et al., 2014). This belief was defined by Bandura (1986; 391) as "people's judgments about their capacity to perform and organize actions necessary to carry out a performance". In other words, self-efficacy belief is a person's judgment, belief about how much he/she can be successful in overcoming difficulties which he/she is likely to face in the future (Senemoğlu, 1998), that is, an individual's personal belief that he/she can achieve a certain task (Kotaman, 2008). This belief has an important place in a person's life and affects four basic psychological processes, namely cognitive, motivational, emotional and choice-making processes (Bandura, 1995). Self-efficacy is regarded by many educational psychologists as an 'antecedent to academic success because it motivates behaviour (primarily perseverance) that leads to success (Jinks et al., 2003). High perceived self-efficacy leads individuals to create higher targets for themselves, thus increasing motivation to achieve a prescribed outcome (Locke et al., 1990). Moreover, it may affect the degree to which individuals experience stress or depression in response to a learning challenge via their self-perceived capacity to cope with the demands of the task (Bandura, 1995).

Besides its affective aspect, piano performance has physical, cognitive, affective, and aesthetic dimensions. A large body of work has confirmed the ubiquity of music performance anxiety in a range of musicians, including amateur and professional instrumentalists and singers, both solo and ensemble performers and child and adolescent musicians (Kenny, 2011; Kenny and Osborne, 2006). The level of music performance anxiety varies according to the degree of evaluative threat (as in auditions and solo performances) and the nature of the audience (Chan 2011). Students who perceive their task mastery (encompassing self-efficacy) as adequate to the challenge tend to experience a more successful performance. Conversely, when self-efficacy belief levels are lower, they may experience performance impairment and perform at levels below their current capacity (Gün et al., 2014). According to Papageorgi, performance quality is affected not only by the experience and task mastery but it is also affected by psychological factors such as self-perception, self-efficacy belief and performance anxiety (Cited by Tokinan, 2014). McPherson and McCormick (2006) emphasize the importance of self-efficacy as a determinant of success in music performance exams.

In this study, the relationship between self-efficacy and music performance anxiety in pre-service music teachers was explored. We note that Kenny, Driscoll and Ackermann (2012) observed a negative correlation between core self-evaluation, a test for self-efficacy, and several measures of anxiety, including music performance anxiety as assessed by the Kenny Music Performance Anxiety Inventory (Kenny, 2009, 2011) in elite professional orchestral musicians. We therefore hypothesized that self-efficacy and music performance anxiety would show a negative correlation in pre-service music teachers; that is, the higher the self-efficacy, the lower the music performance anxiety.

It is also interested to assess whether other factors, such as gender, type of graduated high school, and class level of the pre-service music teachers affected this relationship between self-efficacy and music performance anxiety.

METHODOLOGY

The population of the study comprised the 180 students studying at the Music Education Department of the Education Faculty, Uludag University, Turkey in the 2014-2015 academic year. All students were invited to complete a questionnaire. 129 pre-service music teachers, which represented 71.7% of the population, returned a valid questionnaire. Relevant demographic information about the sample is given in Table 1.

Measures

The data collection tool composed of three parts;

(i) Personal Information Form included questions about gender, type of graduated high school and class level of the sample group; *(ii) Piano Performance Self-Efficacy Scale (PPSES)*: Piano performance self-efficacy scale developed by Gün and Yıldız (2014) includes 25 item divided in to 3 sub-dimensions: technical level perception contains 8 items that describe how sufficient a student perceives his/her own piano technique, stage anxiety perception contains 7 items that describe what a student feels about his/her piano performance when playing in front of the audience, performance level perception which contains 10 items describe student's opinions about his/her own piano performance. The scale is 5-point Likert type scaling system in the form of "strongly agree", "agree", "neutral", "disagree" and "strongly disagree" was used. To measure the reliability of the scale, Cronbach's Alpha coefficient was calculated. The total reliability coefficient of the scale was ά= .75. The reliability coefficients of the three sub-dimensions identified in the factor analysis were as follows: ά=.53 for "perception of technical level"; ά=.47 for "stage anxiety perception"; ά=.84 for 'performance level perception" .
(iii) Kenny's Music Performance Anxiety Scale (KMPAI): The inventory was developed by Kenny in 2004 and revised and extended in 2009. Tokinan (2013) adapted the 5 point Likert type scale which has 25 items into Turkish. Although in the original scale there are 5 sub-dimensions when the inventory was translated into

Table 1. Personal information about the sample.

Personal Information		f	%
Gender	Female	81	62,8
	Male	48	37,2
Grade	1st year	31	24,0
	2nd year	34	26,4
	3rd year	32	24,8
	4th year	32	24.8
Type of High School	Fine Arts H.S.	106	82.2
	General H.S.	23	17,8

Turkish; it was seen that 3 of the sub-dimensions (Somatic Anxiety, Personal Monitoring, and Physiological Helplessness) has only one item, as it is not statistically correct to analyse only one item sub-dimensions. In this research although the researcher applied all the 25-items to the preservice music teachers only 2 sub-dimensions Negative Performance Perception (14 items) and Psychological Helplessness (8 items) KMPAI was analysed. To measure the reliability of the scale, Cronbach's Alpha coefficient was calculated. The total reliability coefficient of the scale was ά= .68. The reliability coefficients of negative performance perception ά=.93 and psychological helplessness ά=.85.

The data obtained through scales were analysed using SPSS 16.0 statistical package. First, descriptive statistics were calculated. In the statistical analyses, the frequency, valid and cumulative percentage distributions describing the general structure of the group were calculated in the direction of the answers given by the pre-service music teachers to the questions. In this study in order to determine the piano performance self-efficacy and music performance anxiety level according to the preservice music teacher perceptions arithmetic means were looked in and when interpreting the means the intervals were evaluated as follows: 1.00-1.79 'very low, 1.80-2.59 'low', 2.60-3.39 'middle', 3.40-4.19 'high' and 4.20-5.00 'very high'. These descriptive statistical procedures made with the aim of describing the sample group in terms of the variables under discussion were followed by the relational analysis studies carried out in accordance with the purposes and the variables of the study. Independent groups t-tests were used to test the significance of the difference between genders on the dependent variables. In the multiple comparisons, Anova was used for parametric distributions and the Mann Whitney U test was used for non-parametric distributions. To test if the conflict resolution method scores differed according to the variables, the independent groups t-test was used. Significances were checked bidirectionally at 0,05 level; in the results where the p value was smaller than 0,05, the differences between groups were accepted as "significant"

RESULTS

In this section of the study, the findings reached through the analysis of the data obtained from the pre-service music teachers via using the questionnaires and the interpretations about these findings were given.

The piano performance self-efficacy general scale score means of the male pre-service music teachers were significantly higher than the female (Table 2). When the sub-dimension scores were taken into consideration, in stage anxiety perception, the male students' means were significantly higher than those of the female. In the sub-dimensions of technical level perception and performance level perception no statistically significant differences were observed between the female and the male pre-service music teachers. However, in the sub-dimensions of both the male pre-service music teachers had higher means compared to the female ones.

When the analysis was made on the basis of grade level, difference was in favor of the 3rd year students. At stage anxiety perception sub-dimension, no significant differences were determined. Moreover, in technical level perception the significant difference was in favour of 3rd year students who had the higher mean than the 1st year students. In the performance level perception sub-dimension, the significant difference was in favour of 2nd year students who had the higher mean than the 1st year students as well (Table 3).

According to the type of graduated high school there is not any significant difference between Fine Arts High School and general high school in terms of piano performance self-efficacy. However than the average of the general high school graduate pre-service music teachers' means seems to be higher. Statistically significant differences were determined in the technical level perception, stage anxiety and performance level perception sub-dimensions. In technical level perception, stage anxiety perception and performance level sub-dimensions the means of the Fine Arts High School graduate pre-service music teachers were higher than those of the general high school graduate pre-service music teachers (Table 4).

Although there is not any significant difference the music performance anxiety levels general scale score means of the female pre-service music teachers were higher than the means of the male pre-service music

Table 2. Piano performance self-efficacy levels according to gender.

		Gender	N	$\bar{x}$	sd	t	p
Scale	Piano performance self-efficacy	Female	81	2,61	0,42	2,26	,02
		Male	48	2,81	0,53		
		Gender	**N**		$\bar{x}$		**t**
Sub-dimensions	Technical level perception	Female	81	2,80		1,50	,13
		Male	48	2,97			
	Stage Anxiety Perception	Female	81	2,57			
		Male	48	2,91		3,30	,00
	Performance Level Perception	Female	81	2,50			
		Male	48	2,60		0,76	,44

Table 3. Piano performance self-efficacy levels according to grade level.

		Grade	N	$\bar{x}$	sd		p
Scale	Piano Performance Self-Efficacy	1st year (A)	31	2,7	0,40		.072
		2nd year (B)	34	2,65	0,50		
		3rd year (C)	32	2,71	0,56		
		4th year (D)	32	2,68	0,44		
		Grade	**N**	$\bar{x}$	**F**	**p**	**Significant Difference**
Sub-dimensions	Technical Level Perception	1st year (A)	31	2.58	4.324	,007	A-C
		2nd year (B)	34	2.29			
		3rd year (C)	32	2.88			
		4th year (D)	32	2.73			
	Stage Anxiety Perception	1st year (A)	31	2.47	7,248	,554	
		2nd year (B)	34	2.51			
		3rd year (C)	32	2.99			
		4th year (D)	32	2.86			
	Performance Level Perception	1st year (A)	31	2,66			
		2nd year (B)	34	3,02			
		3rd year (C)	32	2,86	6,177	,023	A-B
		4th year (D)	32	2.60			

teachers. When the sub-dimension scores were taken into consideration, in negative performance perception there is not any significant difference however female pre-service music teachers have higher means. In psychological helplessness sub-dimension the male pre-service music teachers' means were significantly higher than those of the female pre-service music teachers (Table 5).

When the grade level was taken into consideration, the general scale score mean of 3rd year students is higher than that of other grades. In the negative performance perception sub-dimension, the scale score mean of the 3rd year students was significantly higher than that of the 1st year students. In the psychological helplessness sub-dimension, the scale score mean of the 4th and 2nd year students was significantly higher than those of the 1st year students (Table 6).

According to the type of graduated high school there is

Table 4. Piano performance self-efficacy levels according to the type of graduated high school.

		Type of High School	N	$\bar{x}$	sd	p
Scale	Piano Performance Self-Efficacy	Fine Arts H. S.	106	2,64	0,46	.085
		General H. S.	23	2,88	0,51	
		Type of High School	**N**	$\bar{x}$	**U**	**p**
Sub-dimensions	Technical Level Perception	Fine Arts H. S.	106	2,73	177,5	,044
		General H. S.	23	1,92		
	Stage Anxiety Perception	Fine Arts H. S.	106	3,77	283,5	,003
		General H. S.	23	3,70		
	Performance Level	Fine Arts H. S.	106	2,89	238,5	,008
		General H. S.	23	2,76		

Table 5. Music performance anxiety levels according to gender.

		Gender	N	$\bar{x}$	sd	t	p
Scale	Music performance anxiety	Female	81	3,12	1,29	1,29	0,19
		Male	48	2,82	1,30		
			N	$\bar{x}$		**t**	**p**
Sub-dimensions	Negative performance perception	Female	81	3,19		1,66	0,09
		Male	48	2,76			
	Psychological helplessness	Female	81	2,73		1,84	0,05
		Male	48	2,94			

Table 6. Musical performance anxiety levels according to grade level.

		Grade	N	$\bar{x}$	sd	p	
Scale	Music performance anxiety	1st year (A)	31	2,75	1,27	.042	
		2nd year (B)	34	2,94	1,22		
		3rd year (C)	32	3,38	1,19		
		4th year (D)	32	2,96	1,51		
		Grade	**N**	$\bar{x}$	**F**	**p**	**Significant difference**
Sub-dimensions	Negative performance perception	1st year (A)	31	2,21	5,225	,003	A-C
		2nd year (B)	34	2,16			
		3rd year (C)	32	2,96			
		4th year (D)	32	2,14			
	Psychological helplessness	1st year (A)	31	2,51	9,488	,009	A-D
		2nd year (B)	34	2,57			
		3rd year (C)	32	2,49			A-B
		4th year (D)	32	2,65			

Table 7. Musical performance anxiety levels according to the type of high school.

	Scale	Type of high school	N	$\bar{x}$	sd	p
Scale	Music Performance Anxiety	Fine Arts H. S.	106	2,87	1,24	,06
		General H. S.	23	3,44	1,39	
		Type of high school	**N**	$\bar{x}$	**u**	**p**
Sub-dimension	Negative Performance Perception	Fine Arts H.S.	106	2,44	2,325	,000
		General H. S.	23	2,08		
	Psychological Helplessness	Fine Arts H.S.	106	2,50	2,191	,009
		General H. S.	23	2,17		

Table 8. Correlation between the piano performance self-efficacy sub-dimensions and musical performance anxiety scale.

Dimensions	Technical level perception	Stage perception	Performance level perception	
Musical performance anxiety scale	r=0,07	r=-0,47	r=0,20*	Piano Performance Self-Efficacy
				r=-0,08*

Significance level according to *p<0,05.

not any significant difference between Fine Arts High School and general high school in terms of music performance anxiety. However than the average of the general high school graduate pre-service music teacher' means seems to be higher. In the sub-dimensions of negative performance perception and psychological helplessness, the significant difference is in favour of the Fine Arts High School graduates who had a higher means (Table 7).

In the correlation between the dimensions of both scales, a negative significant relationship was observed between the musical performance anxiety scale and the piano performance self-efficacy.

Moreover, it was also observed that there was a negative significant relationship between the musical performance anxiety scale and the stage perception and there was a positive significant relationship between the musical performance anxiety scale and the performance level perception (Table 8).

DISCUSSION

In relation to the pre-service music teachers' piano performance self-efficacy belief levels, the following interpretations can be made:

a) Interpretations due to piano performance self-efficacy levels according to gender:

In this study, the male pre-service music teachers' piano performance self-efficacy scale score mean was found significantly higher than that of the female pre-service music teachers. The obtained results were parallel to those obtained in the study made by Özmenteş and Özmenteş (2008) with the aim of investigating the relationships between the self-efficacy beliefs and personal characteristics related to the musical aptitude in instrument playing and also the ones obtained in the studies made by Zimmerman and Martinez-Pons (1990) and Nielsen (2004). However, the findings overlap those obtained in the study made by Çevik (2011), who found that the female pre-service music teachers perceived themselves as more competent than the male pre-service music teachers in the field of music education. According to the variable of gender, in some studies investigating the general self-efficacy levels, no significant differences were found between two genders (Akkoyunlu et al., 2003; Işıksal et al., 2003; Yaman et al., 2004; Altunçekiç et al., 2005; Akbaş et al., 2006). In this study, the reason why the male pre-service music teachers' self-efficacy beliefs were higher than the female students might be the male students' taking the stage in the places of entertainment and having the chance to make music more frequently than the female students. Confidence in playing a musical instrument is in direct proportion to the time spent on the instrument. It can be concluded that this situation and also positive supportive feedback received from the audience are two factors increasing self-efficacy

beliefs.

b) Interpretations due to piano performance self-efficacy levels according to grade level:

When the analysis was made on the basis of grade level, difference was in favour of the 3rd year students. It can be stated that pre-service music teachers' self-confidence levels increase as their field knowledge increases with the advancing years. It was observed in the technical level perception sub-dimension of the piano performance self-efficacy beliefs of the pre-service music teachers that the 3rd year students had a higher technical level perception compared to the 1st year students. This result was foreseen because in 4th year piano course is elective course. Many students do not choose piano course. When the stage anxiety perception sub-dimension was taken into consideration, no significant differences were determined between the classes. This finding obtained in this study shows consistency with the finding obtained in the study where Gün (2014) emphasized the fact that the pre-service music teachers' stage anxiety perceptions did not differ according to their class levels.

c) Interpretations due to piano performance self-efficacy levels according to the type of graduated high school:

According to the type of graduated high school there is not any significant difference between Fine Arts High School and General High School in terms of piano performance self-efficacy. However the average of the general high school graduate pre-service music teachers' means seems to be higher. Statistically significant differences were determined in the technical level perception, stage anxiety and performance level perception sub-dimensions. In technical level perception, stage anxiety perception and performance level sub-dimensions the means of the Fine Arts High School graduate pre-service music teachers were higher than those of the general high school graduate pre-service music teachers. In the study made by Gün (2014), similar results were obtained. The Fine Arts High School graduate pre-service music teachers come to the Music Education Division with a music education accumulation of four years which they took in high school. Most general high school graduate students start piano education in the music education division. That the Fine Arts High School graduate pre-service music teachers' technical level perceptions and performance level perceptions were higher than those of the general high school graduates can be explained by this reason.

In relation to the pre-service music teachers' musical performance anxiety levels, the following interpretations can be made:

a) Interpretations due to musical performance anxiety Levels according to gender:

Although there is not any significant difference the music performance anxiety levels, general scale score means of the female pre-service music teachers were higher than the means of the male pre-service music teachers. In the literature, there are some studies supporting this result (Abel et al., 1990; Rae et al., 2004; Yöndem, 2007; Studer et al., 2011; Çırakoğlu et al., 2013; Tokinan, 2014), there are others where no differences were found acccording to the variable of gender (Van Kemenade et al., 1995). Tokinan (2014) reported that in the clinical environment women were more frequently diagnosed as having psychological disorders than men. That the performance anxiety, which was defined by Kenny as a psychological disorder, is observed more frequently in women like in other psychological disorders supports the findings of this study. When the sub-dimension scores were taken into consideration, in negative performance perception there is not any significant difference however female pre-service music teachers have higher means. In Psychological helplessness sub-dimension the male pre-service music teachers' means were significantly higher than those of the female pre-service music teachers.
According to the results female students who have low self-efficacy in piano performance anxiety and high music performance anxiety strengthen the negative relationship between music performance anxiety and piano performance self-efficacy.

b) Interpretations due to musical performance anxiety levels according to grade levels:

When the grade level was taken into consideration, the general scale score mean of 3rd year students is higher than that of other grades. In the negative performance perception sub-dimension, the scale score mean of the 3rd year students was significantly higher than that of the 1st year students. In the psychological helplessness sub-dimension, the scale score mean of the 4th and 2nd year students was significantly higher than those of the 1st year students. Starting from the 1st year until the 4th year, the music pieces included in the piano course program are arranged from easy to difficult. It is considered that this might have resulted from the music pieces with increasing difficulty level. However, this overlaps the finding obtained by Hamann (1982) that experienced students taking education for longer period of time exhibited better performance in front of the audience in anxiety environment compared to less experienced students.

c) Interpretations due to musical performance anxiety levels according to the type of high school:

According to the type of graduated high school there is

not any significant difference between Fine Arts High School and general high school in terms of music performance anxiety. In a study, Tokinan (2014) also found that musical performance anxiety did not differ significantly according to the type of graduated high school. However in our study the average of the general high school graduate pre-service music teacher' means seems to be higher. Because most of the general high school graduated pre-service music teacher start to play the piano in the music education division their levels are not as high as Fine Arts High School graduates. Performance anxiety of general high school graduates can be explained with this.

In relation to Correlation between the Piano Performance Self-Efficacy Sub-Dimensions and Musical Performance Anxiety Scale the following interpretations can be made:

There was a significant negative relationship between the students' musical performance anxiety levels analysed in accordance with the data obtained from the scale answered by the students by considering their "piano performance self-efficacy beliefs and piano performances". That's to say, as the students' piano performance self-efficacy beliefs decreased, their musical performance anxiety levels increased. In some studies, similar results were reached. In their study, McCormick and McPherson (2003) found a strong relationship between the self-efficacy belief and the musical performance quality. Moreover, Topoğlu (2014) determined a small significant negative correlation between the pre-service music teachers' state anxiety levels and their self-efficacy beliefs related to their musical abilities as well. Furthermore, Mcquade (2008) reported that there was a significant negative relationship between self-efficacy and performance anxiety and as self-efficacy decreased, performance anxiety increased.

RECOMMENDATIONS

Based on the results of this study, it can be stated that there is a need for studies to investigate possible reasons for low piano performance self-efficacy belief levels in all students, particularly female students. After investigating possible reasons, necessary precautions should be taken to increase piano performance self-efficacy belief levels of the students that have low piano performance self-efficacy, particularly female students. For this reason, it is suggested that piano instructors should rearrange conditions of working with students having low self-efficacy belief levels. Such matters as selection of music pieces, time allocated for practicing, working environments, points to consider in playing musical pieces, etc. should be discussed by higher education board and the necessary changes in the curriculum should be done.

The strongest factor affecting students' self-efficacy beliefs is performance achievements (Arslan, 2012). Positive experiences lived by individuals help increase their self-efficacy beliefs (Özkal, 2013). Levels of music pieces to be played by students can be reviewed within this context and they can be made to taste the feeling of success with music pieces which students can overcome. It is believed that as a student's sense of success increases, his/her self-efficacy belief increase, too (Arslan, 2012).

According to Arslan (2012), indirect experiences, too, are an important source of self-efficacy belief. In indirect experiences provided by social models, individuals are affected by what they observe and their beliefs related to what they have increase (Özkal, 2013). Starting from this, students can be provided with an environment in which students playing music pieces with similar difficulty levels can have an opportunity to watch one another and then successful student behaviours can be shown as examples to students with low self-efficacy belief levels. Hence, it is considered that the piano performance self-efficacy belief level of a student seeing his/her friend play a musical piece successfully might increase. Moreover, their performances can be recorded step by step and their developments can be shared with other students. Hence, it is believed that the self-efficacy belief level of a student witnessing another student's development process can increase.

