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Multiple Intelligences Profiles in Prospective Teachers

Devrim Erdem[1] & Ibrahim Keklik[2]

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Abstract

The teaching profession in the 21 Century not only requires a rich variety of competences but also necessitates a remarkable capacity for adaptability to changes. Training programs for teachers have increasingly incorporated a focus on the personal growth and improvements of teachers. This growth involves acquiring considerable insight into a range of their physical, cognitive and affective characteristics. In an attempt to contribute to the literature on teachers' characteristics, the current work intended to examine multiple intelligence profiles of a sample of pre-service teachers and compare their scores with respect to their gender, field of study and year of college. The participants of the current correlational study were 346 pre-service teachers in Turkey. Findings showed pre-service teachers' weakest areas were in the musical-rhythmic and verbal/linguistic domains. Significant differences were revealed in several domains of multiple intelligence according to gender, departments and year of college.

Keywords: *Multiple intelligence, Teacher education, Individual differences*

Introduction

Most contemporary societies and governments are to one degree or another aware of the importance of education for the future of their respective societies. Individuals in 21st Century have to learn more knowledge and skills than ever before. Likewise, "education is increasingly important to the success of both individuals and nations" (Darling-Hammond, 2006, p. 1). Thus, an immense body of research focusing on countless numbers of variables ranging from characteristics of teachers to cultural and contextual variables, teachers training programs, classroom variables to various aspects of students' characteristics, teaching methods, learning theories and so on has been accumulated. A closer look at this literature shows that the majority of these studies focus on teachers because of their crucial role in orchestrating learning environments and experiences. This role is of even more crucial in the contemporary societies for two main reasons. One, the breadth and depth of information and skills today's pupils are having to acquire is incomparably greater than before. Also improved medical services have led to greater diversity of gene pool while also most of the world's countries have made primary education

[1]Department of Educational Sciences, Nigde Omer Halisdemir University,[ORCID 0000-0003-1810-2454],erdem_devrim@yahoo.com
[2]Department of Psychological Counseling & Guidance, Hacettepe University, [ORCID 0000-0002-8442-995X],keklikibrahim@gmail.com

mandatory to all school age children. Moreover, in many industrial countries, education is geared toward "leaving no child behind." This even further complicates what entails teaching in the 21st Century. Added to this is the fact that teachers and education, traditionally, focused on the past and present more so than the future, the stunning pace of change in the new Millennium necessitates the future "to be more deliberately thought of" as put by Roy Singh (1991, p. vii).

Hence, the teachers in the 21st Century need to acquire a rich range of competences as well as an outstanding capacity for adaptability to changes. As such, training programs for teachers have increasingly incorporated a focus on the personal growth and improvements of teachers. Only few decades ago individuals in almost all occupational areas, essentially got by without enormous additions to what they had acquired in their respective university educational programs. However, due to remarkably fast paced change in all spheres of life during the last several decades, individuals did not only need to continually improve their skills and knowledge but also were required to be more flexible and capable of effectively adapting to these changes. Thus, compared to a colleague in the 1970's, a geography teacher in the present times is having to learn more about utilizing technologies, personal attributes of his/her students, an incomparably richer variety of teaching methods as well as about an array of his/her own personal characteristics. As such, today's teaching programs should not only strive for equipping students with knowledge, skills and attitudes for effective teaching, but also facilitate significant degree self-awareness, self-reflection and personal growth so as to promote the above-mentioned adaptive capacity.

In other words, in today's teacher education the personal growth of the candidate teacher is an integral part of his or her training. Particularly, in contexts such as Turkey, due to a huge lack of career counseling services and its exam-oriented educational system, often times individuals are placed in teacher education programs based solely on their scores on national examinations. Candidate teachers list their programs of choice for college education after they receive their scores on these exams. For a great number of these individuals teaching is one of the many programs they list prior to entry to university. It should be kept in mind that teachers' education in Turkey is provided at undergraduate level. As such, ideally, both teacher training programs and university student personnel services should go the extra mile to facilitate personal growth of these individuals. Part of such efforts should involve identifying and examining various cognitive and affective characteristics of candidate teachers. One of the most important areas to explore is candidate teachers' intellectual capacities.