If individuals are convinced verbally that they have necessary abilities to complete given activities, they exhibit more effort and perseverance when there is a problem that those who feel personal incompetence and self-suspicion (Özkal, 2013). It is also believed that verbally persuading students that they can do their performances most successfully can increase their piano performance self-efficacy beliefs. When students take supportive feedback from their families, teachers and peers, their confidence levels increase.

Self-efficacy is an important feature related to the affective domain. According to Bandura (1995), individuals' psychological states at the same time affect their judgments in relation to their personal competencies. Positive psychological state increases perceived self-efficacy, but hopeless psychological state decreases self-efficacy (Cited by Özkal, 2013). For this reason, it is necessary that piano educators should follow developments about their students carefully.

With this study, it was observed that as the students' piano performance self-efficacy beliefs increased, their musical performance anxiety levels decreased due to various reasons. It is believed that students' music performance anxiety levels can be minimized via taking the stage frequently.

In this context, it is suggested that activities should be organized to have piano students frequently live this experience and not only those who have high technical

skills but also those who are at every level should be encouraged. This will allow students for creating regular studying discipline.

Musical performance anxiety is a frequently encountered problem among musicians. For this reason, it is suggested that the Music Education Divisions should include methods of coping with musical performance anxiety within the scope of elective courses or among the subject matters of the current courses in their teaching programs and also courses or subject matters to increase students' awareness levels in relation to self-efficacy beliefs.

Conflict of Interests

The author has not declared any conflicts of interest.

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Full Length Research Paper

Schema-based text comprehension*

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Schema is one of the most common terms used for classifying and constructing knowledge. Therefore, a schema is a pre-planned set of concepts. It usually contains social information and is used to represent chain of events, perceptions, situations, relationships and even objects. For example, Kant initially defines the idea of schema as some natural structures that enable us to comprehend nature. According to the perspective of Kant who is a strong nativist, the provided opportunities of human mind help us to comprehend temporal relations and their components. In the 1930s, a content of schema idea similar to Kant's was represented again in a more planned and intentional way by Bartlett from Cambridge University in his study "Remembering: A Study in Experimental and Social Psychology (1932/reprint,1950)" Therefore, it is vital for readers to compute information using textual or discourse-related means and integrate their background information in the boundries of textual content and context. Although it is related to the past, Bartlett's approach "[s]chema is an active organization of past experience and reactions. Environmental stimulus contribute to these organized schema" is successful to protect its effects even in today thanks to abstraction of linguistic ideas (cognitive psychology and language), language processing and examination of memory in its natural context. Considering that children who attend elementary school constantly live in close contact with "verbal or written discourse products", the only certainty for all these efforts to comprehend is that it is necessary to continue to produce data for all grade levels until a more integrated approach, supported by more comprehensive and reliable data, is developed. Considering that the research on text interpretation processes have not yet provided an applicable, stand alone alternative, it is evident that such an alternative must benefit from a versatile and interdisciplinary network of information. Furthermore, it is known in the literature on the subject that countless discussions have been and will be held around the scope in question. For instance, despite all the scientific discussions, no assumptions on the nature and processes of text interpretation independent of statements of other fields can be developed.

Key words: Schema, world knowledge, text/discourse structure, information processing.

INTRODUCTION

Cognitive psychology, a field of psychology associated with information processing and how humans use it, focuses on how such mental faculties as senses, memory and reason work (Britton and Black, 1985; Dirven, 2002). This field was first pointed out by Glass et al. (1979). İn the early 80s. They associated cognitive psychology with

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the question, 'how knowledge is activated and used by humans' and studied senses, memory and reason' (Dirven, 2002; Ashcraft, 2002; Eysenck and Keane, 2003). Therefore, cognitive psychologists are actually interested in how knowledge is stored in human mind. They are striving to unravel this mystery. Hence they need some descriptions of knowledge. Another important distinction is between exemplary description and analytic description. To account for this, Werth (1999: 29) proposes that the exemplary description of an item is the description of which specific ways look like that item and exemplifies this by showing a map and how it symbolizes places. According to Werth, similarity can actually be based on theoretical and cultural models. Furthermore, it can be figurative – the reason why Gardner thinks it is a mistake to consider emphasis in culture. He states that this can be exemplified by such numeric units as the speed, degree and forward/backward moving time of the description of the continuous properties. Therefore, he suggests considering mental descriptions as exemplary (integrity), experimental (such as the content of stored according to perceptual integrity) or as complex movements (such as doing your shoe laces). He also sees some of the codes in language as analytic descriptions.

There is plenty to say about human knowledge apart from the descriptive and associative concepts. Most of what is known is structured in a complex manner. Humans trying to interpret the world frequently use categories and mental schema associated with them. For example, Bilgin (2003: 55) argues that people use two different types of approach depending on the properties of their motives and the situations they find themselves, posits that these approaches are either theory driven or data driven, and every human has some specific conceptual knowledge. Humans will both foresee what is going to happen and acquire new information that will enable them to interpret what is happening right now by using this knowledge. Also, this knowledge will take effect in every new acquisition. Asch reports that groups of subjects who were handed lists of adjective where only a single word differs from the other list had different impressions of the target subject. Asch argues that this is due to the fact that different mental structures or schema were stimulated in the subjects.

To prove the aforesaid mental framework, Bartlett attempted to restructure the concept of schema[1].

Accordingly, a schema or schemas are the graphical representations of outlines or models. They are also organized facts on a specific element in the world. Therefore, it is implied that stereotype information is more or less, similar for all language users in a specific culture. For instance, the word 'house' is associated with a different thing for all language users. However, the stereotype or encyclopedic information is unchanged for everyone. A house comprises a kitchen and rooms. It may have a front door and a leaky roof. It can be rented or purchased. Hence, the Schema Theory points to information clusters about well-associated world, events, people and actions. In this respect, possibilities (Deals with information on events and the consequences of events) and frameworks (Deals with information on the properties of objects and places) are types of more detailed schemas (Sanacore, 1985; Lorch and van den Broek, 1997; Ashcraft, 2002; Eysenck and Keane, 2003).

Bartlett had a special interest in how the memories and reminiscences of people are shaped by their expectations. As such, he defended that the expectations are mentally presented with schematic models and somehow take effect to shape experiences. In a famous experiment, a North American Indian Folk Story was presented at different times to English subjects to be memorized. Although the folk story comprised numerous elements and causal structures that are foreign to the western style expectations, the subjects re-told the story instead of remembering it word-for-word (Eysenck and Keane, 2003: 252-254). However, this re-telling did not

[1] Despite the issues with Bartlett's processes, Eysenck and Keane (2003) indicate that the evidence affirming his fundamental findings are attained from well-checked studies, presenting their remarks based on the said studies as follows:

> *For example, Sulin and Dooling (1974) provided some participants with a story about Gerald Martin: "Gerald Martin struggled with the underground administration to realize his political purposes... He became a cruel, uncontrolled dictator. The latest effect of his rules was the collapse of his country" (Sulin and Dooling, 1974). Other participants were given the same story, but the character's name was changed to Adolf Hitler. When the participants that were told a story about Adolf Hitler reading the sentence "He hated the story characters and tortured them", they, to their mistake, believed it more than the other participants. Their schematic knowledge of Adolf Hitler distorted the information about the story. Bartlett estimated that such distortions appear in the long-term memory rather than the short-term memory. There are doubts that some of Bartlett's findings can be repeated under more natural conditions. Wynn and Logie (1998), in various interviews of intervals varying from two weeks to six months, conducted tests to remind students of their "real life" experiences in their first weeks in college. Their results were: "The emergence that occurs throughout this timeline without any change after a time points to the use of very little configuring processes" (Wynn and Logie 1998). The reason for such failure in part may be that the students can only utilize a limited amount of schema-based processes. Whatever the explanations are, the findings demonstrate very little applicability of Bartlett's findings. Another assumption by Bartlett (1932) is that memory distortions are generally caused by schema-based reconfiguring processes activated during recalling. As we have seen in Bransford and Johnson's (1972) work, diagrams frequently influence perception processes rather than remembrance processes. However, schemas also occasionally affect recalling information in the long term memory. Pichert (1978) asked participants to read a story in terms of a robber or someone who wants to buy the house. After memorizing the story, they were asked to take the alternative aspect and to re-memorize the story. In the second memorizing, the participants memorized more information or schemas, compared to the first one, which is more important in the second aspect. Such evidence supports the idea of remembering schemas (pp. 353-360).*

Comply with the western style of narration, as demonstrated in the example below.

An original part of the story war of the ghosts and the same story retold by a subject (Bartlett, 1950, P. 65-76)

War of the ghosts

One night, two young men of Egulac went down to the river to hunt seals, at which time the fog came down to the river and became quiet. Then, they heard sounds of battle and thought "It may be a war party". They ran to the shore and hid behind a tree trunk. Canoes arrived and they heard oars. They saw a canoe coming towards them. There were five persons in the canoe and they said "What are you thinking? We wish to understand you. We are going to fight the folk up the river".

One of the young men went along, but the other returned home…(It turns out the five men in the boat are ghosts and the young man accompanies them in their war, then returns to the village to tell his story) … Take care, I have accompanied ghosts and we fought. Many of our comrades were killed, many of the attackers died. "They said I was shot, but I did not feel it", he said. He told all then stopped. When the sun rose, he collapsed. Something black came out of his mouth. His face bent over… He died.

Brief presentation of the story

One night, two young men of Egulac went down to the river to hunt seals, at which time the fog came down to the river and became quiet. Then, they heard sounds of battle and thought "It may be a war party". They ran to the shore and hid behind a tree trunk. Canoes arrived and they heard oars and saw a canoe coming towards them. There were five persons in the canoe and they said "What are you thinking? We wish to understand you. We are going to fight the folk up the river".

One of the young men said "I don't have any arrows".
"The arrows are in the canoe", they answered.
"I cannot come with you, I could be killed. My relatives don't know where I went", turning to the others "But you can go with them", he said.

Thus, one of the young men went with them. But the other returned home. So, the warriors went up the river, while the rest returned to the town. The villagers came near the shore and began to fight and many were killed. But the young men suddenly heard one of the warriors say, "Let's go back, the villagers are hit" and thought "they are ghosts". He did not feel injured, but they said he was hit. Thus, the canoes returned to Egulac and the young man went home through the shore. He lit a fire. He told what happened to many people and said "Take care, I accompanied ghosts and went to fight alongside them. Many of our friends were killed and many of those attacking us were killed. They said I was hit, but I did not feel injured". He told all of these then stopped. When the sun rose, he collapsed. Something black came out of his mouth. His face became grim. People jumped and cried. He was dead.

The story retold by a subject (two weeks later)

There are two ghosts. They are by the river. There is a canoe in the river holding five men. There, the war of the ghosts began… As it started, many were injured and many died. A ghost was injured, but did not feel sick. He returned to the village in a canoe. The next morning, he felt sick and something black came out of his mouth and they shout "he's dead".

A brief presentation of the story retold by a subject (two weeks later)

Two young men of Egulac went to catch fish. While they were busy with the work, they heard sounds from a distance. One of them said "These are war cries" and "there will be a battle nearby". As they went up the river, some warriors appeared who asked them to join in.

Due to his family, one of them asked them to excuse him and said "I cannot come", "I could be killed". So, he returned home. On the other hand, the other men joined the party and went up the river in canoes. As they were landing, the enemies emerged, running towards them. One of them was finally injured and the group realized they were fighting ghosts. The young man and his friends went back to their homes in their boats.
The next morning, he was telling his adventures to his friends. Suddenly, something black came out of his mouth and he fell down in screams. His friends surrounded him. Unfortunately, they realized he was dead.

The differences in the presentations of the above story are quite remarkable. Many details in the original story disappeared in the other versions. In the story taking place in Egulac, the men hear the sound of oars and hide behind a trunk. But this piece of information is not present in the story as it is retold. Furthermore, the presentation of the story took a more modern shape. For instance, "due to his family". Also, in the original story, a war party

is set to make war on people. In the other version, this is a trip. In the original story, the protagonist is hit, while in the retold story, that person is plainly "someone". Moving on the question of "How can this and many similar variations be explained?", Bartlett defended that the remembering of the stories is affected by the recipient's mental framework. In this, he thinks of associating the processing of new information with the use of old information. Thus, this mental framework presents evidence that new events are integrated with existing information structures (With respect to the story above, the information relates to the Indians). However, this mental framework also leads to warping or distorting new facts (Ashcraft, 2002; Eysenck and Keane, 2003).

According to Bartlett, western subjects reading this story will adapt to their own information framework. "Hunting seals" in the original story will turn to the more familiar "fishing", "war cries" (shouts) and "warriors" will be transformed to "enemies". Therefore, Bartlett (1932) believes such information can be analyzed using the various categories listed below (Solso et al., 2005):

> ***Transformed Information****: Unknown words are replaced by known words.*
> ***Transformed Sequence****: Some events in the story will be shown to have taken place before and after others.*
> ***Omissions****: Information that seems meaningless or not fulfilling the subject's expectations will not be remembered.*
> ***Logicalization****: Some information is added to the story to make the non-complying parts of the story compliant or reasonable.*
> ***Prominent Subject****: Some subjects become more prominent and some features are associated with that subject.*
> ***Participant's Attitude****: The degree of remembrance is determined by the participant's attitude towards the material (p. 334).*

On the other hand, schemas are also important for processing linguistic information. For instance, Schank and Albelson (1977) pointed to the possibility of a restaurant that involves going to the restaurant to eat (information on the general chain of events). Because, most of the information used to facilitate understanding what is heard and read, consists of schemas. Another significant function of diagrams is to enable establishing expectations. For instance, we expect to be shown to the table and the waiter to take our orders for food and beverages in a restaurant. If any of these expectations are interrupted, we take the necessary action, such as, if the menu isn't provided, we expect to make eye contact with the waiter. As our expectations are generally fulfilled, the schemas help us to make the world more predictable (Abhcraft, 2002).

Schank and Albelson worked on how people gather the information they use –as can be seen below- in understanding a text (Werth, 1999: 103-105). To this end, they developed the Scenario Theory that aims to focus on the ways to gather information in understanding daily activities, such as going to a restaurant. In this schema, walking and sitting are activities, whilst roles[2] – waiter, etc.- or other sub titles –entering, etc.- are the structural gaps in the schema. Role gaps are filled with values as waiter, customer, cook, etc., by certain people in the environment (situation). For instance, it is unexpected and unusual to see a dog as a waiter, and this unforeseen event causes extra activity (in the brain). General components of the schema are the different versions of structural gaps – taking activities like walking, sitting, etc. into consideration. In this case, it is possible to create structures to complete people's knowledge about daily events (Werth, 1999). For this, Schank and Albelson (Eysenck and Keane, 2003) worked on gaining the knowledge people use to grasp the meaning of a long text, such as the one below.

> *Ruth and Mark were having lunch in a restaurant today. They really liked the food. But they were worried about the price. They were shocked to see the bill that came after the ice-cream was rather reasonable (p. 252).*

When we read the text, we infer that the food (mentioned in the second sentence) is the lunch they had in the restaurant and it included ice-cream, and that the bill did not come on its own, most probably brought by a waiter and we infer these by using our knowledge. Schank and Albelson argue that we need forecasting outline to deduce and uncover the hidden sides of the events. These special outlines they claimed are called schema. They are also knowledge constructions that organize conventional clusters of daily events. For instance, if you occasionally eat in a restaurant, you have an "eating" in a restaurant schema, that is "Restaurant Schema" (Lorch and van den Broek, 1997; Ashcraft, 2002; Eysenck and Keane, 2003). This Restaurant Schema developed by Schank and Albelson has four main parts; "entrance, order, eating, leaving. These main parts have subparts as

[2] For instance, an occasion where the food is served by a chimpanzee or a unicycle rather than a waiter. Schank proposed more versatile information schema organizations like memory organization packages. But symbolic information blocks, even the ones proposed by Schank (1973, 1975, 1977), are not versatile enough to explain human cognition. For this reason, cognitive psychologists focused their attention to neural networks, that is to computer models that (more or less) simplifies our understanding of human neural system (Werth, 1999; Ashcraft, 2002; Eysenck and Keane, 2003). In these neural network models, information is programmed by the researcher but it is perceived as he processes the input and gets a feedback about its performance (McClelland, Rumelhart, & PDP Research Group, 1986). Output produced by the system in supervised learning paradigms (i.e. a positive response to confirmation) is considered right or wrong by the supervisor (Anderson and Lebiere, 2003: 591-592).

well, such as entering the restaurant, looking for a table, thinking about where to sit, heading to the table and sitting" (Eysenck and Keane, 2003: 254).

It is better understood by the example above that, neither genre specific knowledge nor more special linguistic clues are enough on their own to define the processes of grasping. Comprehenders use different versions of older knowledge to understand the defined situations. Besides, using older knowledge is necessary to comprehend the expression (Anderson and Lebiere, 2003). This example also shows that comprehenders sometimes need to change or shunt their previous knowledge to grasp the true meaning of an expression. Thus, fully grasping different expressions require lowering our expectations of the reality of the defined situation (fairy tales, science fiction novels, etc) and predicting special violations of normal expectations. For instance, in a fairy tale, it is expected to see characters with magical powers or talking animals, but not spaceships or other futuristic technologies. Similarly, futuristic technologies are expected in a science fiction story, but not talking animals or magic wands. For this reason, acquisition and application of former knowledge is more important in grasping expressions (Zwaan and Rapp, 2006: 726-728).

It can be seen that main problems in Schema Theory were not ignored. Because of the unscrupulous nature of Schema Theory, many researchers agree on its being unprincipled. Eysenck and Keane (2003: 256-257) present a comprehensive analysis of views on problems of schema theory introduced by researchers by taking integrity problem and coordinating schema fact into consideration as follows:

> *Schema theory has been used as it is always possible to create a certain concept for information blocks. Schank has been working on this problem by aiming to limit probable blocks in long-term memory, but the theory is still not clear. Problem still exists. For example, what are the certain contents of these blocks? So in general, schema theory is good at analysing results, but it is not as forecasting as expected. There are two solutions to this. First, theorist can at least demote the contents of the used blocks to definable condition. So, if you are using dynamic memory theory, you can identify possible schema to be used. Unfortunately, when we take vastness of human knowledge and possible changes of knowledge blocks in different people into consideration, this becomes almost impossible. Another option is to be more vivid than today in how to gain these blocks. If we have more information on this, we can be able to test how chosen experiences transform into more controlled form. Although dynamic memory theory was presented to overcome the integrity of Schema Theory, some leading theorists still believe that intuitive integrity of the approach is still not noticed in any current schema (Rumelhart et al., 1986a). For instance, Rumelhart and Ortony (1977) claimed that structural gap variants in schema have two differentiating properties. First, as stated before, a certain object must be tested to see if it is a suitable filler for a structural gap or not. Second, structural gaps must have mutual attachment, that is, if a gap fills a specific value, then value in the schema must start a change in the faulty value of the structural gap. For instance, let us assume a room schema with gaps for furniture. There are small objects in the room and the room is of normal size; then the following structure would be faulty for a kitchen schema; furniture, a kitchen table, chair; small objects, cup, bread box; size, small. There would be different faults in the other rooms. Bathroom is also small. But there is toilet, shower and washbasin. There are toothbrushes as small objects. Rumelhart et al. (1986a) solved these problems with a connecting approach of the schema. According to this, schema emerged after a need out of relationship between numerous interconnecting parallel processing parts. In this framework, there are no clear schema but action models that affects schema in the previous study. When the input is taken from a parallel path, some components in the path are active while some are passive. Rumelhart et al. showed the usefulness of the framework by coding schema-like info in a connecting path. Firstly they chose 40 definition (i.e. door, small, washbasin, walls, medium, etc.) for four different room types (i.e. kitchen, bathroom, bedroom, etc.). Test subjects were asked if each defining word completed the room in their imagination to get the main information, that is the path (pp. 256-257).*

Bartlett states that textual information is systematically distorted by the reader to cross match –in the memory- it with his cultural and real knowledge and this distortion increases in time. In fact, various following researches in textual processing period are based on the theoretical framework he developed. Moreover, Bartlett differentiated the mental presentation of the reader with the text's surfacing presentation. This differentiation is backed up by pioneering researches on textual processing. On the other hand, Bartlett states that readers are trying to make meaning out of both their pre-existing knowledge (rendition) and internal organization (Bransford and Franks, 1971; Schnotz, 1984; Britton and Black, 1985; Britton and Gulgoz, 1991; Lorch and van den Broek, 1997; Berman and Nir-sagiv, 2007). In various studies in harmony with his statement, it is seen that in understanding a text reader's memory for a text, that is text's topic, is important. Mentioned studies also show that a reader's under-

standing a text mainly depends on his accomplishment in associating[3] his pre-existing knowledge with the text's content (Schnotz, 1984; 54-55; Bransford and Johnson, 1972). In connection with these findings, many studies on educational psychology point out that suitable pro-regulators help readers in analyzing textual consistency (Ausubel, 1960; van Dijk and Kintsch,1983; Mannes and Kintsch, 1987: 91-93; McNamara et al., 1996: 1-4; Halldorson and Singer, 2002: 145-146; Berman and Nir-sagiv, 2007: 90-93; Tracy and Headley, 2013).

There are two more non-behaviorist centered and interconnected sources different from Bartlett's Schema-Theoretic Approach (Anderson and Bower, 1973). Both sources have been examined by education psychologists that aim to apply the experimental studies on memory to classroom learning. For instance, in one of these studies, it has been analyzed if the Interference Theory, developed to explain Paired Associate Learning, satisfactorily defines forgetting a text. In fact, testing conditions and interference effects, when a text made carefully, are correlated to their connected expression (Myrow and Anderson, 1972). But the conditions that the argument is observed are proportionally limited. Hence, theory is viewed as "lacking qualifications to explain memory for a text". In short, Schema Theory was very popular in the 1970s and was tried to be updated. These theories came up in different forms. For instance, Schank's (1972) Conceptual Dependency Theory associated schema with connectional theories. Rumelhart et al. used it to present Story Grammar, that forms a basis to story comprehension (Rumelhart, 1975; Stein and Glenn, 1979; Thorndyke, 1977). In terms of developmental psychology, Piaget (1967, 1970) used schema thought to explain cognitive changes in children. Schema also includes organized sentence patterns, suggested by Schank and Albelson (1977) to test people's knowledge about daily situations, named as scenarios. Rumelhart and Ortony (1977) and Rumelhart (1980) argue a use of a general schema. For artificial intelligence, Minsky (1975) suggests a similar structure named framework, included to visual perception (Lorch and van den Broek, 1997: 213-217).

In addition to these in terms of on which topics schema theory focuses, Akyol (2006: 36-37) focuses on how new knowledge is integrated with the older, how it is learnt, how the learnt is changed and developed, and how they are used. Akyol also emphasizes, "This theory suggests that schema are always open to development. There is never a complete schema. When the concepts in the schema are considered in terms of their relationship with other concepts, there is always a development and an enlargement. It is seen that there is only one thing certain for these understanding efforts, that is the notion of continuing to develop data for every possible condition, whether it is controversial or not, until obtaining a more integrative approach supported by more comprehensive and reliable.

Conclusion

Although there is a short history of the study in understanding text, an important portion of elucidatory ideas was implemented by schema, script and frame (Schank and Albelson, 1977; Minsky, 1975; Werth, 1999: 103-105). According to this notion, knowledge merges with other information that can be connected around an object's main features or the main point or action of a suitable and available clusters of a thing. The effectiveness of schema rationale in terms of teaching applications, although they are less effective today than before for comprehension studies, became more perceivable because of the development of connecting learning processes by the researchers (Linderholm et al., 2000). This is more tangible today than before. As it can be understood by this, the essence of schema centered comprehension depends on the coupling of text and schema.

Considering that children who attend elementary school constantly live in close contact with "verbal or written discourse products", the only certainty for all these efforts to comprehend is that it is necessary to continue to produce data for all grade levels until a more integrated approach, supported by more comprehensive and reliable data, is developed. Considering that the research on text interpretation processes have not yet provided an applicable, stand alone alternative, it is evident that such an alternative must benefit from a versatile and interdisciplinary network of information. Furthermore, it is known in the literature on the subject that countless discussions have been and will be held around the scope in question. For instance, despite all the scientific discussions, no assumptions on the nature and processes of text interpretation independent of statements of other fields can be developed.

[3] A similar situation is also viable to a descriptive texts, some kind of a template. When the plexal connection of the descriptive text is made schema relationship is used, just like story texts. Along with these, whether the readers have a mental schema about the content of the text or not makes the understandability of the text easy or difficult (Bartlett, 1932/1950; Bransford and Johnson, 1972; Schnotz, 1984: 55; Berman and Nir-sagiv, 2007). Thus, schema not only includes information about tangible elements but also the relationship between various elements. Hence, if the readers have pre-existing schema related to the information provided in the text, they understand the text more easily than those who have not. This is the reason why Anderson (1984) "defines schema as the organized form of earthly knowledge" (Lorch and van den Broek, 1997; Linderholm, Everson, van den Broek, Mischinski and Samuels, 2000: 532-533; Ashcraft, 2002; Eysenck and Keane, 2003).

Conflict of Interests

The author has not declared any conflicts of interest.

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Full Length Research Paper

The relationship between self-confidence and learning Turkish as a foreign language

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The purpose of this study is to identify whether there is a relationship between learning Turkish as a foreign language, and to what extent, if there is such a relationship. A screening model was used in this qualitative research study. Finding out the existence of a relationship between the subjects' self-confidence, and their success in learning Turkish as a foreign language was aimed without modifying or influencing them. Participants of the study included 53 students attending A1 level Turkish as a foreign language program of the Aristotle University of Thessaloniki. Two different tools including a *survey* and a *final exam* were used to collect data. The final exam results and the survey data were transferred into SPSS. All percentages, statistical comparisons, and ratings were figured out using the SPSS software. At the end of the study, it was concluded that subjects with higher self-confidence were more successful than the subjects with lower self-confidence, and self-confidence led to a more positive outcome in learning Turkish. It was also concluded that speaking more than one language had a positive effect on learning Turkish.

Key words: Self-confidence, foreign language achievement, Turkish as a foreign language.

INTRODUCTION

According to the dictionary of modern Turkish by Turkish Language Association, self-confidence is a *feeling of self-assurance*. On the other hand, according to Rubio (2007), the most recognized definition is *a feeling of self-competence required to handle basic problems in life, and be happy*. Self-confidence means an individual's self-assessment and self-esteem (Timirli, 2013; Annissa and Hacene, 2011). Self-confidence is a sense that has been present in every individual since their childhood, and that has two main components such as *lovability* and *competence* (Mutluer, 2006, p. 8). Based on these definitions, self-confidence can be considered as a cognitive human perception that plays important roles in fulfilling basic human requirements such as happiness and success. Self-confidence can play an important role not only in school life but in personal and social lives as well, and therefore, at every stage of life towards success. It is evident that self-confident students are enthusiastic, study harder, have higher motivations, and do not quit when difficulties confront them (Bong, 2002; Pajares and Miller, 1994; Zimmerman and Kitsantas, 2005). This can be seen as a positive effect of self-confidence on students' achievements. Bandura (2006) explains this in association with being purposefulness.

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Bandura suggests that purposefulness has an effect on individuals with certain purpose to make future plans and have strategies. High motivation in self-confident foreign language students who can stand firm against any hardship can be associated with the purposefulness linked to their self-confidence in foreign language learning.

Rubio (2007) in the volume of the book about the correlation between the self-confidence and foreign language learning, named *Self-Esteem and Foreign Language Learning*, edited by him mentions that generally two topics are discussed in self-confidence studies. These are (1) self-confidence; a result of or cause of academic achievement, and (2) the relation between academic achievement and self-confidence. Rubio suggests that these studies have different outcomes. It can be claimed that there is a correlation between competence and self-confidence. According to Rubio (2007), these two concepts are discussed under two titles such as activity and achievement. Some researchers suggest that there is a correlation between the sense of self-competence and the cultural background of individuals (Dessi and Zhao, 2011; Heine et al. 2001; Kobayashi and Brown, 2003). The expectations of the society and the individual's competency to meet those expectations can influence the development of competency. Various factors can lower self-confidence; for instance, an individual seeing himself competent for a job may hesitate to start the job because of his or her low self-confidence.

An individual who sees himself competent with language learning might think that he will not be successful in the classroom can be considered as lacking ~~in~~ self-confidence. Rubio (2007) states that cognition is the center of self-confidence, that success or failure is felt cognitively. This brings us to the conclusion that self-confidence is a sense (cognitive) just like anxiety and fear in humans. Many different factors may lead to anxiety and fear just like many different factors may increase or decrease self-confidence. Clark's (1994) study conducted about low self-confidence provided one of the most remarkable findings. According to Clark's study, students who live away from their parents for short or long terms, or who have parents who do not show much interest in them lack in self-confidence. Therefore, the family factor can be effective on the development of self-confidence in young students. Other researchers state that emotional bonds between students and their parents have effects on the development of self-confidence in them and hinder their success (Elliot and Church, 1997; Elliot and McGregor, 2001; Grant and Dweck, 2003). Over-protective parents may hinder the development of self-confidence in little children. Parents who do not want their children to struggle alone against difficulties may cause their children to lack in self-confidence, and deprive them of the feeling of *success,* if they solve all problems before their children. *Criticizing children's personalities, comparing their achievements with other children's achievements, and saying to children "you cannot do it" can be considered one of the factors that hinder the development of self-confidence in children.*

Self-confidence and foreign language learning

In a number of research conducted by different researchers, both positive (Klein and Keller, 1990; Lawrence, 1996) and negative (Roy et al., 2003) correlation between self-confidence and foreign language learning were found out. Rubio (2007) explains this situation by claiming that concept of self-confidence is hard to understand semantically or it can be understood differently. Rubio states that self-confidence has both psychological and social aspects. Low self-confidence may have a negative effect on foreign language learning alongside with many other possible themes. According to Rubio (2007), low self-confidence may lead to some psychological conditions such as sense of insecurity, fear, anxiety, and antisocial behaviors. This may be the case in foreign language learning too. At least, due to low self-confidence, the student will not be able to make a good start in foreign language learning, because low self-confidence affects students' learning motivation (Bong, 2008; Pajares and Miller, 1994). An individual who lacks in self-confidence will most probably have a negative bias towards the course and the classroom. A student will have constant negative feelings like fear of failure, being inadequate, fear of humiliation, and anxiety towards the teacher and course during the class, and refrain from speaking and participating in classroom activities. Low self-confidence can lead to foreign language anxiety (Bağış, 2007; Gardner and MacIntyre, 1989; Horwitz et al. 1986). The foreign language learning abilities of students lacking self-confidence cannot be revealed. Such students cannot socialize properly and refrain from speaking in the classroom.

According to Rubio (2007), there is a correlation between foreign language learning and classroom atmosphere. Foreign language learning classrooms must promote self-confidence. Therefore, creating an environment in which each student will feel self-confident can be considered important. The classroom environments in which students can answer questions without hesitation express themselves without any fear or anxiety of making a mistake or being humiliated by their teacher even if they make a mistake will promote their self-confidence. Therefore, teachers' behavior, feedbacks, and questions they ask to students, and the language teaching activities they are required to take part in are directly correlated with their self-confidence.

Encouraging students to act and speak correctly, giving them feedbacks -especially positive feedbacks- instantly, and offering them in-class activities they will enjoy can

improve their self-confidence. Looking at the correlation between classroom and self-confidence from Bandura's perspective (2006), there is a strong correlation between an individual's sense of self-confidence (and self-competence) and the social group he is in. People are inclined to think like the social group they are in. Therefore, a student's sense of self-confidence can be promoted by other students' sense of self-competence and self-confidence in a foreign language learning classroom with students high in self-confidence.

When mentioning the key points of achieving success in foreign language learning, Arnold (2007) emphasizes that communication among individuals in classroom brings success faster than any material and technique. Ensuring a good communication with students is an achievement of success for foreign language teachers. Only self-confident teachers and students can achieve this success. Self-confident teachers feel comfortable in classroom, and can convey their messages to students without disturbing them. Their calm and confident nature and actions can promote students' self-confidence (Krashen, 1982; MacIntyre and Clement 1977; Öner, 2008).Self-confidence may help foreign language teachers communicate with their students, and promote their students' self-confidence. Studies researching self-confidence (and self-competence) demonstrated that self-confident teachers could have an effect on their students' achievements and motivations (Gibson and Dembo, 1984; Chacon 2005; Eryaman et al. 2013). Self-confident teachers are not complex in nature, can create a relaxed classroom atmosphere for their students, entertain their students while teaching a lesson, teach a foreign language without boring them, act carefully not to lower their students' self-confidence when they need to correct their mistakes, and keep students away from anxieties in classroom, because they do not demand any performance beyond their students' capacities. Therefore, self-confident foreign language teachers can contribute to their students' achievements. Achievement of success plays a role in increasing self-confidence. Teachers should be able to explain clearly what they demand from their students in foreign language classes; in other words, they should be able to explain the purpose of language programs clearly. This will help students to relax, and increase their self-confidence in foreign language learning. Some examples of teacher behaviors and classroom atmosphere that may increase or decrease students' self-confidence in foreign language learning are as follows (Figure 1).

It seems that former studies researching the correlation between the achievement of learning Turkish as a foreign language and self-confidence were insufficient. This study aims to fill this gap. The study was on the students who are learning Turkish outside Turkey (in Greece), and this can be seen as an added value, because practicing the learned language outside the classroom was not possible, and the opportunity of testing the effect of this handicap on the students' self-confidence for foreign language learning was available.

In this study, participants' general self-satisfactory level, their own idea about competence of overcoming a work, and whether they think that their individual abilities tend to increase with hard work were researched. At the end of the study, these results were compared with participants' Turkish class achievements. To exemplify, Turkish class achievements of students who are always self-confident were compared with those who are not satisfied with their achievement in the same class. Students' self-confidence about foreign languages was also researched in this study. The state of considering themselves as sufficient towards foreign languages, number of foreign languages, and the case of thinking that there might be some topics that cannot be learnt despite hard work were researched. Those results also were compared with students' Turkish class achievements. For example, what is the correlation between Turkish class achievements of students who consider themselves competent about foreign languages and the achievements of students who do not consider themselves competent about foreign languages? Those cases were researched in this study.

The purpose of this study is to identify whether there is a correlation between learning Turkish as a foreign language and self-confidence, and in what extent, if there is a correlation.

The research questions to be answered according to the purpose of the study:

a. How are the subjects' senses of competency about their self-confidence?
b. How is the subjects' self-confidence in learning a foreign language?
c. What correlation exists between self-confidence and achieving success in foreign language learning?

METHOD

Information about the model, population, sampling, data collection, and data analysis used in the study are given.

Research design

A screening model was used in this qualitative research study. Screening models are the research models aiming to describe a past or present situation as it is/was without attempting to modify, or influence them (Karasar, 2012, p. 77). The subjects' self-confidence was revealed without modifying or influencing them. The research was carried out using a relational screening model. Relational screening models are the research models used to find the existence and/or the degree of covariance between two or more number of variables (Karasar, 2012, p. 81). In this study, it was aimed to identify the correlation between the subjects' achievements of learning Turkish as a foreign language and their self-confidence,

Situation or Behavior	Expected Result
Humiliating students when they make language mistakes	Decrease in self-confidence
Expecting outstanding success in foreign language learning	Decrease in self-confidence
Explaining the language program clearly	Increase in self-confidence
Language teacher's low level of self-confidence	Decrease in self-confidence
A relaxed foreign language class atmosphere	Increase in self-confidence
A stressed foreign language class atmosphere	Decrease in self-confidence

Figure 1. Examples of behaviors and classroom atmosphere to increase or decrease self-confidence in foreign language learning.

Table 1. Subject distribution according to age and sex.

Sex	f	%	Age	f	%
Man	5	9,4	18-20	6	11,3
Woman	48	90,6	21-23	42	79,2
Total	53	100	24 and over	5	9,4
			Total	53	100

Table 2. Subject distribution according to the number of foreign languages they speak.

Number of foreign language	f	%
1	3	5,7
2	15	28,3
3	21	39,6
4 or more	14	26,4
Total	53	100

and the extent of the correlation.

Participants

The target population of the study included 53 students attending the A1 (beginner level) Turkish as a foreign language program of the Aristotle University of Thessaloniki in Greece. The researcher was a teacher teaching Turkish as a foreign language at the Aristotle University of Thessaloniki. The study included all students attending the A1 level program. All of the students were Greek, and they were attending various programs at the Aristotle University of Thessaloniki.

Table 1 shows the distribution of the subjects according to sex and age. 9,4% of the subjects were men (5 men), and 90,6% of them were women (48 women). Majority of the subjects (79,2%) were in 21-23 age group.

Table 2 shows the distribution of the subjects according to the number of foreign languages they were able to speak. 5,7% of the subjects (3 subjects) were able to speak only one foreign language, 28,3% (15 subjects) two foreign languages, 39,6% (21 subjects) three foreign languages and 26,4% (14 subjects) four or more foreign languages.

Data collection tools

Two different tools, including a survey and a final exam were used to collect data for this qualitative research study. The survey was prepared referring to the article *Correlation Study between Self-Concept and Foreign Language Achievement* by Anissa and Hacene (2011). The questionnaire prepared by the researcher for the survey was edited by a Turkish Language instructor. For this reason, an extra pilot data collection was not needed. The questionnaire was assessed by two instructors from TÖMER (Canakkale University Turkish Language Center). Finally, the questionnaire was translated into Greek language by a native Turkish speaker, PhD student studying Greek at the Aristotle University of Thessaloniki. The subjects were surveyed using the questionnaire in Greek language.

Survey questions were asked to participants to find out the level regarding their own (a) and their foreign language learning self-confidence. While first seven items of survey are related to individual self-confidence (Are you satisfied with yourself in general, to what extent do you think you have good traits, and etc.), other five items are about participants' language learning experiences (I think I have ability of learning a foreign language, I am confident that I will be successful in foreign languages, and etc. See Annex 1).

Spelling and dictation of survey questions prepared by researcher were evaluated and reviewed by Turkish Education assistant professor at Çanakkale Onsekiz Mart University. Context evaluation of survey questions was realized by two different instructors of Çanakkale University Turkish Language Center. Upon feedback from instructors, a change has been made in the seventh question of questionnaire and "towards foreign languages" statement was added to the beginning of survey item. With its last revised version, questionnaire was translated into Greek by an expert who is studying doctorate at Thessaloniki Aristo University in Greek and whose mother tongue is Turkish. Finally, questionnaire in Greek was translated into Turkish by a bilingual undergraduate student studying at Thessaloniki Aristo University and it was assessed by Turkish Language Center instructors both linguistically and contextually. Survey in Greek was distributed to participants.

The survey included twelve closed-ended questions. Seven questions were designed to find out the subjects' self-confidence towards their competencies. The other five questions were about the subjects' self-confidence in foreign language learning (see Annex 1). In the first seven questions, the subjects' were asked (1) if they were pleased with themselves in general, (2) about the good traits they thought they had, (3) if they were helpful to others, (4) if they thought they were competent in general, (5) if they were competent to succeed in anything when they want to, (6) if they thought their individual skills could be improved, and (7) if they sometimes thought themselves incompetent. In the remaining five questions which were designed to find out their self-confidence, the subjects were asked (1) if they liked foreign languages, (2) the number of foreign languages they learned, (3) if they thought they had competence with foreign language learning, (4) if they were self-confident, and believed that they would succeed in foreign language learning (2 questions).

The second data collection tool used in this study was a 25-question final exam. A test designed to evaluate the subjects' achievements in learning Turkish was prepared by the researcher who was also the course teacher, and the test included the topics studied in the course. Upon preparing exam questions, it was evaluated by Çanakkale University Turkish Language Center instructor. Four marks were awarded for each question, and the highest mark a subject could get was 100.

The test included 22 *multiple choice*; two *matching*, and one *true/false* questions (see Annex 2).

Data Analysis

The survey data were transferred into the SPSS 15.0. Data were analyzed using descriptive analysis. Data analysis was realized using percentages, statistical comparisons, ratings and crosstabs. Statistics related to the first and second questionnaire survey items (participants' general self-satisfactory level, considering themselves supportive to others, their behaviors towards foreign languages) was shown as depicting frequency and percentage.

The third research question of the research is to research the correlation between self-confidence and foreign language achievements of the participants. At this stage, participants' exam averages, minimum and maximum value of exams were provided.

Table 3. Distribution according to the answers to the question "Are you pleased with yourself in general?" asked to the subjects.

Are you pleased?	f	%
Always	20	37,7
Sometimes	33	62,3
Never	-	-
Total	53	100

Table 4. Distribution according to the answers to the question "how many good qualities do you think you have?" asked to the subjects.

How many qualities?	f	%
Many	24	45,3
Some	29	54,7
Very little	-	-
Total	53	100

Exam averages were compared with the participants' questionnaire items intended for self-confidence with the help of the cross tables. The final exam results were transferred into the SPSS, just like the survey data. The survey data and the final exam results were matched to obtain the statistical data and thus all data necessary for statistical results were achieved.

RESULTS

This section includes the study outcome and findings associated with the sub-purpose groups.

Findings associated with first research question

First research question of the study includes the findings based on the answers to the question asked to the subjects to detect if they think they are self-confident enough.

Table 3 shows the distribution according to the answers to the question "Are you pleased with yourself in general?" asked to the subjects. 37.7% of the subjects (20 subjects) answered that they were always pleased with themselves, and 62,3% of the subjects (33 subjects) answered that they were *sometimes pleased with themselves*. None of the subjects answered that they were *never pleased with themselves*.

Table 4 shows that 45,3% of the subjects (24 subjects) thought that they had *many good qualities*, and 57,7% (29 subjects) thought that they had *some good qualities*.

Table 5 shows that all of the subjects thought they were

Table 5. Distribution According to the answers to the question "are you helpful to others?" asked to the subjects.

Are you helpful?	f	%
Yes	53	100
No	-	-
Total	53	100

Table 6. Distribution according to the answers to the question "do you think you are competent?" asked to the subjects.

Are you competent?	f	%
I am incompetent	12	22,6
I am competent	33	62,3
I am very competent	8	15,1
Total	53	100

Table 7. Distribution according to the answers to the question "I believe that in anything, if I want to" given to the subjects.

I believe that (…)	f	%
I will absolutely succeed	50	94,3
I will not succeed	3	5,7
Total	53	100

Table 8. Distribution according to the answers to the question "I believe that I can improve my individual skills, if I work hard and practice" given to the subjects.

I believe that (…)	f	%
Yes	46	86,8
No	7	13,2
Total	53	100

helpful to others.

Table 6 shows that 22,6% of the subjects (12 subjects) stated that they were *incompetent*, 62,2% *competent*, and 15,1% (8 subjects) *very competent*.

Table 7 shows that 94.3% of the subjects (50 subjects) thought that they *would absolutely succeed in anything, if they wanted to*, while 5,7% (3 subjects) thought that they *would not succeed*.

Table 8 shows that 86.8% of the subjects (46 subjects) stated that they believed their *individual skills can be improved by working hard and practicing*, and seven subjects stated that they *did not think so*.

Table 9. Distribution according to the answers to the question "I do/do not think that I am completely incompetent" given to the subjects.

I (…) think that	f	%
Always	2	3,8
Sometimes	45	84,9
Never	6	11,3
Total	53	100

Table 10. Distribution according to the answers of the subjects when they were asked if they liked foreign languages.

Do you like?	f	%
Yes	51	96,2
No	2	3,8
Total	53	100

Table 9 shows the responses of the subjects asked if they thought themselves completely incompetent. 84.9% of the subjects (45 subjects) stated that they *sometimes thought themselves incompetent*, 11.3% (6 subjects) stated they never thought themselves incompetent, and 3.8% (2 subjects) stated they *always thought themselves incompetent*.

Findings associated with second research question

Second research question of the study includes the findings based on the answers to the question asked to the subjects "How is subjects' self-confidence in learning a foreign language?"

Table 10 shows the responses of the Subjects asked if they liked foreign languages. 96.2% (51 subjects) stated that *they liked foreign languages*. Two subjects (3.8%) stated that *they did not like foreign languages*.

Table 11 shows the distribution according to the number of foreign languages the subjects were able to speak. 5.7% (3 subjects) were able to speak one foreign language, 28.3% (15 subjects) two foreign languages, 39,6% (21 subjects) three foreign languages, and 26.4% (14 subjects) spoke 4 or more foreign languages.

Table 12 shows that 79.2% (42 subjects) thought they *had competence with foreign language learning*. 20.8% (11 subjects) thought they *had no competence with foreign language learning*.

Table 13 shows that 75.5% (40 subjects) did not accept that *there were subjects they could never learn, no matter how hard they tried*. 24.5% (13 subjects) accepted that *there were subjects they could never learn, no matter*

Table 11. Distribution according to the answers given by the subjects when they were asked the number of foreign languages they spoke.

Foreign languages	f	%
1	3	5,7
2	15	28,3
3	21	39,6
4 ormore	14	26,4
Total	53	100

Table 12. Distribution according to the answers of the subjects when they were asked if they thought they had competence with foreign language learning.

Do you have competence with…?	f	%
Yes	42	79,2
No	11	20,8
Total	53	100

Table 13. Distribution according to the responses of the subjects to the phrase "I think there are subjects that i can never learn, no matter how hard I try".

Some subjects I can never learn	f	%
Yes	13	24,5
No	40	75,5
Total	53	100

how hard they tried.

Table 14 shows the distribution according to the answers of the subjects when they were asked "if they hoped that they would succeed in learning a foreign language". 88,7% (47 subjects) stated that *they were very hopeful* that they would succeed in learning a foreign language. 11,3% (6 subjects) stated that *they had a little hope*.

Table 14. Distribution according to the answers of the subjects when asked if they hoped that they would succeed in foreign language learning.

Do you have any hope…?	f	%
I am hopeless	-	-
I have a little hope	6	11,3
I am very hopeful	47	88,7
Total	53	100

Findings associated with the third research question

Research question of the study includes the findings based on the answers to the question asked to the subjects "*What correlation exists between self-confidence and achieving success in foreign language learning?*"

Table 15 shows the subjects' *state of being pleased with themselves* and the Turkish marks averages. The subjects who stated that they were pleased with themselves had higher Turkish marks average (X=93,00) than the subjects who stated that they were sometimes pleased with themselves (X=83,06). At the Turkish test, the subjects that have high self-confidence were more successful than the subjects that have low self-confidence.

Table 16 shows the competency and the success rates in learning Turkish for both groups. The group with the members who thought they were *very competent* achieved the highest success in learning Turkish (X=89,00).

Table 17 shows that the Turkish marks averages of the subjects who believed that *they were competent to succeed in anything they wanted to*, and the subjects who believed that *they would not achieve any success* are very close. No correlation between those two variables is observed in terms of causality.

Table 18 shows the number of foreign languages spoken by the subjects and their success rate in learning Turkish language. As it is seen in the table the subjects who were able to speak *four or more foreign languages* achieved the highest success rate (X=91,00). The subjects who were able to speak three foreign languages achieved a success rate higher than the subjects who were able to speak two foreign languages. The subjects who were able to speak only one foreign language achieved a success rate of 90 but there were only three subjects in that category. Therefore, the number of foreign languages learned has positive effects on achieving success in learning new foreign languages.

As it is seen in Table 19 the averages of the subjects who believed that *they had competence with foreign language learning*, and the subjects who believed that *they did not have the competence* are very close. No correlation between those two variables is observed in terms of causality.

As seen in Table 20, the Turkish marks average of the subjects who have the self-confidence to achieve success in foreign language learning are higher than the average of the subjects who have less self-confidence. It is observed that there is a positive correlation between self-confidence and achieving success in foreign language learning.

DISCUSSION

Studies on learning Turkish language and self-confidence

Table 15. Distribution according to being pleased with oneself and achieving success in learning Turkish.

Are you pleased?	f	Average marks	Ss	Min.	Max.
Always	20	93,000	4,340	85,00	100,00
Sometimes	33	83,060	5,123	70,00	90,00
Total	53				

Table 16. Distribution according to seeing oneself competent and achieving success in learning Turkish.

Are you competent?	f	Average marks	Ss	Min.	Max.
I am incompetent	12	88,750	7,262	74,00	100,00
I am competent	33	85,575	6,422	70,00	90,00
I am very competent	8	89,000	6,833	78,00	98,00
Total	53				

Table 17. Distribution according to believing to be competent to succeed in anything when wanted to and achieving success in learning Turkish.

(…) I believe that	f	Average marks	Ss	Min.	Max.
I will succeed	50	86,820	7,262	74,00	100,00
I will not succeed	3	86,666	6,422	70,00	90,00
Total	53				

Table 18. Distribution according to the number of foreign languages the subjects speak, and their achievement of success in learning Turkish.

Foreign languages	f	Average marks	Ss	Min.	Max.
1	3	90,000	5,000	85,00	95,00
2	15	84,733	6,734	70,00	100,00
3	21	85,047	6,437	70,00	96,00
4 or more	14	91,000	6,251	80,00	100,00
Total	53				

Table 19. Distribution according to having competence with foreign language learning and achieving success in learning Turkish.

Do you have competence with…?	f	Average marks	Ss	Min.	Max.
Yes	42	86,9524	6,416	70,00	100,00
No	11	86,2727	8,580	70,00	98,00
Total	53				

are very inadequate in Turkey, and according to Rubio (2007), there are not many studies carried out about foreign language and classroom atmosphere in the western countries. Having done many studies particularly on foreign language anxiety, Horwitz (2007) mentions that although foreign language teachers know the importance of promoting students' self-confidence, they are not sure about how to do it. In order to show teachers

Table 20. Self-Confidence to achieve success in foreign language learning and achieving success in learning Turkish.

Do you have any hope?	f	Average marks	Ss	Min.	Max.
I have a little hope.	6	80,500	5,822	70,00	86,00
I am very hopeful.	47	87,617	6,575	70,00	100,00
Total	53				

how to promote self-confidence, different approaches can be used to find out why foreign language teachers experience this issue. For instance, Eryaman et al. (2013) states that the recent studies carried out about self-competence were all based on teachers' personal opinions on the sense of self-competence that could motivate students to learn. Therefore, focusing on self-confidence which promotes some factors for students like classroom atmosphere and teachers' attitudes towards students, and carrying out further studies about teacher's self-confidence and self-competencies that may influence students' sense of self-confidence in parallel with their sense of self-competence can be suggested. Bandura (1997) states that self-competence is a sense that is inclusive of individuals' beliefs in their abilities to accomplish any mission they are assigned to. Therefore, it is not easy to suggest that the sense of self-competence can develop before the development self-confidence has been completed. Chachon (2005) suggests that teachers' senses of self-competence and self-confidence are quite important in education. Therefore, it can be claimed that teachers can have difficulties in creating a classroom atmosphere to motivate students to learn foreign languages, and it will be difficult for them to enable the development of a sense, which they do not have, in others, if they lack in the self-confidence to achieve success in, and consequently think that they do not have competence with language teaching, the mission they are assigned to. Students who have difficulties in learning and even the most problematic ones can achieve success with self-confident teachers and the efforts they spend (Gibson and Dembo, 1984). Therefore, the significance of teachers' inadequacies and low self-confidence should not be underestimated in the studies carried out about the reasons of low self-confidence in foreign language learners.

Hortwiz (2007) states that setting realistic language targets for students can promote their self-confidence. Horwitz emphasizes that in foreign language classes, teaching lessons in students' level of competency will increase their self-confidence as they see their achievements. When teaching Turkish, assessing students using a proper method to find out their levels of competence can contribute to and promote their self-confidence, because students may lose their self-confidence when foreign language programs above their level of competence hinder their success. According to Reasoner, the definition of healthy or unhealthy low self-confidence should be discussed (Rubio, 2007, cited in Reasoner, 1982). Low self-confidence, which occurs due to teachers' actions that lower students' self-confidence, can be considered an unhealthy low self-confidence as defined by Reasoner, because in such cases there is lack of self-confidence that hinders the expected action. Mutluer (2006) states that self-confidence is congenital and present in every individual but constantly trimmed and reduced. Therefore, teachers' behavior in classrooms can be seen as a part of this trimming process. Psychologically healthy individuals can be raised in healthy societies (cultures) (Özdoğan, 2005, p. 5). Self-confidence is a condition seen in healthy individuals. Preston (2007) states that there are steps to follow towards self-confidence, and at the twelfth step an individual is required to be physically healthy to have self-confidence. Therefore, the *individuals who are self-confident in learning foreign languages can only be raised in healthy classroom environments*. Teachers' role in the creation of such environments is important. As mentioned above, in order to create such classroom environments, teachers need to have high self-confidence.

Bandura (2006) states that there is a correlation between the society the individual is in and the individual's self-confidence. Individuals can have high self-confidence like the society they are in, if the society is self-confident. In this study, it was observed that the marks averages of the learners that had high sense of self-competence, and the learners who had high self-confidence were very close. It can be suggested that the learners who have high self-confidence had a positive effect on other learners. This had an effect on their success rates in Turkish language learning too. On the other hand, it contradicts the thesis of individuals who lack self-confidence cannot achieve success in anything they do (Bandura; 2006; Gardner and MacIntyre 1989; Bağış 2007). It was observed that the individuals who lacked in self-confidence at the beginning of any process could become self-confident individuals later on; could achieve success under the influence of the society they were part of; it was possible for the individuals who have low self-confidence to achieve success in certain tasks due to various factors.

The results of this study show that there is a positive

correlation between self-confidence and the number foreign languages learned. This supports Rubio's (2007) thesis that claims self-confidence is a cognitive condition just like anxiety, and has a role in foreign language learning. Tunçel's study (2014) on Greek students studying Turkish language showed that a certain level of anxiety can have positive effects on achieving success in foreign language learning. İşcan (2011) reported that low anxiety promoted success. Self-confidence and anxiety are two cognitive conditions that have effects on foreign language learning. In their work named "*Biases in self-rating of second language proficiency: The role of language anxiety*", published in 1997, MacIntyre, Noels and Clement state that the individuals who tend to see themselves competent, in other words, the individuals who have high self-confidence achieve more success in foreign language learning. Also, the results of this study show that the individuals who have high self-confidence are more successful than those who lack self-confidence in foreign language learning.

CONCLUSION AND SUGGESTIONS

The subjects who stated that *they were always pleased with themselves* achieved higher success rates in learning Turkish language than the subjects stated that *they were sometimes happy with themselves*. In terms of the Turkish language test, the subjects who have high self-confidence achieved higher success rates than the subjects who have low self-confidence. The success rate in learning Turkish was increased by the subjects' level of self-confidence. The subjects who thought they were *very competent* achieved *higher* success rates in learning Turkish language than those thought they were *incompetent* or *competent.* Wylie (Baumeister and et al., 2003 cited from Wylie 1979) also suggested a positive correlation between self-confidence and students' academic performance. One of the most crowded studies carried out in literature was Hansford and Hattie's (1982) in which more than 200.000 participants took part. As a result of this study, a strong correlation between academic performance and self-confidence was suggested. In another study carried out by Rosenberg (1989), a strong correlation between self-confidence and learning success was suggested (r=24 in tenth graders, r=25 in twelfth graders). On the contrary, another study done by Davies and Brember (1999) it was claimed that there is a weak correlation between academic performance and self-confidence (sorted between correlation .10 and .13). Zimmerman and et al. (1997) did not find out data that suggests high self-confidence leads to high success.

As a result of this study, none of the subjects thought that they would fail in foreign language learning. The subjects' answers were ranged from *having some hopes* to *being very hopeful*. The subjects, who stated they were very hopeful that they would succeed in foreign language learning, achieved higher success rates in learning Turkish than those who stated they had less hopes. Therefore, the subjects who had high self-confidence in foreign language learning were more successful than the subjects that have low self-confidence. These findings show that there is a positive correlation between self-confidence and achieving success in foreign language learning.

This study shows that the number of foreign languages learned has a positive effect on achieving success in learning Turkish. The subjects who were able to speak three languages achieved higher success rates than the subjects who were able to speak two languages, and the subjects who were able to speak four or more languages achieved higher success rates than those who were able to speak two and three languages. The subjects' success rate in language learning was increased by the number of foreign languages they were able to speak.

It is observed that that there is a strong correlation between an individuals' achievement of success in foreign language learning and his or her level of self-confidence. Turkish language teachers' behavior and feedbacks to promote self-confidence can contribute to the success rates of the students in their Turkish language classes. In other words, behaviors that can lower students' self-confidence in classroom should be avoided to contribute to the achievement of higher success rates in learning Turkish. It would be better if teachers can work on their self-confidence, because competent, self-confident teachers can be more successful in teaching Turkish.

Researchers should carry out studies about Turkish language teachers' behaviors and classroom environments that can promote or lower the self-confidence in Turkish language learners. Carrying out such studies can contribute to the development of Turkish language teachers and courses. Research studies carried out about the factors that increase or decrease self confidence in students can be important. The effects of classroom environments, group studies, or teachers' behavior on self-confidence in teaching Turkish as a foreign language should be particularly studied.

Conflict of Interests

The author has not declared any conflicts of interest.

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Appendices

Appendix 1: The questionnaire used in the study.

Τμήμα			
Φύλο	Άνδρας		Γυναίκα
Ηλικία	18-20	21-23	24 και άνω

1.Είστεικανοποιημένοι μετον εαυτό σας;
Πάντα [ ] Μερικέςφορές [ ] Ποτέ [ ]
2.Νομίζετεότιέχετε καλέςικανότητες;
Πολλές [ ] Μερικές [ ] Ελάχιστες [ ]
3.Πιστεύετεότιείστεχρήσιμοιγια τουςάλλους;
Ναι [ ] Όχι [ ]
4.Νομίζετεότι _____.
δενείστεέξυπνοι [ ] είστε αρκετάέξυπνοι [ ] είστε πολύέξυπνοι [ ]
5.Όταν θέλετε να κάνετεκάτι, ξέρετεότι πρόκειται _____.
να το πετύχετε [ ] να αποτύχετε [ ]
6.Για σας, η επίτευξητων ατομικών σας στόχωνέχει να κάνειμετηνσκληρήδουλειά, τηνμελέτη και την πρακτική.
Ναι [ ] Όχι [ ]
7.Πιστεύετεότιδενείστετόσο καλοίσεόλα;
Πάντα [ ] Μερικέςφορές [ ] Ποτέ [ ]
8. Σας αρέσουνοιξένεςγλώσσες;
Ναι [ ] Όχι [ ]
9. Πόσεςξένεςγλώσσεςγνωρίζετε;
1 [ ] 2 [ ] 3 [ ] 4 και άνω [ ]
10.Πιστεύετεότιέχετε ταλέντοστηνεκμάθησηξένηςγλώσσας;
Ναι [ ] Όχι [ ]
11.Θεωρείτεότι υπάρχουν πράγματα σεμια ξένηγλώσσα πουδεν μπορείτε να μάθετε ακόμα κι αν κάνετετις αναγκαίες προσπάθειες;
Ναι [ ] Όχι [ ]
12. _____ για να γίνετε καλόςσεμια ξένηγλώσσα.
Δενέχετεελπίδα [ ] Έχετελίγηελπίδα [ ] Έχετεμεγάληελπίδα [ ]

Ευχαριστώ για τονχρόνο που αφιερώσατε.

Hayrettin TUNÇEL, Aristotle University of Thessaloniki

Appendix 2: Final Exam.

1
29.05.2014

TÜRKÇE FİNAL SINAVI (A1)

1. "O ne iş yapıyor?" (4 puan)

A) O okulda çalışıyor.
B) O bir mühendis
C) Öğrenciyim.
D) Taksi sürüyor.

2. Sen tamirci misin? (4 puan)

A) Hayır, tamirci değil.
B) Evet, tamirci.
C) Hayır, tamirci değilsiniz.
D) Hayır, tamirci değilim.

3. Eşleştir. (4 puan)

A) Ne iş yapıyorsun?	Hayır, değilim.
B) Baban ne iş yapıyor?	Evet, berbersin.
C) Sen, pilot musun?	O, avukat.
D) Ben berber miyim?	Terziyim.

4. Hangisi meslek değil? (4 puan)

A) Yönetmen
B) Aşçı
C) Biber dolması
D) Sekreter

5. "Ben bir aşçı____. Yemek pişir____ seviyorum. " (4 puan)

A) -ım, -meyi
B) -vım, -meyi
C) -yım, -mayı
D) -sın, -meyi

6. "Ben bir şarkıcı _____. Ben şarkı söylemeyi bilmiyorum." (4 puan)

A) değilim
B) -yım
C) değilsin
D) değilsin

7. Arkadaşım bir _____. O mektup _____. (4 puan)

A) postacıyım, dağıtır.
B) postacı, dağıtır.
C) postacısın, dağıtır.
D) postacı değil, dağıtır.

8. _____ resim çizer. (4 puan)
_____ tedavi eder.
_____ öğretir.

A) doktor, ressam, öğretmen
B) doktor, veteriner, öğretmen
C) ressam, doktor, öğretmen
D) doktor, mühendis, öğretmen

9. Terzi _____ diker. (4 puan)
Şoför _____ sürer.
Pilot _____ kullanır.

A) elbise, bisiklet, uçak
B) elbise, araba, uçak
C) elbise, araba, vapur
D) ayakkabı, araba, uçak

10. Hemşire nerede çalışır? (4 puan)

A) Hastaneyi
B) Hastaneye
C) Hastane
D) Hastanede

11. Doğru mu, yanlış mı? (4 puan)

A) Futbolcular stadyumda çalışır. **D/Y**
B) Tamirci tamirhanede çalışır. **D/Y**
C) Pastacı, postanede çalışır. **D/Y**
D) Postacı, postanede çalışır. **D/Y**

12. Ne olmak istiyorsun? (4 puan)

A) Mühendis olmak istiyor.
B) Çiftçi olmak istiyorum.
C) Bilim adamı olmak istiyoruz.
D) Dişçi olmak istiyorsun.

2
29.05.2014

13. Eşleştir (4 puan)

Ben	içecekler
Sen	konuşacaksınız
O	bileceğim
Biz	okuyacaksın
Siz	gelecek
Onlar	susacağız

14. **A:** Ev___ ne yap_____? (4 puan)
B: Ev___ uyuyacağım.

A) -te, -acaksın **B)** -de, -eceksin
C) -de, -acaksın **D)** -e, -acaksın

15. Hangisi yanlış? (4 puan)

A) Biz yarın gidecekiz.
B) Siz içmeyeceksiniz.
C) Ben okumayacaklar.
D) Onlar uyuyacaklar mı?

16. Hangisi doğru? (4 puan)

A) Biz yarın sabah kahvaltı yapacaksınız.
B) Onlar Türkçe öğrenecek.
C) Siz neden geleceğiz?
D) Ben yarın Gümülcine'ye gideceğim.

17. *"Siz dün okulda Türkçe öğrendiniz."* Bu cümle gelecek zaman nasıldır? (4 puan)

A) Siz dün okulda Türkçe öğreneceksiniz.
B) Siz yarın okulda Türkçe öğrenecekler.
C) Siz yarın okulda Türkçe öğreneceksiniz.
D) Siz yarın Türkçe öğreneceksiniz.

18. Bu gece ne yapacaksın? (4 puan)

A) Hayır, kafeye gideceğim.
B) Sadece ders çalışacağım.
C) İnternete bakıyorum.
D) Evet, kafeye gideceğim.

19. Onlar tatil için nereye gidecekler? (4 puan)

A) Evet, denize gidecekler.
B) Onlar tatil için denize gidecekler.
C) Evet, gidecekler.
D) Hayır, tatile gitmeyecekler.

20. Biz sinema___ film seyret___ git_____. (4 puan)

A) -ya, -maya, -eceğiz
B) -ya, -meye, -eceğiz
C) -vı, -meye, -eceğiz
D) -, -meye, -eceğiz

21. **A:** Yağmur yağıyor mu? (4 puan)
B: Hayır, yağ_____ ama yağ_____.

A) -mıyorum, -acak
B) -miyor, -acak
C) -mıyor, -yacak
D) -mıyor, -acak

22. Köpek, kız__ ısır_____. (4 puan)

A) -u, -acak
B) -ı, -acak
C) -a, -acak
D) -ı, -ecek

23. Onlar, sen__ çok sev_____. (4 puan)

A) -i, -ecekler
B) -i, -ecek
C) -a, -acaklar
D) -, -ecekler

24. Bahçe___ ağaçlar ____. O ağaçlar çok hızlı büyü_____. (4 puan)

A) -te, var, yecekler
B) -de, var, ecekler
C) -de, yok, yecekler
D) -de, var, yecekler

25. Okul____ _____ arkadaş____ ____ kafe___ kahve iç_____ git_____. (4 puan)

A) -dan sonra, -larım ile, -e, -meye, -eceğiz.
B) -den sonra, -larım ile, -ye, -maya, -eceğiz.
C) -dan sonra, -larım ile, -ye, -meye, -eceğiz.
D) -dan sonra, -lar ile, -ye, -meye, -ecekler.

SINAV BİTTİ

Department			
Gender	Male		Female
Age	18-20	21-23	24 or more

Appendix 3: The Survey.

1. Are you generally satisfied with yourself?
Always ( ) Sometimes ( ) Never ( )
2. To what extent you think you have good traits??
Many ( ) Little ( ) Few ( )
3. Do you think you're someone useful to others?
Yes ( ) No ( )
4. I think_____ .
I am not a competent person ( ) I am a competent person( ) I am a very competent person ( )
5. When I want to do some work, I believe I can _____
I will definitely succeed ( ) I will fail ( )
6. I believe that I can develop my individual skills with hard work and practice
Yes ( ) No ( )
7. I _____ think/do not think that I am incompetent.
Always ( ) Sometimes ( ) Never ( )
8. I like foreign languages.
Yes ( ) No ( )
9. I can speak _____ foreign languages.
1 ( ) 2 ( ) 3 ( ) 4 or more ( )
10. I think I am capable of foreign languages.
Yes ( ) No ( )
11. I think there are some topics that I will never be able to learn despite hard work.
Yes ( ) No ( )
12. Regarding my faith in learning a foreign language, I _____.
have no hope ( ) have some hope () am very hopeful ( )

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Educational Research and Reviews

Full Length Research Paper

How six sigma methodology improved doctors' performance

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Six Sigma methodology was used in a District General Hospital to assess the effect of the introduction of an educational programme to limit unnecessary admissions. The performance of the doctors involved in the programme was assessed. Ishikawa Fishbone and 5 S's were initially used and Pareto analysis of their findings was performed. The results were analysed and it was found that it was favouring the use of this technique, as the Six Sigma value increased from 2.6 to 4 producing a 99.4% yield. In conclusion this study stresses that The Six Sigma methodology is an acceptable tool which can be used for improvement of the performance of a Hospital Department and also of individuals; it can easily be used to improve the service safety and the patients' requirements.

Key words: Education, health, quality, six sigma methodology.

INTRODUCTION

Six sigma is a methodology used to improve the quality of any product. It started to be used in the manufacturing industry, as it was created and introduced in 1987 in Motorola. Since then many prominent industries as General Electric, Toyota and many others used it in trying to improve their quality (Basu, 2001; Bhote, 2003; Juran and De Feo, 2010; Pande et al., 2000; Pyzdek, 2003; Tomsett, 2005; Yang and El-Haik, 2003).

The methodology takes serious consideration of the customers' opinion and their requirements and by using these as the base improves the quality of the service.

The name is based on the Greek letter σ (σιγμα = sigma) which is the symbol of Standard Deviation. It is calculated that if the 6σ will be achieved the yield of the improvement is rising to 99.9997% (Bhote, 2003; Pyzdek, 2003; Yang and El-Haik, 2003; Tomsett, 2005; Juran and De Feo, 2010).

The methodology is based on the DMAIC (Define – Measure – Analyse – Improve – Control) concept. For service providing industry the 5 S's (Surrounding – Suppliers – Systems – Skills – Safety) system is used (Tomsett, 2005).

Six Sigma is known to be used in the industry (Bhote, 2003; Yang and El-Haik, 2003; Goffnett, 2004; Tomsett, 2005; Juran and De Feo, 2010; Pande et al., 2000; Reosekar and Pohekar, 2013).Since 2000 it started to be used in private educational institutes to improve educational performance and the outcome (Goffnett, 2004; Bandyopadhyah and Lichman, 2007; Kaushik and Khanduja, 2010; Mehrabi, 2012; Ramasubramanian,

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2012; Prasad et al., 2012; Pryor et al., 2012; Lakshminarayanan and Pamanakumar, 2014), but it is not considered as method to be used openly in the health system, although since the early years of the turn of the millennium there are publications indicating the use of the methodology and mainly the lean six sigma application to different health institutions (Bahensky et al., 2005; Koning et al., 2006; Taner and Sezen, 2007; Schweikhart and Dembe, 2009; Stuenkel and Faulkner, 2009; Sanders, 2015).

The present study will concentrate on the impact the Six Sigma Methodology has in the quality improvement of the Orthopaedic Department in a District General Hospital with an increased in its emergency admissions and thus the quality and effect of individual doctors' performance following the implementation of an educational scheme in their daily curriculum. The aim is to answer if an educational programme would be possible to change doctors' behaviour and reduce the unnecessary admissions in the Orthopaedic Department.

METHODS

The Orthopaedic Department, in a 450 bed District General Hospital, had been the subject of major changes following the retirement of all the previously existing consultants due to age or sickness within the last two years and the replacement of them with newly appointed consultants. The existing middle grades were still employed and they were few years away from their own retirement. The department was manned by four newly appointed consultants, four middle grade and three junior doctors. In every on call duty, the Team consisted by one member of each grade. Decision for the admission of a patient was mainly made by the middle grade doctor, as they were at all times present in the hospital supporting the juniors and only in case of any doubt, they were contacting the Consultant for further advice.

It was observed that the emergency admissions of the Orthopaedic Department were higher than expected and on particular days even more. Patients who may have their assessment and final treatment in their first visit in the Accident and Emergency Department following their referral to Orthopaedics have been admitted for "further" treatment in the Hospital. This practice was leading to the patients being reviewed by the admitting consultant the following morning and after instructions to be discharged. Despite this, due to man-power limitations the majority of the patients' discharges were delayed an extra day thus resulting to an almost daily bed crisis and funding problems. This has a direct impact in patients' satisfaction and of their relatives as they had to spend time within the hospital understanding that it was not necessary for their loved one to be admitted in the first place.

Due to the arising problems it was necessary to find the reasons that led to these unwanted admissions. In the face of this problem which was established as a quality limitation the Six Sigma Methodology was used and the 5 S's and DMAIC were implemented (Tomsett, 2005).

The **5 S's** system reviewed:

Surrounding: The environment and the timing of the potential unnecessary admissions were recorded.

Suppliers: For this category the individual doctors' activities reviewed

Systems: The admission process was recorded

Skills: The doctors' actions observed

Safety: The safety of the doctors as well as that of the patients was reviewed.

DMAIC analysed

Define: Open and constructive discussions with the admitting doctors took place in a departmental meeting. Verbal consent from all was taken as notes were kept in the attempt to understand the potential reasons led to the admissions. The opinion of the four middle grade doctors who were giving the instructions to the juniors for the admission was recorded. Each of these doctors had seven or eight days on call duties per month. Initial data of the post on call emergency admissions of each and every middle grade doctor from every day and the sum of the monthly admissions corresponding to them was collected, as well as the unnecessary admissions were gathered for every day and month corresponding to every one of them.

The patients' pathway for the emergency admissions was examined and the different alternatives for the different way of treatment were reviewed. Patients after they were reviewed following their investigations could be either discharged by the Accident and Emergency doctor or be referred to the Orthopaedic team. These who were referred could be discharged following the junior doctor's opinion or referred further to the middle grade. From the referred patients some were discharged and others were admitted and according to their pathway they were separated in different groups. People who underwent surgery were in group a, those who had another kind of treatment in group b and the patients who were discharged following their review by the consultant and characterized as unnecessary admissions in group c.

The Ishikawa Fishbone diagram was used to find the indicative causes leading to the unnecessary admissions. Initially was indicated that there are reasons influenced by the patients or their environment but there are reasons clearly influenced by the doctors' behaviour and understanding of each of the cases (Figure 1).

From the 5 S's there was some evidence that the time of patient presenting to Accident and Emergency Department or their behaviour may influence their admission but based on the discussion with the doctors it was evident that in the name of safety (patient's and their own) and possibly due to either lack of communication, of skills or inexperience they had developed a very low threshold to patient admissions. This indicated that their decision making and diagnostic skills needed support. From the 5 S's the emphasis fell on the suppliers (doctors) and their skills.

The defects per million opportunities (DPMO) equation was applied

$$DPMO = 1000000 \frac{defects}{number\ of\ opportunities}$$

The doctors' opinions were recorded and quantified according to the frequency they were appearing during the departmental meeting. These were tabulated.

Measure: There were two kinds of data. The data following the discussions of the departmental meetings (initial and following the educational programme), where opinions of doctors were gathered, and the data of the total emergency admissions in the Hospital including the unnecessary emergency admissions which was collected by the admission office. The selected data was initially viewed and Pareto diagrams of the doctors' views and activities

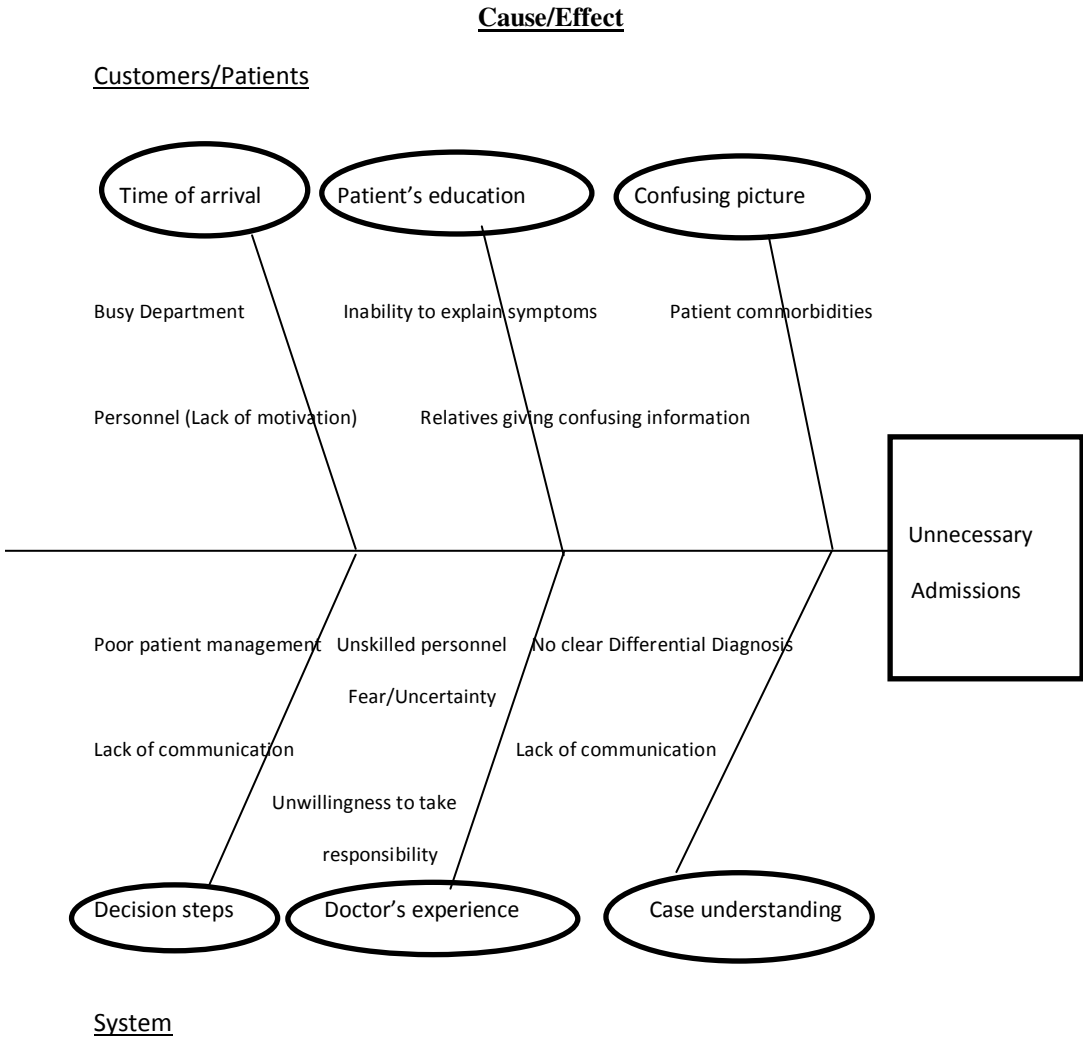

Figure 1. Ishikawa diagram.

were done. In the same time the sigma and the yield was found.

Analysis: An admission pathway was constructed and with Ishikawa diagram and 5 S's list all were reviewed indicating the potential causes influencing the unnecessary admissions. Data collected during the initial departmental meeting was analysed using a qualitative analysis. The data from the admissions (total including the unnecessary and the latter ones in separation) corresponding to each individual doctor was analysed using the Excel analysis and diagrams were made picturing the doctor's performance. The cumulative sigma was calculated using an pre-calibrated computerised six sigma calculator where the data was inserted and automatically it was calculating the sigma and the yield.

Improve: Based on the initial findings and the view that it was possible and more feasible to influence the doctors' behaviour and placing the patient or their relatives at the centre of their treatment, a daily conducted educational meeting was founded. This meeting was unanimously approved by the doctors of the department. In this meeting all emergency admissions were presented by the admitting junior doctor and they were openly discussed and analysed by all members of the department. The potential management was indicated by the juniors and the middle grades leaving the consultants' opinion delivered at the end. The meeting was not confrontational and the discussion was based on evidence based medicine. Prior to their presentations the presenting doctors were preparing themselves in the library if time allowed and in this way it let to other teams to make themselves aware of the cases and prepare for the presentation.

Following this introduction of education, data from the admissions office was gathered for each of the four doctors and the potential changes of their behaviour towards emergency admissions were analysed. The data collected was corresponding to a chosen month, the administrators of the admissions department decided to use in six monthly intervals, on six, twelve and eighteen months, post introduction of the educational programme.

Control: Data of one month's admissions (total and unnecessary corresponding to each individual doctor) was gathered in six monthly intervals, on six, twelve and eighteen month and this was reviewed, analysed and the sigma and the yield of improvement

Table 1. Doctors' opinion in initial departmental meeting

Collective doctors' opinions expressed in departmental meeting			
	Count	**Cumulative count**	**Cumulative %**
Habit	165	165	47.82608696
Skills	100	265	76.8115942
Development/Confidence	80	345	100

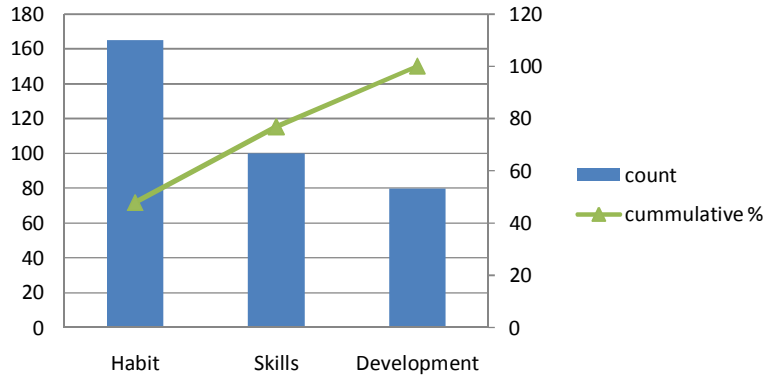

Figure 2. Pareto analysis of doctors' opinions.

was recorded. Further departmental discussions took place and the doctors' opinion was recorded. Further qualitative analysis was performed following their final answers.

The educational programme was evaluated within a Departmental Group Meeting where discussions and assessment of the programme took place. The opinions of each doctor were discussed and recorded by answering how in their opinion the educational programme influenced them and if their practice in their opinion changed and if they were satisfied. In all meetings verbal consent was taken from the participants.

Additional instruments

Departmental group meetings conducted with the doctors: The first was conducted initially to establish the potential reasons of the unnecessary admissions, and reveal the doctors' practices. The answers given were noted and analysed.

The second departmental meeting was conducted, following the educational programme, and verbal consent from all participants obtained. From the data collected after the questions were answered during the meeting for the assessment and evaluation of the programme, the following opinions were tabulated.

The answers of both meetings were analysed using qualitative methods.

RESULTS

Taking into consideration the customers' requirements it was found that this was a twofold condition. The first was based on the doctors' practices considering the safety of the patient within their own skills and understanding and the second is the patients' understanding of quick management and treatment and limited stay in the hospital's premises within a safe environment.

The doctors' expressed opinion during the initial Departmental Meeting were, "*this is how we used to do*" or "*this is how we were told to do by our previous Consultants*" or "*we thought would be safer for the patient as we wanted to ask you*". In these statements it is evident that there are some indications of habitual medicine, old fashion skills and limited professional development and lack of confidence.

The major finding within the Pareto analysis (Pareto principle states that 80% of the observed effects come from the 20% of the causes) is the link of the doctors' practice with that one which was implemented by the retired Consultants in the past years creating some bad habits.

The results are seen in Table 1 and the Pareto analysis in Figure 2.

Figure 3 indicates the different possible ways of the patient's treatment and discharge. All emergency admissions are corresponding to groups a, b, and c. The unnecessary admissions' group is indicated using the letter c.

From the Ishikawa Fishbone diagram, also to be seen were some factors related to the patients but the main factors which could be changed by the internal Departmental processes was the behavioural changes affecting the doctor's experience, their understanding of

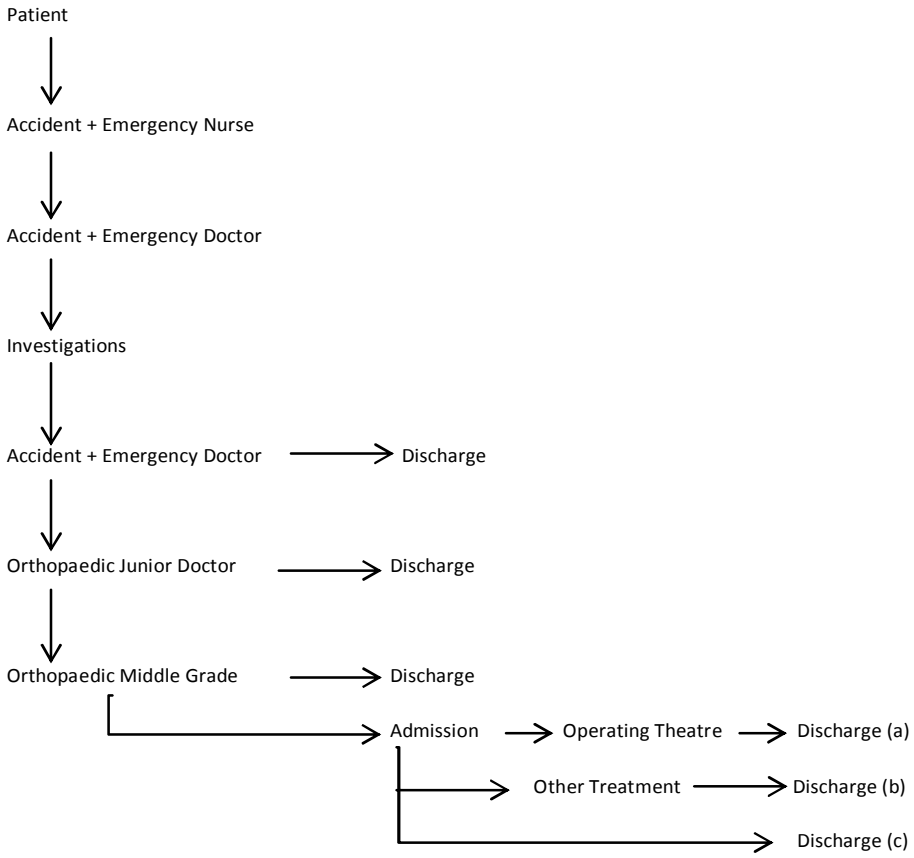

Figure 3. Patients' emergency referral and admission pathway in orthopaedics.

the individual cases and the management by making the correct and safe decisions for the patient.

Figure 4 demonstrates the collected data of the unnecessary admissions corresponding to each individual doctor, per on call day and the sum of all the on calls and the number of all the emergency admissions as collected from the admissions office. It is showing data collected initially before the educational programme was established (initial findings), as well as the data of each one month which the audit office decided to collect, at a six month interval, starting from six months post-educational programme up to the re-view after 18 months following the implementation of it.

From this, can be seen the Six Sigma calculation and the yield corresponding to it on the sum of all admissions of each chronological review. The progressive improvement also can be seen (Table 2).

The data of the total unnecessary admissions throughout the project is seen in Figure 5. This is demonstrating visually for every single doctor that the number of the unnecessary admissions within the studied months showing a progressive improvement of their performance.

From the data demonstrated can be observed that the education with a constructive cognitive way of teaching motivated the doctors of all teams to be prepared for the case presentations. The sigma is improved in all doctors. It is evident that one of them (Doctor C), who was employed at a later date than the other three colleagues, was able to perform better much more quicker as he had no unnecessary admissions since the 12 month review. Cumulatively all started from a Sigma 2.6 indicating 86.40% yield to improve to a Sigma 4 (99.40% yield).

Using the DPMO formula, the Table 6 collected date was analysed and the results found are tabulated in Table 3. It is evident the progress of improvement within the 18 month period since the project commenced.

Both the data collected from Six Sigma methodology and the answers in the questionnaires indicate that the educational programme was successful and achieved the goals of improving the quality of the treatment received by the patients but also improved the confidence of the treating doctors (Table 4).

DISCUSSION

Six Sigma methodology is based on quality improvement and the continuing effort to meet the customers'

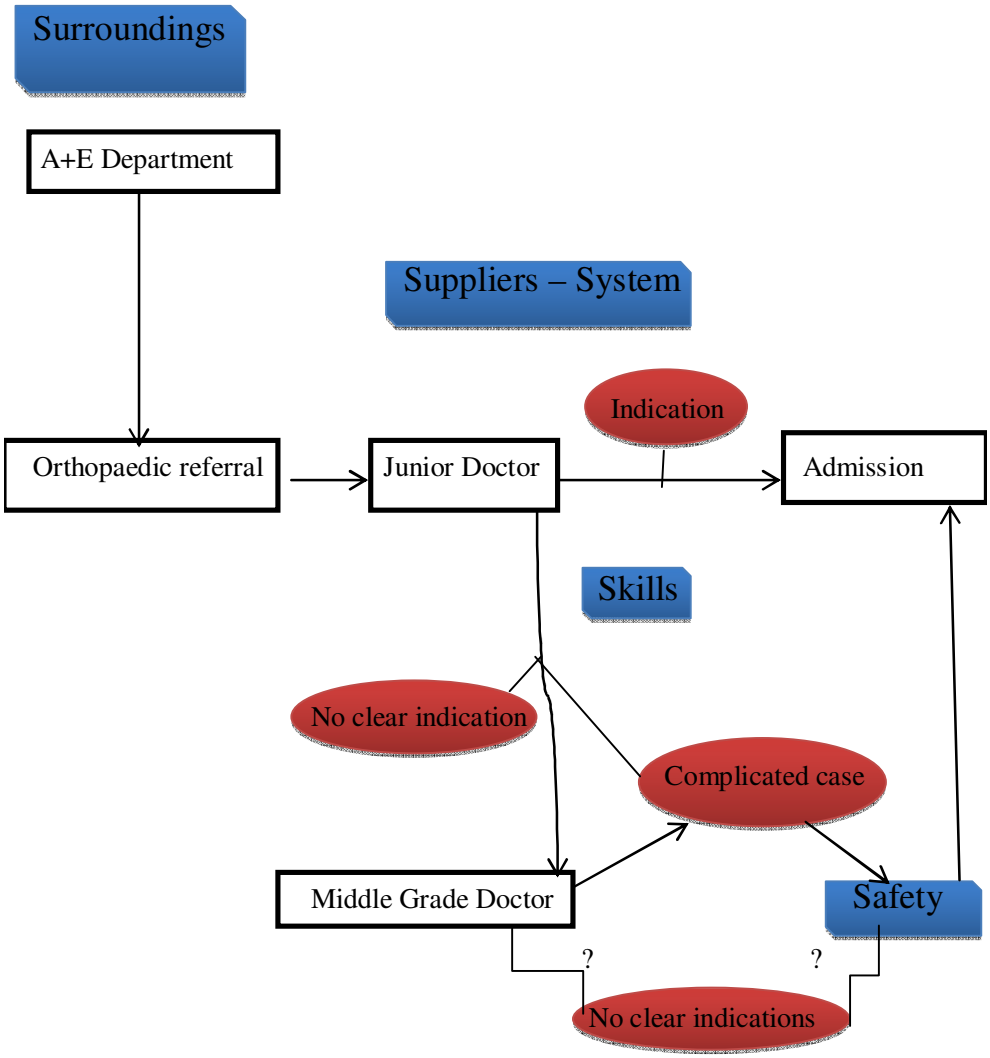

Figure 4. 5 S's analysis showing on the flowchart the pathways for admission.

requirements (Bhote, 2003; Pyzdek, 2003; Yang and El-Haik, 2003; Tomsett, 2005; Juran and De Feo, 2010; Pande et al., 2000). In the health system there are multiple factors which can influence this, but concentrating in a very simplistic way the customers' (patients) requirements have to be defined. Literature indicates that it is necessary to achieve patient satisfaction and this has to be in the centre of healthcare services (Koning et al., 2006; Taner and Sezen, 2007; Stuenkel and Faulkner, 2009). To achieve patient satisfaction is necessary to care about the quality of the provided service, to provide to them what they are asking for, to improve the delivery of services in an effective and timely manner reducing or even eliminating unnecessary activities (Taner and Sezen, 2007; Balensky et al., 2005). Reducing hospital stay is considered as an important factor to achieve patient satisfaction not only by influencing the psychology of the persons involved but also reducing the risk of infection (Taner and Sezen, 2007; Stuenkel and Fulkner, 2009). When patient satisfaction is achieved is observed that health carers' moral is improving. Consequently their performance is improving and they are more willing to participate in professional development activities (Stuenkel and Fulkner, 2009). Improving performance leads to timely predictability of the services and this reflects to the serving community and shows a thriving and successful organisation (Stuenkel and Fulkner, 2009; Taner and Sezen, 2007; Saunders, 2015). The introduction and use of Six Sigma methodology is clearly improving the quality of the provided service (Koning et al., 2006; Schweikhart and Denbe, 2009).

In the present study from the point of view of the patients the most evident is the provision of a quick examination and treatment within a safe environment, as

Table 2. Collected data (initial and of one month in every six month intervals over the period of 18 months)

Doctor	Unnecessary admissions per on call day and doctor (Group c)	Unnecessary admissions per month and doctor (Group c)	Monthly emergency admissions per doctor (Groups a, b and c)	Sigma	Yield
Initial findings					
A (8 on calls)	8	64	125		
B (8 on calls)	9	54	120		
C (7 on calls)	4	28	95		
D (7 on calls)	10	70	90		
Total	31	216	430	sigma 2.6	86.40%
6 months later					
A (8 on calls)	3	24	90		
B (8 on calls)	3	24	115		
C (7 on calls)	2	14	100		
D (7 on calls)	3	21	85		
Total	11	83	390	sigma 3.1	94.50%
12 months later					
A (8 on calls)	1	8	130		
B (8 on calls)	2	16	110		
C (7 on calls)	0	0	106		
D (7 on calls)	2	14	94		
Total	5	38	440	sigma 3.5	97.70%
18 months later					
A (8 on calls)	0	0	167		
B (8 on calls)	1	8	164		
C (7 on calls)	0	0	135		
D (7 on calls)	1	7	124		
Total	2	15	590	sigma 4	99.40%

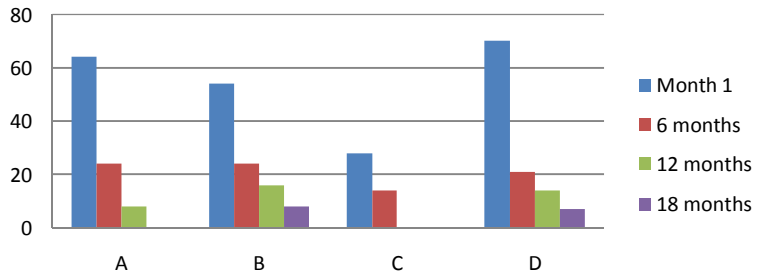

Figure 5. Total average unnecessary admissions per doctor through the project.

Table 3. Defects per million opportunities (DPMO)

DPMO	
Initial	502325
6 months	212820
12 months	86363
18 months	25423

well as limited time spent by them in Hospital. On the other hand, doctors are concentrating to the safe diagnosis and treatment sometimes without considering the time spent.

Although safety is mentioned by both groups (patients and doctors) and it is paramount, it seems that safety maybe the subject that can divide the two groups. The

Table 4. Tabulated answers to the questionnaire given at the second departmental meeting.

Questionnaire of the second departmental meeting	
Questions	**Answers**
In your opinion, how did the educational programme influence you?	1. Increased confidence 2. Made me better to understand the latest developments within our specialty 3. Helped me to create my own opinion based on evidence 4. Improved my self-development
Do you think that the programme should continue?	The answer was positive
Do you think that such programme should be implemented in other departments?	The answer was positive by all
Do you think that the programme achieved the goals?	The answer was positive by all
Do you think that the level of treatment to the patients has been influenced and how?	The confidence and level of knowledge achieved is giving the internal security and self-respect which is reflected to the treatment and the quick and safe management of the patients.

first group wants safe treatment within limited time in the premises of a Hospital and the second wants to keep patients under surveillance just in case that something is missed and makes their treatment unsafe. This can create a gap between the two groups understanding.

Reviewing the 5 S's is evident that the doctors' skills and habits need improvement, if hospital stay and unnecessary admissions need to be decreased.

In the Ishikawa Fishbone Diagram it is evident that it is more than one factor influencing the unnecessary admissions. It was thought whether it was possible to influence mainly changes on the System factors than those of the Customers. Fear, uncertainty, unwillingness to take responsibilities due to habitual outdated practices have been revealed and need change. With this in mind implementation of an educational programme is designed and proved that can bridge this gap.

The programme improved the doctors' confidence and understanding of their art, helping them to meet the patients' requirements.

Six Sigma methodology used for the evaluation the educational programmes helped educational organisations to observe, assess and change their performance (Goffnett, 2004; Ramasubramanian, 2012; Prasad et al., 2012). The methodology was used to change the organisational culture of the institute (Mehrabi, 2012), improve the quality of the leadership in education or improve the quality of the curriculum's assessment (Pryor et al., 2012). The necessity to implement such measures as the Six Sigma methodology in the higher education was the result of the public scrutiny on the subjects mainly to control the check of the higher education funds and stop the unnecessary waste of money. This was shown that it was achieved by using these techniques as the academic programmes had to be redesigned so the quality of them will be optimised and improved (Bandyopadhyah and Lichman, 2007). But the Six Sigma methodology was not only used for the control of the funds but also for the improvement of the students' performance during their studies (Kaushik and Khanduja, 2010), as well as the preparation of them in the open arena of the free market and make them ready for an earlier employment (Lakshminarayanan and Pamanakumar, 2014).

Following the educational programme, doctors in their words achieved "greater internal security and self-respect" which led to treatment quality improvement.

The DPMO was reduced during the 18 month period, by almost 20 times down.

The initial Six Sigma score was 2.6 corresponding to 84.4% yield. After the implementation of the educational programme, the following evaluations showed the gradual improvement of the score leading to 4 giving 99.4% yield.

The goals of the patients' requirements of a safe quick administered treatment in a safe environment without lengthy unnecessary hospital admission and the safe guarded implementation of medicine by the doctors were met and measured successfully by the use of six sigma methodology. In the same time the educational programme was evaluated successfully by the same means. Six Sigma methodology was proven to be very successful in improving the departmental, as well as the individual doctors' performance. The programme continues with the goal to improve to six sigma score of 6, corresponding to 99.9997% yield. This study proves that such methodology can be implemented in the Educational as well as the Health system.

Conclusion

Six sigma methodology is proven to be beneficial for the assessment of individual doctors by evaluating their

performance and also improving the overall performance of the whole department and consequently the performance of the hospital.

Conflict of Interests

The author has not declared any conflicts of interest.

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Educational Research and Reviews

Full Length Research Paper

A development of participation of primary school students in conservation of school environments

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This study aimed to investigate and compare knowledge, attitudes and participating behaviors of students who participated in a training session. A training manual based on the participatory process was used. The sample consisted of 30 grade 5 students and 30 grade 6 students using a voluntary sampling technique. Research instruments included 1) a training manual for participation in environmental conservation, 2) a test on knowledge about environment, 3) scale on attitudes towards participation in environmental conservation, and 4) a questionnaire about participatory behaviors in environmental conservation. The major findings revealed that the developed training manual had an effectiveness index of 0.586. The students as a whole and as classified according to sex and grade level showed gains in knowledge, attitudes and behaviors before participating in the training session. The female students indicated more knowledge as a whole and in 3 aspects: garbage and sewage disposal, water conservation, and chemical usage than the male students. The grade 6 students evidenced more knowledge in the aspect of energy conservation than the grade 5 students. But these two groups of the students did not indicate attitudes and behaviors differently. Also, the statistical interactions of sex with grade level on knowledge and behaviors were found to be significant.

Key words: Participation in environmental conservation, knowledge, attitudes, behaviors.

INTRODUCTION

Natural resources are very essential to human lives and are supporting things for promoting all prosperity of humans. Natural resources such as soil, water, air, minerals, forests, wild animals, etc, are natural heritage which influence indirectly and indirectly on human lives (Singh, 2013; Simmons, 2000). Humans rely on the environments as a basis for living and learning to improve and modify or create natural resources for accommodating their appropriate existence such as shelter, clothing and drugs. The appropriate consumption of natural resources for living has evolves gradually by using the science processes which provides valuable knowledge for people or community to wisely use natural resources and environments (Ministry of Natural Resources and Environment, 2005). These wise usages could result in stabilities in economy, good consumption and good life quality. Otherwise, a country or a community lacks natural resources, or people lack knowledge and understanding, and are unaware of over-consumption and lack responsibility in using and maintaining the

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natural resources this will result in wasted natural resources leading to lack of natural resources, low quality of life, and inevitably competitive consumptions of limited natural resources. (Office of Natural Resources and Environmental Policy and Planning, 2008). The current situations of environment have unavoidable impacts on humans and animals and cause the world to face with intensified environmental problems which cannot be solved sustainably. (Chanakul and others, 2008; Barnett, 2003). Many countries are faced with problems with different levels of severity which impacted human life quality, depending upon increased population, economic expansion, technological advancement and deficiency of ineffective processes of environmental management (Suparat, 2010). In many instances, some environmental disasters are caused by the effects of the rapid development without environmental consideration which inevitably affects human living. In solving the environmental problems, therefore, it is a duty and responsibility of every citizen to work cooperatively for preventing future problems (Duvall and Zint, 2007).

In Thailand, the promotion and development of the quality of environments and solving environmental problems in the past, only the government agencies had a sole responsibility without participations from all valued sectors especially the public sector. The lack of public participation is due to people lack knowledge and understanding, awareness, attitudes towards self – action to environment, and a sense of responsibility in environmental conservation (Louber et al., 2001). In order to solve the problems, the people must become knowledgeable and understandable about an environmental education in all areas, as well as apply them in daily life and solving problems correctly (UNESCO, 1978) An appropriate approach is an organization of teaching and learning according to environmental education in order to develop the learners' knowledge and understanding, awareness and problem – solving skills. When they become adult citizens, they will have conscience, awareness and values and help cooperatively preserve natural resources for a long – term sustainment (Ferkany and Whyte, 2012; Sanera and Shaw, 1999). Therefore, the researcher is interested in holding a training session for promoting knowledge about environments, altitudes towards participation in environmental conservation and participatory behaviors in environmental conservation of primary school students.

Objectives

1. To study and compare knowledge, attitudes, and behaviors in environmental conservation before and after using the training manual based on participation of the students as a whole and as classified according to sex and grade level.
2. To compare knowledge, attitudes, and behaviors in environmental conservation of the students with different sexes and grade levels.

RESEARCH METHODOLOGY

Population and sample

The sample consisted of 60 (30 each) grades 5 and 6 students, obtained using Howell formula (Howell, 2007). They voluntarily participated in the training session. These sample students were selected from a population of 320 students, attending Khueungnai (Chareonrat) School in Khueangnai District, Ubon Ratchatani province, Thailand.

Study variables

Independent variables included sex and grade level-grade 5 and grade 6. Dependent variables included knowledge about environment, attitudes towards environmental conservation, and participatory behaviors in environmental conservation.

Research instruments

The instruments are as follows: a training manual on participation in environmental conservation with assigned activities based on 5 participatory processes: problem perception, planning, implementing, profit participation, and evaluation; a multiple - choice test on knowledge about environment with 40 items, and 4 aspects: garbage and sewage disposal, water conservation, chemical usage and electricity conservation, and with difficulty values ranged between 0.24 and 0.60, item discriminating values ranged between 0.24 and 0.48, and individual and total reliabilities ranged between 0.802 and 0.862; a rating – scale questionnaire about attitudes towards participation in environmental conservation with 45 items and 4 aspects: garbage and sewage disposal, water conservation, chemical usage and electricity conservation; and with item discriminating values (item - total correlation) ranged between 0.30 and 0.72, and individual and total reliabilities ranged between 0.833 and 0.862; a rating – scale questionnaire about participatory behaviors in environmental conservation with 32 items and 4 aspects ; garbage and sewage disposal, water conservation, chemical usage, and electricity conservation ; and with item discriminating values ranged between 0.34 and 0.79, and individual and total reliabilities ranged between 0.827 and 0.868.

Data collection

The three developed instruments were administered to the sample students at the first day of the training session – as pretest scores. The training session were lasted for two days from January 11 – 12, 2014. During participation in the session, the students were doing various activities such as lecture, VDO – watching , small group

discussion, survey of school environments, and role – play. Two instruments (except for the behavior questionnaire) were administered to the students at the end of the session – as immediately posttest scores. The behavior questionnaire was administered to the students after two months of the training session (March) as delayed posttest scores. In addition, the students presented their group projects on solving school environments in the areas of garbage and sewage disposal, water conservation, chemical usage, and electricity conservation.

Data analysis

All collected data from the pretest and posttest administration were analyzed as follows: The test on knowledge of environment from pretest and posttest periods was scored and the scores were used for the calculation of an effectiveness index. The attitude questionnaire was scored as strongly agreed (5), agreed (4), uncertain (3), disagreed (2), and strongly disagreed (1). Also, a mean score from this questionnaire is interpreted as follows.

Mean interval	Meaning
4.51 – 5.00	strongly agreed
3.51 – 4.50	agreed
2.51 – 3.50	uncertain
1.51 – 2.50	disagreed
1.00 – 1.50	strongly disagreed

The behavior questionnaire was scored as always, with participation given a score of 4, frequent participation a score of 3, sometime participation a score of 2, and never participation a score of 1. Also, a mean score from this questionnaire is interpreted as follows:

Mean Interval	Meaning
3.51 – 4.00	always participation
2.51 – 3.50	frequent participation
1.51 – 2.50	sometime participation
1.00 – 1.50	never participation

The posttest scores from the instruments were analyzed to test assumptions of the Two-way MANCOVA and ANCOVA in terms of correlation of dependent variables, homogeneity of variance, homogeneity of regression slope, and homogeneity of variance - covariance matrices. The test results confirmed the assumptions at the .05 level of significance.

The scores from the instruments were tested for the difference between the pretest and the posttest measures using the paired t-test according to the whole students, sex and grade level of the students.

The posttest scores from the instruments were analyzed for testing the hypothesis stated that the students with different sexes and grade levels had different knowledge, attitudes and behaviors using the F-test (Two-way MANCOVA and ANCOVA).

FINDINGS

The training manual had an effectiveness index of 0.586, showing that students progressed their learning at 58.6 percent. The students as a whole and as classified according to sex and grade level showed gains in knowledge, attitudes and behaviors in overall and in each aspect from before participating in the training session ($p<.001$).The female students had the whole knowledge and in 3 aspects : garbage and sewage disposal, water conservation, and chemical usage more than the male students ($p\leq.036$). However, the students with different sexes did not show different attitudes and behaviors in overall and in each aspect (Tables 1-4). The grade 6 students indicated the whole knowledge and in 3 aspects: garbage and sewage disposal, water conservation, and chemical usage ; and attitudes towards electricity conservation more than the grade 5 students. However, the two groups of the students did not evidence behaviors differently.

There were statistical interactions of sex with grade level on the whole knowledge and in the aspect of chemical usage and the whole behaviors and in the aspect of chemical usage and the aspect of electricity conservation ($p<.01$ and Tables 1-4).

DISCUSSION

This study had illustrated the positive influences of the training manual on knowledge, attitudes and behaviors of the students. Some discussions were presented in details as below.

Firstly, the students as a whole and as classified according to sex and grade level showed gains in environmental knowledge, attitudes towards environmental conservation and participatory behaviors in environmental conservation from before participating in the training session was supported by findings found that the students who participated in the training session using an environmental training manual, an activities environmental learning manual, or a camping manual had more knowledge about environmental pollution (Ratanapaiboon, 2006), waste disposal knowledge and safety food selection (Bupphapan, 2008), environmental knowledge (Prerdproa, 2009), and knowledge about electricity conservation and waste disposal (Bunprasert, 2012), than before attending the training session. This might be due to the training manual had various activities such as

Table 1. Comparison of knowledge, attitudes and participation behaviors in environmental conservation of the students with different sexes and grade levels.

Source of variation	Test statistic	F	Hypothesis df	Error df	p	Partial Eta Squared
Pretest knowledge	Pillai's Trace	.420	3.000	51.000	.739	.024
	Wilks' Lambda	.420	3.000	51.000	.739	.024
	Hotelling's Trace	.420	3.000	51.000	.739	.024
	Roy's Largest Root	.420	3.000	51.000	.739	.024
Pretest attitude	Pillai's Trace	5.211	3.000	51.000	.003*	.235
	Wilks' Lambda	5.211	3.000	51.000	.003*	.235
	Hotelling's Trace	5.211	3.000	51.000	.003*	.235
	Roy's Largest Root	5.211	3.000	51.000	.003*	.235
Pretest behavior	Pillai's Trace	2.162	3.000	51.000	.104	.113
	Wilks' Lambda	2.162	3.000	51.000	.104	.113
	Hotelling's Trace	2.162	3.000	51.000	.104	.113
	Roy's Largest Root	2.162	3.000	51.000	.104	.113
Sex	Pillai's Trace	11.729	3.000	51.000	.001*	.408
	Wilks' Lambda	11.729	3.000	51.000	.001*	.408
	Hotelling's Trace	11.729	3.000	51.000	.001*	.408
	Roy's Largest Root	11.729	3.000	51.000	.001*	.408
Grade level	Pillai's Trace	14.434	3.000	51.000	.001*	.459
	Wilks' Lambda	14.434	3.000	51.000	.001*	.459
	Hotelling's Trace	14.434	3.000	51.000	.001*	.459
	Roy's Largest Root	14.434	3.000	51.000	.001*	.459
Interaction	Pillai's Trace	4.874	3.000	51.000	.005*	.223
	Wilks' Lambda	4.874	3.000	51.000	.005*	.223
	Hotelling's Trace	4.874	3.000	51.000	.005*	.223
	Roy's Largest Root	4.874	3.000	51.000	.005*	.223

* significant at the .05 level.

giving lecture from experts and VDO watching, brain storming during a small group discussion, and practices of doing some activities based on a participatory process. These provided activities were relevant to the principles of learning by doing of John Dewey (Ausubel, 1968), and the principles of cooperative learning of Johnson and Johnson (1991). Each student had an opportunity to learn by himself or herself, had an inter-independence with other group members, and had cooperative learning, They could learn meaningfully and understand clearly what they learned. This gained knowledge might result in having attitudes towards environmental conservation which caused changes in participatory behaviors in environmental conservation (Wimolsak, 2005; Rickinson, 2011).

Secondly, the male students and the female students did not indicate different environmental knowledge in some aspects, attitudes and behaviors was supported by findings found that the students with different sexes did not indicate different waste disposal knowledge, food safety selection, and attitudes toward waste disposal after attending the training session (Bupphapun, 2008). This might be due to the male students and the female students who generally had some different abilities and voluntarily participated in the training session had an

Table 2. Comparison of environmental knowledge about garbage and sewage disposal, water conservation, chemical usage and electricity conservation of students with different sexes and grade levels (Two-way ANCOVA).

Learning outcome	Source of variation	SS	df	MS	F	p	Partial Eta Squared
Garbage and sewage disposal	Pretest	.219	1	.219	.314	.578	.006
	Sex	3.235	1	3.235	4.644	.036*	.078
	Grade level	6.233	1	6.233	8.947	.004*	.140
	Interaction	1.521	1	1.521	2.183	1.450	.038
Water conservation	Pretest	.045	1	.045	.072	.789	.001
	Sex	6.520	1	6.520	10.397	.002*	.159
	Grade level	7.643	1	7.643	12.189	.001*	.181
	Interaction	.446	1	.446	.711	.403	.013
Chemical usage	Pretest	.662	1	.662	1.000	.322	.018
	Sex	4.832	1	4.832	7.300	.009*	.117
	Grade level	11.887	1	11.887	17.958	.001*	.246
	Interaction	3.133	1	3.133	4.734	.034*	.079
Electricity conservation	Pretest	.922	1	.922	1.325	.255	.024
	Sex	1.788	1	1.788	2.568	.155	.045
	Grade level	.109	1	.109	.156	.694	.003
	Interaction	.120	1	.120	.172	.680	.003

*significant at the .05 level.

Table 3. Comparison of attitudes towards participation in environmental conservation in the aspects of garbage and sewage disposal, water conservation, chemical usage and electricity conservation of students with different sexes and grade levels (Two-way ANCOVA).

Learning outcome	Source of variation	SS	df	MS	F	p	Partial Eta squared
Garbage and sewage disposal	Pretest	.001	1	.001	.021	.886	.000
	Sex	.131	1	.131	3.001	.089	.052
	Grade level	.022	1	.022	.497	.484	.009
	Interaction	.067	1	.067	1.548	.219	.027
Water conservation	Pretest	.099	1	.099	2.137	.149	.037
	Sex	1.22E-05	1	1.22E-05	.000	.937	.000
	Grade level	.109	1	.109	2.243	.132	.041
	Interaction	4.637E-05	1	4.637E-05	.001	.975	.000
Chemical usage	Pretest	.013	1	.013	.329	.569	.006
	Sex	.001	1	.001	.022	.883	.000
	Grade level	.008	1	.008	.208	.650	.004
	Interaction	.010	1	.010	.239	.627	.004
Electricity conservation	Pretest	.003	1	.003	.039	.843	.001
	Sex	.189	1	.189	2.740	.104	.047
	Grade level	.565	1	.565	8.212	.006*	.130
	Interaction	.219	1	.219	3.187	.080	.055

* significant at the .05 level.

Table 4. Comparison of participatory behaviors in environmental conservation in the areas of garbage and sewage disposal, water conservation, chemical usage and electricity conservation of students with different sexes and grade levels (Two-way ANCOVA).

Learning outcome	Source of variation	SS	df	MS	F	p	Partial Eta Squared
Garbage and sewage disposal	Pretest	.002	1	.002	.058	.811	.001
	Sex	.100	1	.100	3.292	.075	.056
	Grade level	.067	1	.067	2.214	.143	.039
	Interaction	.082	1	.082	.2.717	.105	.047
Water conservation	Pretest	.117	1	.117	2.523	.118	.044
	Sex	.012	1	.012	.249	.620	.005
	Grade level	.115	1	.115	2.468	.122	.043
	Interaction	.062	1	.062	1.333	.253	.024
Chemical usage	Pretest	.061	1	.061	.794	.377	.014
	Sex	.047	1	.047	.612	.437	.011
	Grade level	.001	1	.001	.016	.901	.000
	Interaction	.415	1	.415	5.377	.024*	.089
Electricity conservation	Pretest	.001	1	.001	.014	.905	.000
	Sex	.052	1	.052	.931	.339	.017
	Grade level	.040	1	.040	.720	.400	.013
	Interaction	.631	1	.631	11.291	.001*	.170

* significant at the .05 level.

opportunity to learn by doing and cooperating each others in a group of mixed sexes. Therefore, both sexes could equally gain in knowledge, attitudes, and behaviors.

However, the finding showed that the female students indicated more overall environmental knowledge and in 3 aspects: garbage and sewage disposal, water conservation, and chemical usage than the male students. This might be due to the nature of females did not resist to change as compared with the males (Erickson and Erickson, 1984). After the female students were taught and instructed to do for conservation of the environments, they were willing to change their attitudes and behaviors more frequently than the male students.

Lastly, the grade 6 students showed more posttest environmental knowledge in overall and in 3 aspects, and attitudes towards electricity conservation more than the grade 5 students was supported by the findings found that the students learned at a higher grade level had more environmental knowledge (Ratanapaiboon, 2006), environmental knowledge and environmental attitudes than the students learned at a lower grade level (Prerdproa, 2009). This might be due to the high grade level students had more environmental knowledge structure (Ausubel, 1968), more experiences and attitudes towards environment, and more maturity and responsibility (Ausubel, 1968) resulted from in - class learning and out-of class learning than the lower grade level students.

However, the findings showed that the grade 6 and grade 5 students did not indicate different participatory behaviors in environmental conservation was supported by the finding found that the students with different grade levels did not indicate different behaviors in environmental conservation (Ngarmsriwong, 2007). This might be due to the principle stated that the behaviors may change as an individual has awareness or attitude (Schwartz, 1974). In other words, the affective behaviors influence the performance behaviors. Since these two groups of the students after attending the training session did not show different attitudes towards environmental conservation, therefore they did not have different behaviors.

RECOMMENDATION

Environmental problems have severe impacts on human living without considerations of age, sex, occupation and

so on. Young citizens should be educated about natural resources and environments in order to be adult citizens responsible for conservation of natural resources and environment. The contents of conservation of natural resources and environments should be learned effectively at primary education level by using an appropriate teaching method or holding a training session.

Conflict of Interests

The authors have not declared any conflicts of interest.

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Educational Research and Reviews

Full Length Research Paper

A CFBPN artificial neural network model for educational qualitative data analyses: Example of students' attitudes based on Kellerts' typologies

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In this study, artificial neural networks are suggested as a model that can be 'trained' to yield qualitative results out of a huge amount of categorical data. It can be said that this is a new approach applied in educational qualitative data analysis. In this direction, a cascade-forward back-propagation neural network (CFBPN) model was developed to analyze categorical data for determine students' attitudes. The data were collected using a conceptual understanding test which includes open-ended questions. The results of this study indicate that using CFBPN model in analyzing data from educational research examining attitudes, behaviors, or beliefs may help us obtain more detailed information about the data analyzed and hence about the characteristics of the participants involved.

Key words: artificial neural networks; qualitative data analysis; education; biology

INTRODUCTION

Kellerts' attitudinal typologies

There have been many studies conducted on attitudes towards nature and living things. Studies by Stephen Kellert have special importance because they proposed a particular systematic for attitudes towards nature. By conducting comprehensive studies Kellert (1996) determined nine basic attitude types and showed that attitudes vary with respect to age (Table 1). Whereas children's relationship with animals is more of emotional at ages 6-9, they focus on learning about living things at ages 10-13. In later developmental stages ethical/ ecological issues emerge related to living things and their habitat.

Most of the studies conducted based on Kellert's typologies try to determine in which of the 9 categories participants fall. However, in some instances Kellert (1991) made some additions to the 9 basic attitudes. For instance, in a study related to Japanese society Kellert included naturalistic and theistic attitudes (Kellert, 1991). In some other cases, Kellert preferred to use attitudes with similar properties as grouped (such as naturalistic-ecologistic) (Kellert, 1993b).

Data analyses in educational researches

The majority of the data collected within the scope of

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Table 1. Kellerts' typologies of basic attitudes toward wildlife (according to Thompson and Mintzes, 2002; p.647).

Term	Definition
Naturalistic	Primary focus an interest and affection for wildlife and the outdoors.
Ecologistic	Primary concern for the environment as a system, and for interrelationships between wildlife species and natural habitats.
Humanistic	Primary interest in and strong affection for individual animals such as pets or large wild animals with strong anthropomorphic associations.
Moralistic	Primary concern for the right and wrong treatment of animals, with strong ethical opposition to presumed overexploitation or cruelty toward animals.
Scientistic	Primary interest in the physical attributes and biological functioning of animals.
Aesthetic	Primary interest in the physical attractiveness and symbolic characteristics of animals.
Utilitarian	Primary interest in the practical value of animals.
Dominionistic	Primary interest in the mastery and control of animals, typically in sporting situations.
Negativistic	Primary orientation an active avoidance of animals due to dislike or fear.

researches conducted on social cases such as education rely on quantitative data. In this respect, most commonly used statistical analysis procedures are descriptive statistics, *t*-test, ANOVA/MANOVA, correlation, regression, and psychometric statistics (Hsu, 2005). The main reason for this is that quantitative data take less time to collect and analyze by using package software. However, results obtained from qualitative analyses provide more in-depth data on subjects and thus considered to be more 'valuable' for researchers. In this respect, it is considered that new methods to analyze a large amount of qualitative data in a short span of time with minimal loss are required.

The main reason that encourages us to conduct this study is our persuasion that artificial neural networks have such a huge potential. Customized artificial neural network architectures and training algorithms specific to individual studies are considered to be used in the analyses of qualitative data. For example, in this study, artificial neural networks are suggested as a model that can be 'trained' to yield qualitative results out of a huge amount of categorical data.

Artificial neural networks

Artificial neural networks (ANNs) are mathematical models inspired by biological neural networks contained in human brain. Having similar characteristics to those of biological neural networks (i.e. consistency, flexibility, parallel function, and tolerance to errors, etc.), these systems attempt to learn tasks and determine how they will react to new tasks by means of creating their own experiences through the data obtained by using the predetermined samples (Sagiroglu et al., 2003).

Neural networks can be used to model complex relationship without using simplifying assumptions, which are commonly used in linear approaches. The other advantages of the ANNs are the ability to represent both linear and nonlinear relationships, the ability to learn these relationships directly from the data used, need not take into account a detailed information of structures and interactions in the systems, and they are regarded as ultimate black-box models. At least in some cases if not always, i.e. for prediction using the trained network, the ANN systems are alternative to experimentation and save a lot of time which may have been consumed since experimentation is so difficult and in some cases are impossible. Artificial neurons based on biological model were first defined by McCulloch and Pitts. McCulloch-Pitts (MCP) neuron model is given in Figure 1.

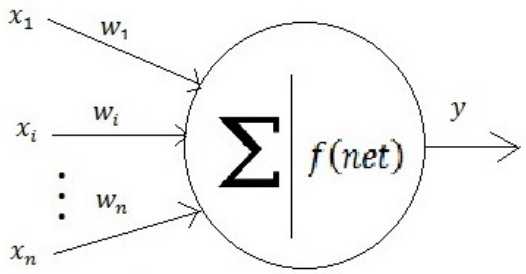

Figure 1. Representation of a neuron.

In all neural network models, x_i input values are multiplied by w_i connection weights and then summed up. Summation unit is compatible with the body of biological neuron. It sums up weighted inputs and then gives the *net* output, such that:

$$net = w_1x_1 + w_2x_2 + \ldots\ldots\ldots + w_nx_n + x_0b = \sum_{i=1}^{n} w_ix_i + x_0b \qquad (1)$$

$$y = f(net)$$

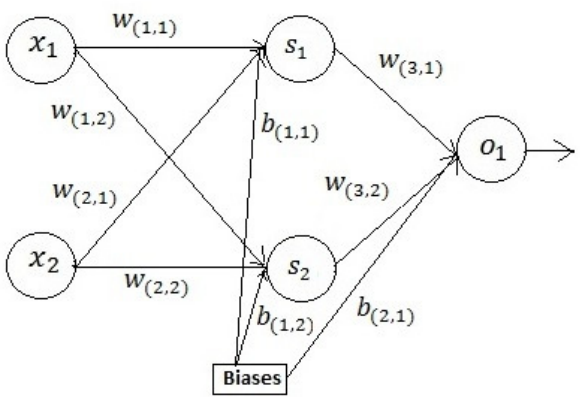

Figure 2. Feed forward ANN (FFANN).

Input values (x_i) are multiplied by weights (w_i) assigned to connections and applied to additive function (Σ) together with a bias value ($x_0 * b$). Bias value is applied to neuron externally. Output is obtained by application of *f* activation function to additive function output.

Each input has an effect on output in proportion to weights assigned to connections, and threshold value is independent from system inputs. In case the values of all inputs are equal to 0, the output function is represented as $f(x_0 * b)$.

In case of biological neurons, neuron yields to output when input exceeds the activation value. In order to apply this feature in ANNs, an activation function, usually nonlinear, which produces cell output by means of processing net input obtained from additive function, is used. Various activation functions are applied based on the model used. Most commonly used functions are step functions (unipolar and bipolar), linear functions (standard linear, and symmetric piecewise linear), and sigmoid functions (logarithmic sigmoid and tangent sigmoid).

Structures of ANN

ANNs can be analyzed in two separate groups as single-layer and multilayer ANNs, which are determined based on the number of layers in their structures (i.e. network architectures). In a single-layer neural network, neurons represent output layer. Neurons receiving input values are not considered as input layer due to the fact that no calculations are made in this layer. Data received from input layer is calculated in output layer and network output is obtained.

On the other hand, multilayer networks are different from other networks, such that multilayer networks have one or more hidden layers and also weighting is applied in input layer. In multilayer networks, at least one hidden layer (s_1,s_2) is represented between output layer (o_1) and input layer (x_1,x_2) (Fausett, 1994) (Figure 2).

Learning in ANNs

In a neural network, learning can be defined as reaching optimum weight values between neurons, which provides approximation between the output values calculated by output values versus a given input vector set and the expected output values.

A training algorithm is used for learning process and compositions of weights are determined by these algorithms. The objective of the learning process is to obtain an output value with a maximum approximation to the expected output by means of reducing errors using learning algorithms. For this purpose, weights in the system are iterated in each network with an aim to reduce errors. If artificial neural networks have achieved their goal with the input-output pairs, weight values are saved. The process during which weights are constantly iterated until the expected result is achieved is defined as "learning" (Lawrence et al., 1997).

Delta Rule, also applies to this study, is one of the most commonly used learning rules (Sagiroglu et al., 2003). Reducing the discrepancy between the expected output value and the predicted output value of neuron, this learning rule is based on the concept that strengthens and constantly changes input connections. This rule is based on the principle of reducing mean square error by means of changing weight values of the connections and it attempts to reduce errors by means of back propagation from output layer towards input layer. Therefore, Delta Rule is also called back propagation or least mean square learning rule.

Feed forward back-propagation ANNs (FFANN)

In feed forward ANNs, one layer contains some neurons which are connected to those of the following layer. Each connection is weighed. A neuron is described with its own activation level, which is responsible for the propagation of the information from the input layer to the output layer. However, to obtain reliable weights, the neural network must learn about the known input- and output-samples. During the learning process, an error between theoretical and experimental outputs is computed. Thus, the weight-values are modified through an error back propagation process which is executed on several sampling data, until achieving as small error as possible. After this last step, the neural network can be considered as trained and able to be used in calculating other responses to new entries that have never been

presented to the network. It is important to emphasize that the learning speed of the neural network depends not only on the architecture but also on the algorithm used (Gallant, 1993; Guney, 1997).

Back-propagation algorithm

Back propagation of errors learning model, first introduced by Rumelhart (1986), is one of the most commonly used models amongst other artificial neural network learning models (Rumelhart, 1986). In back propagation algorithm, learning mechanism is based on iterative gradient descent method which minimizes errors between the expected outputs and the predicted outputs of the network. In learning rule, error calculated in network output is used in the calculation of new values of the weights. Supposing that y_i represents output value of the ith neuron in the output of artificial neural network after k times of iteration of the training, d_i represents the expected value, and e_i represents the error signal of the i neuron, then the calculation of error value is defined by the following Equation:

$$e_i = \left(d_i - y_i\left(k\right)\right) \tag{2}$$

When an input data is applied to a network, various processes are performed on this data until it reaches output layer. Output obtained as a result of these processes is compared to the expected output and approximation function is defined by the following Equation:

$$E = \frac{1}{2}\sum_i \left(e_i(k)\right)^2 = \frac{1}{2}\sum_i \left(d_i - y_i(k)\right)^2 \tag{3}$$

The difference between the calculated values and the expected values is calculated as an error signal for each output node. Based on these error signals, connection weights are rearranged for each neuron. This arrangement allows for convergence of the network to a condition where all data can be coded, and the gradient of weight values is determined by the method of the steepest falling gradient (Rumelhart, 1986), which can be represented by the following Equation:

$$\Delta w_{ij} = -\eta \frac{\partial E\left(\vec{w}\right)}{\partial w_{ij}} \tag{4}$$

In the above Equation, η is coefficient of learning. Each iteration process in back propagation algorithm consists of two stages as forward propagation and back propagation. During forward propagation, output values of ANN versus input signals applied to ANN at that time are determined. During back propagation, the previously assigned weights are rearranged on the basis of resulting output errors. Each change of weight in ANN is performed based on the following equation:

$$\Delta w_j = \eta \delta_j y_i \tag{5}$$

For neurons in output layer, δ_j is defined as

$$\delta_j = e_j\left(k\right) f_j^{'} \tag{6}$$

Whereas, for neurons in hidden layers, it is defined as

$$\delta_j = f_j^{'} \sum_m \delta_m w_{mj} \tag{7}$$

f_j is the activation function of j neuron. By these definitions, the flow of error signals from output towards input is considered to be similar to the flow of signals forward during forward propagation. Iteration process continues until the error value is reduced to a certain level and therefore training process of the network is completed. Weight values of the connections between layers are obtained from the network upon completion of its training and these values are stored to be used during test process (Yao 1999).

METHOD

Qualitative data obtained from student answers to open-ended questions were used to train and test the ANN model. 80% of this data was used for training of the network and the remaining 20% was used for testing of the network (Hagan et al., 1996). Detailed information and algorithms of ANNs are explained in above section 1.3.

Subjects

The participants included 214 students (127 female and 87 male) who were selected via cluster sampling method (Bogdan and Biklen, 2006) from eight high schools in Izmir, a large city in western Turkey. Schools accepted students from different parts of the city and students varied in terms of socioeconomic status.

Data collection

In this study a conceptual understanding test was used. The test included open-ended questions and was developed by researchers. In addition, to clarify vague concepts and to obtain in-depth information about the topics interviews were conducted with students and teachers. The final version of the test used in this study is presented in Table 2.

Table 2. Conceptual understanding test of the living things.

1. It is estimated that there are millions of species living on Earth. If you were asked to classify all the living things (types, species) into main groups, without leaving anyone out, *at least* how many groups can you from?
2. When all the living things were considered, what do you think is the biological position of *human*? Explain.
3. When all the living things were considered, in your opinion is(are) there any living thing(s), existence of which is(are) unimportant (to have little or no use)? If yes, which ones? If no, why? Explain your reason.
4. When you rank the following names of the living things from the most significant to the least, according to your criteria of importance, which one ranks first? How did you determine the level of importance? Explain. Rat, nettle, mushroom, honeybee, daisy.

Table 3. Student rankings of the living things in terms of significance.

Students	Rank1	Rank2	Rank3	Rank4	Rank5	Attitudes
X17	Rat	Honeybee	Daisy	Mushroom	Nettle	Humanistic
X20	Mushroom	Rat	Nettle	Honeybee	Daisy	Utilitarian
X21	Honeybee	Rat	Nettle	Mushroom	Daisy	Ecologistic
X27	Honeybee	Rat	Nettle	Daisy	Mushroom	Utilitarian
X28	Mushroom	Rat	Daisy	Nettle	Honeybee	Utilitarian
X29	Honeybee	Rat	Mushroom	Nettle	Daisy	Ecologistic
X147	Daisy	Mushroom	Honeybee	Nettle	Rat	Utilitarian
X148	Honeybee	Mushroom	Daisy	Nettle	Rat	Utilitarian
X149	Daisy	Honeybee	Mushroom	Nettle	Rat	Ecologistic
X150	Daisy	Honeybee	Mushroom	Nettle	Rat	Scientistic

Data analyses

The fourth question in the conceptual understanding test was used to train and test our artificial neural network. Students answer this question at two stages. First, they were asked to list the names of 5 living things according to importance. Then, they were asked to explain the criteria they used to write the name of the first living thing as the first on the list.

Students' answers to the 4th question evaluated along with their answers to other questions and their attitudes were tried to determine based on Kellert's typologies. For example, let's assume that two students list the names of the living things as the same and both wrote the honeybee first. Let us further assume that one student's reason to write honeybee first was that "honeybees are living things that have important functions in nature." The reason put forth by the other student was that "honeybees make honey for us." In this case, according to Kellert's typologies first student can be characterized as 'ecologistic' and the second as 'utilitarian.' All students' answers were analyzed in this way and the data were tabulated. Some data are presented in Table 3.

Creating CFBPN model

In this study, we developed a cascade-forward back-propagation network (CFBPN) model. The CFBPN model is structurally very similar to the FFANN model. Every neuron at input and hidden layers are connected to each other. In addition, all input layer neurons and output layer neurons have direct connections with each other. While the hidden layer takes data only from the input layer, the output layer takes data from both the input layer and the hidden layer. According to Filik and Kurban (2007) the fact that input layer (independent variables) and the output layer (dependent variables) is connected provides CFBPN model some advantages over the FFANN model in some cases.

To test the proposed ANN model collected data were divided into two groups as training data and test data. Training data were used to develop the ANN model. Test data were not used in training, they were used to verify and test the ANN model.

The model started training with the randomly chosen weight matrix. Then, results from the output layer compared to expected results and a back propagation error value is defined. This error value is back propagated in the network and weights were rearranged. This process continued until there is minimum error value or there is no change in weights. In addition, number of neurons hidden layer should have was determined to be able to obtain appropriate results. There is not a definite method of determining the number of neurons hidden layer should have. It has been determined through trial and error depending on researcher experience. The number of neurons in input and output layers is determined according to number of dependent and independent variables. Since listing names of five living things is the independent variable, there are 25 neurons in the input layer to represent this listing. Since there are four attitudinal typology types determined, there are four neurons in the output layer to represent this. Table 4 shows how the data in Table 3 were coded to train our network.

As the set of species contained in the research problem is given to the students in the following sequence as "rat, nettle, mushroom, honey bee, and daisy", the same sequence has also been used in coding. For each species, a vector containing four '0' and one '1' has been used. Therefore, the code used by a student to list these five species is a vector consisting of 25 bits. For example, when the

Table 4. Input vector data coding for ANN model.

Living things	Rat	Nettle	Mushroom	Honey bee	Daisy
Codes	10000	01000	00100	00010	00001

Table 5. Output vector data coding for ANN model.

Attitudes	Codes
Ecologistic (E)	1000
Utilitarian (U)	0100
Humanistic (H)	0010
Scientistic (S)	0001
E/U	1100
E/H	1010
E/S	1001
U/H	0110
U/S	0101
H/S	0011
E/U/H	1110
E/U/S	1101
E/H/S	1011
U/H/S	0111
E/U/H/S	1111

following sequence as 'nettle-honey bee-daisy-mushroom-rat' is coded, (01000) in the first order for nettle, (00010) in the second order for honey bee, (00001) in the third order for daisy, (00100) in the fourth order for mushroom, and (10000) in the fifth order for rat are entered, respectively. In other words, the complete sequence is coded as the following: 0100000010000010010010000. Written in vector notation, it is the input vector: (0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0).

A similar method has been used in coding attitudes (Table 5.). (**1**000) for ecologist, (0**1**00) for utilitarian, (00**1**0) for humanistic, and (000**1**) for scientific have been used, respectively. However, a coding method inspired by the studies on rough set conducted by Narli *et al.* (2010) has been developed for the students who list the species in the same order, however having different attitude characteristics. Therefore, codes have been used in combinations in case of two or more attitudes. For example, the code (**11**00) has been used in case of ecologist-utilitarian, and the code (1011) has been used in case of ecologist-humanistic-scientific.

In the next stage, the transfer function for each stage must be determined by trial and error approach. In this regards, different types of transfer functions including logarithmic sigmoid, hyper-bolic tangent sigmoid, linear, and radial basis transfer functions were used to find the proper transfer function for the proposed neural network (Hagan et al., 1996).

Next, we determined transfer functions necessary for every stage. To determine the most appropriate transfer functions for our model, logarithmic sigmoid (logsig), hyperbolic tangent sigmoid (tansig), linear, and radial basis transfer functions were tried. As a result, logsig (Eq. (8)) and tansig (Eq. (9)) functions were decided as appropriate for the hidden layer and output layer respectively (Figure 3.).

$$f(net) = \frac{1}{1+e^{-net}} \tag{8}$$

$$f(net) = \frac{1-e^{-2net}}{1+e^{-2net}} \tag{9}$$

The CFBPN model used in our study has 25 neurons in input layer, 10 neurons in hidden layer and four neurons in output layer. The model is shown schematically in Figure 4.

As explained earlier, training stage is one of the important steps. In general, back propagation algorithm is used for training. We have used Levenberg-Marquardt algorithm in the training phase of the present study. Convergence rate of back propagation algorithm is low and its risk to find a local minimum is quite high. Levenberg-Marquardt Algorithm (LM) is generally used for problems vulnerable to such risks. Whereas back propagation algorithm (BP) attempts to reduce errors by use of first order derivatives, LM interpolates between Newton method and BP method, and then it attempts to reduce errors by use of second order derivatives (Hagan and Menhaj, 1994; Rumelhart and McClelland, 1986). LM method is a damped least-squares method based on the concept of maximum neighborhood (Levenberg, 1944).

In the next step, we determined the number of hidden layers. It was reported that networks having one hidden layer are appropriate for nonlinear approaches (Cybenko, 1989). Our model thus includes only one hidden layer.

RESULTS AND DISCUSSION

First, 184 cases were used for training of the network and30 cases were used for testing the network. According to the results obtained via trial and error approach, optimum number of neurons that hidden layer should have was determined as 10. Therefore, to have a minimum error our network model should have a network architecture as 25x10x4 (Figure 5). The activation (transfer) functions used in hidden and output layers are logsig and tansig respectively.

In addition, the synaptic parameters including weights and biases are given in Tables 6, 7 and 8 which enable any one to reproduce every used data points in the present study.

The network was trained until optimum parameters are obtained (more than 1000 epoch). Then, it was tested using test data. The training and test phases are displayed in Figures 6 and 7 respectively. As a result, there is great consistency between the results our model produced and the expected results.

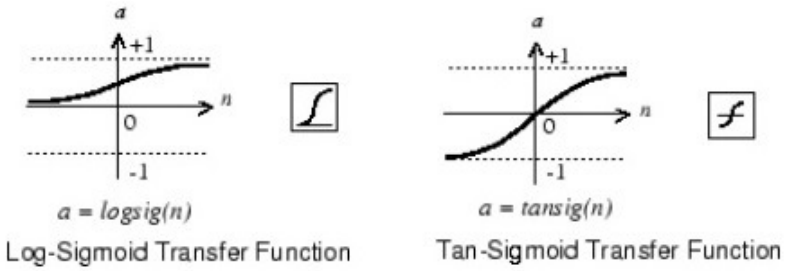

Figure 3. Transfer functions.

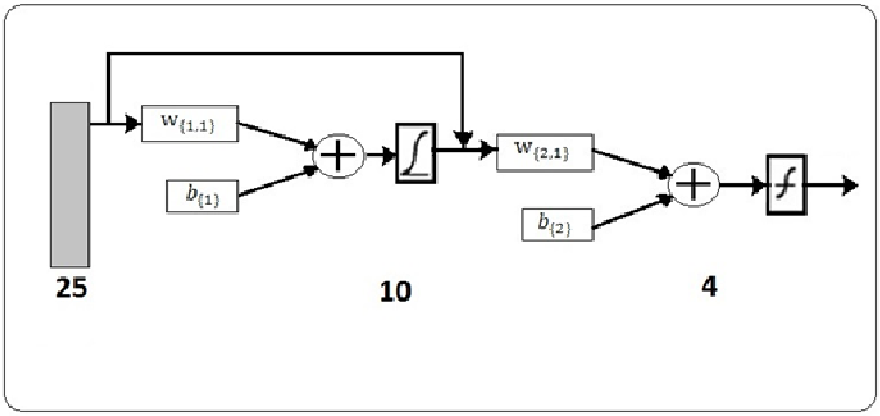

Figure 4. The schematic representation of CFBPN model.

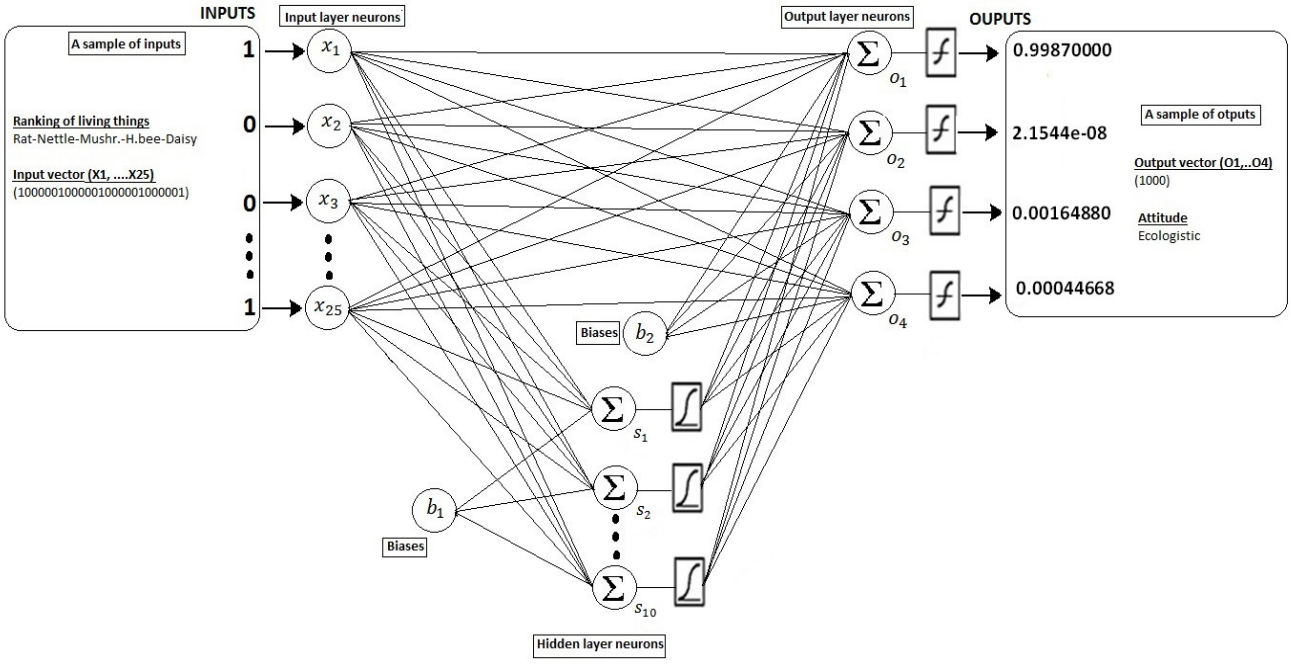

Figure 5. Trainable CFBPN artificial neural network architecture.

Table 6. Connection weights matrix from the input layer to hidden layer (w_{ij}) and biases

		Hidden layer neurons									
		S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
Inputs	Rank1 (X_1,..X_5)	0.78864	1.4503	-1.8079	1.452	0.5519	-0.35577	-1.2072	0.037516	3.1423	2.1863
		-0.76022	0.13729	0.63891	1.0559	2.3707	-3.2429	-0.25737	2.3275	-0.54864	0.38329
		-0.95737	-0.17876	1.6528	0.58333	-1.0237	0.97174	2.6421	-1.1106	0.58025	-1.954
		0.36849	-2.1475	-2.6011	-3.455	-1.0759	1.9243	1.7404	-2.016	1.5536	-2.6801
		1.3728	-1.1545	2.0002	1.624	-0.16809	0.13441	-1.5541	0.47475	-0.35286	0.98813
	Rank2 (X_6,..X_{10})	-0.57162	2.3206	-1.1575	-0.52872	-3.724	0.37781	2.0017	-1.8524	-1.2134	-1.6003
		1.8729	-0.56485	0.72145	0.9362	0.88649	2.4606	0.92906	-2.8851	-2.1532	-0.10247
		0.44667	-3.3594	2.4802	-3.0291	3.0585	-1.0951	-4.4233	-2.0221	1.8581	-1.6579
		1.6994	1.1755	-1.7374	0.64896	2.2722	0.6353	-0.14444	2.2274	-1.5478	2.447
		-3.756	-2.1113	0.47761	1.9744	1.1089	-1.835	2.713	2.1359	-1.267	-2.4429
	Rank3 (X_{11},..X_{15})	-2.9365	0.65099	1.1628	-1.2544	1.0925	0.23389	-0.59234	0.33941	-0.68414	1.2433
		-0.50569	-3.4599	-0. 1137	0.96792	-3.6886	1.6913	-0.23712	1.1109	-2.4188	1.0576
		-2.65	1.5159	-4.3883	1.8249	2.8767	0.9495	-2.1025	-0.0026772	-0.90547	0.15393
		1.3603	1.6502	1.0117	0.13681	-0.41837	-1.5426	2.3729	1.0265	1.5974	-2.7632
		3.7646	-0.36254	-1.8205	-0.65485	-0.37411	-0.87901	-0.26321	-2.9487	-0.19173	-1.9
	Rank4 (X_{16},..X_{20})	2.0695	-1.9722	1.0685	0.69426	1.2338	0.22989	-0.37213	2.4683	-1.5162	-2.4725
		-0.71868	-0.98477	-3.4045	-0.88019	0.61636	-0.39837	2.6059	1.4761	0.29735	-1.5167
		1.0083	-0.60972	0.78559	-1.562	-2.64	-2.8013	1.0831	-0.95471	-1.6036	0.73547
		-3.0347	-3.6995	2.5029	0.0010816	1.2943	-0.20637	-2.1829	-0.044698	1.9217	-1.9484
		1.7884	4.4183	-0.24413	0.70473	-0.86411	1.2632	0.083992	-1.1271	1.5847	1.0705
	Rank5 (X_{21},..X_{25})	0.39689	-3.5193	0.55003	0.8385	0.47616	0.19385	1.1589	-0. 90451	1.0328	-0.99713
		-0.065859	2.2805	1.0507	-1.5964	1.3658	-0.54835	-2.1511	-1.5024	2.362	-2.5135
		1.5188	1.0353	-0.45812	1.4767	0.3819	3.616	2.2732	1.5689	-0.97686	0.35713
		0.081028	1.054	-0.31353	1.1559	-1.8619	-2.2108	-0.11367	-2.041	-3.0828	0.45892
		-3.2666	-3.2021	-0.30518	-3.5333	2.0617	0.27449	-1.1567	-0.011975	-1.9181	0.53516
	Biases (b_1)	-3.1279	-1.8378	2.0019	-1.0257	-0.68062	-0.4867	-1.1728	2.0629	2.689	3.7156

Conclusion

The present study used a CFBPN model approach to an educational research involving qualitative data. It can be said that this is a new approach applied in educational qualitative data analysis. Consequently, the present study has attempted to show the applicability of ANNs in detailed analyses of educational data. The ANNs are utilized mostly

Table 7. Weights connection matrix from the input layer to output layer (Wik) and biases

		Output layer neurons			
		O_1	O_2	O_3	O_4
Inputs	Rank1 (X_1,..X_5)	4.5734	-5.3634	0.38563	-4.4941
		-0.66081	-0.91009	-1.3472	0.72317
		0.68001	5.9236	-0.36622	-0.51813
		3.4679	1.9517	-3.2882	-0.45556
		2.4582	4.3011	2.1037	-1.5538
	Rank2 (X_6,..X_{10})	-1.1156	-1.9907	-3.1977	2.0466
		-0.17552	0.82335	-0.57041	-0.86524
		2.1132	-2.9039	-0.6195	-1.8202
		0.74707	-0.87652	0.59601	1.9969
		1.2532	1.179	0.56482	-0.41237
	Rank3 (X_{11},..X_{15})	0.041205	3.6995	-0.19798	0.51898
		-2.8629	2.4737	3.0117	-2.9654
		-1.0726	-0.27359	-2.5616	-0.19829
		2.221	-3.7873	-1.089	0.92936
		1.9347	-2.4868	-1.3744	-1.9162
	Rank4 (X_{16},..X_{20})	1.7668	0.025732	-0.49382	-0.032302
		-0.14938	-0.58613	-0.75787	-0.96644
		3.9681	-1.0538	1.9719	0.75513
		1.5356	2.0224	-0.47041	-4.9275
		-0.40513	-0.27916	-3.1219	2.6014
	Rank5 (X_{21},..X_{25})	0.88078	3.8167	1.0816	-0.80005
		4.6141	-1.735	-2.4077	1.1337
		0.3151	-1.7403	-2.0866	-0.15404
		-1.7809	1.327	1.0452	-1.0701
		1.4228	-1.3297	-0.70889	-1.1441
	Biases (b_1)	-4.6917	-0.47138	2.4025	-0.041698

Table 8. Weights connection matrix from the hidden layer to output layer (W*jk*)

		Output layer neurons			
		O_1	O_2	O_3	O_4
Hidden layer neurons	S_1	-5.0116	8.3042	-3.015	-7.1749
	S_2	8.4891	-0.74355	8.4183	-11.4488
	S_3	-8.5945	-7.6702	-10.2047	-0.002188
	S_4	1.8644	-6.3863	-3.8443	8.91
	S_5	-0.74532	7.5856	-4.2982	9.861
	S_6	4.0926	-7.7658	0.92315	4.1332
	S_7	9.1429	-1.5493	-10.8214	0.060434
	S_8	6.047	6.6244	-3.89	-4.818
	S_9	8.5302	3.1134	7.4547	-3.849
	S_{10}	8.815	0.28353	-11.7286	-4.7165

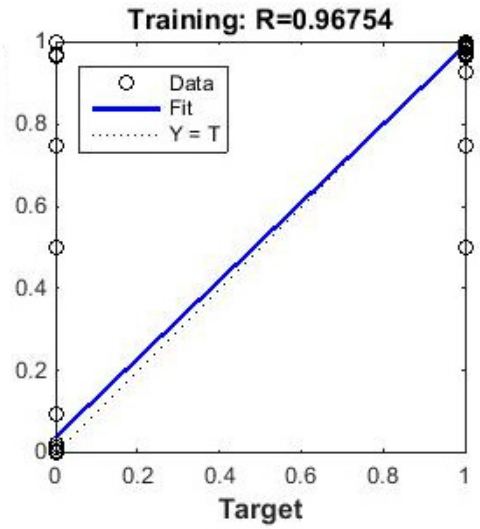

Figure 6. Predicted attitudes vs. expected attitudes for training data set.

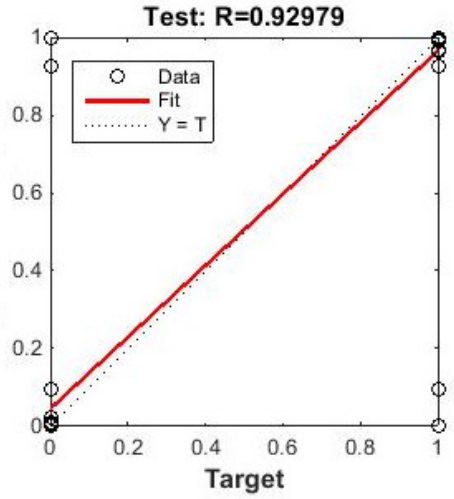

Figure 7. Predicted attitudes vs. expected attitudes for test data set.

in areas such as artificial intelligence (AI), machine learning, pattern recognition, decision support systems, expert systems, data analysis, and data mining.

Kellert (1993a, b) has represented some typologies in binary groups (e.g., utilitarian–dominionistic). However, these groupings occur between typologies that display very similar characteristics. Narli et al. (2010) argued that there may be students who have intermediate attitudes among the typologies identified by Kellert. In this study, it has been showed that CFBPN model can be trained to uncover intermediate attitudes. Moreover, this can be done in much shorter time in this way.

Consequently, the results of this study indicate that using CFBPN model in analyzing data from educational research examining attitudes, behaviors, or beliefs may help us obtain more detailed information about the data analyzed and hence about the characteristics of the participants involved. In addition, precise knowledge about our students' attitudes and beliefs may prove helpful in curricular and instructional studies.

Conflict of Interests

The authors have not declared any conflicts of interest.

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