Human beings have always had immense curiosity for the mind since at least the time of Plato and Aristotle. However, it was not until the beginning of the last century that a tangible conceptualization of human intellectual capacity was formulated. In 1904, in an attempt to identify children at risk for failure, the French psychologist Alfred Binet developed the first intelligence test. It is noteworthy that this perhaps could not be possible without the remarkable interest in human individual differences that arose during the late 1800s. After Binet's pioneering work a human intellectual capacity called "intelligence" emerged and it was viewed as a measurable construct which could be represented with a single score called the IQ score (Binet & Simon, 1916). The proceeding decades witnessed popularity in development of intelligence tests by eminent scientists such as Yerkes (Yerkes, Bridges, & Hardwick, 1915), Wechsler (1939) Spearman (1927) and Thurstone (1938). These pioneering attempts intended to devise instruments for a variety of age groups. While use of IQ tests ranged from legal to clinical or educational settings and provided valuable tools for determination of special education needs to criminal court decisions, there was growing criticism. One of the essential reasons for critics of IQ testing had to do with its questionable bias which stimulated heated debates for decades. Since intelligence has often been used interchangeably with adaptive behavior. Yet, accumulated empirical evidence suggests that both constructs are related but separate thus should not be taken synonymously (Keith, Fehrmann, Harrison, & Pottebaum, 1987; Krape, Kenworty, Popal, Martin, & Wallace, 2017). Another significant issue was that there emerged a variety of definitions and scores of intelligence that some authors used the term IQ scores instead of using the word intelligence (Richardson, 2002). Indeed, individuals obtain different scores depending on which IQ tests they take (Flynn, 2000). Starting from Binet's times IQ tests have been developed to predict the degree to

which students can benefit from school (or the degree to which they might succeed in school subjects), and IQ tests items are often designed into various academic skill areas, accumulated research has shown that many individuals with high IQ scores did not always succeed academically (Flynn, 1991; Clevenger, 2013; Guez, Panaïotisb, Peyre, & Ramus, 2018). This pointed to a highly significant issue with IQ tests since they were often used to project individuals' future academic performance. Through the years, another essential question with intelligence and IQ tests has been whether intelligence is a single overall ability or a set of multiple abilities?

The growing skepticism about IQ being a single unifying entity led to emergence of theories of multiple intelligences. According to Gardner and Hatch (1989) the main reason leading to this former conceptualization of intelligence was the discrepancy between theoretical and applied concerns. This gap went on until the late 1970s when Sternberg (1977, 1982, 1985), who focused on the information processing aspect of test items, pioneered bringing the theoretical and research aspects of intelligence closer. Another remarkable contribution came from Howard Gardner who was inspired by both theoretical and research concerns. Studying "development and break down of human cognitive and symbol using capacities", Gardner (1975, 1979, 1983) ended up questioning Piaget's (Piaget, 1970) conceptualization of the intellect. Accumulated empirical evidence convinced Gardner that instead of viewing all aspect of symbol use as a part of a single "semiotic function" as asserted by Piaget, separate psychological processes were at play "in dealing with linguistic, numerical, pictorial, gestural, and other kinds of symbolic systems" (Gardner & Hatch, 1989, p. 5).

Indeed, his proceeding work involving various persons with brain damage led Gardner to conclude that different parts of the cerebral cortex were involved in different forms of symbol use. Furthermore, Gardner's realization that most of IQ test and achievement test were almost exclusively based on two forms of symbol use, namely, logical-mathematical symbolization and linguistic symbolization. Given that there were other prominent forms of symbol use, he conclude that if individuals were given tests that included items from other forms of symbol use, they would have quite different IQ, achievement or other scholastic test scores. For such reasons, he introduced the idea of *multiple intelligences*. Thus, he "defined intelligence as the capacity to solve problems or to fashion products that are valued in one or more cultural settings" (Gardner & Hatch, 1989. p. 5) and detailed a set of criteria for a human intelligence. His initial work led to identification of the following seven intelligences: verbal-linguistic intelligence, logical-mathematical intelligence, visual-spatial intelligence, bodily-kinesthetic intelligence, musical- rhythmic intelligence, interpersonal intelligence, and intrapersonal intelligence. Later on, naturalist intelligence was added as the eighth and more recently existential intelligence was added as the ninth area of intelligences.

Gardner's theory revolutionized the existing thinking about the human potential. Educators and specialists from various disciplines began to no longer ask as to how smart someone is but, rather, how he or she is smart (Christodolou, 2009). Since its emergence it has gained such popularity that to date, there exists virtually no academic discipline that has not incorporated into its scientific discourse. This has been particularly so for the fields of education ranging from arts education (Eraslan-Taspinar & Kaya, 2016) to students' use of library resources (Kumbar, 2006). Likewise, there is an ongoing debate as to whether there exists sufficient support from cognitive neuroscience for Gardner's theory of MI. While some authors insist that such evidence is not sufficiently established yet (Waterhouse, 2006), proponents of the theory claim that there is indeed ample evidence supporting the theory (i.e., Shearer & Karanian, 2017; Cherniss, Extein, Goleman, & Weissberg 2006; Gardner & Moran, 2006).

Gardner's theory of MI has received remarkable attention by persons in the fields of education in Turkey. Studies with Turkish samples involved exploring MI applications and academic achievement (Yurt & Polat, 2015); use of MI in teaching visual arts class (Eraslan Taspinar, & Kaya, 2016); comparison of athletes and non-athletes adolescents MI profiles (Bozkus, Erol, Elci, & Bozkus, 2014); MI profiles and learning foreign languages (Tezel, 2017; Iyitoglu & Aydin, 2015; Senbaz Filiz, 2010); teaching math (Yilmaz, 2012) to name but a few. Likewise, there have been a considerable number of

studies working with samples of pre-service teachers (i.e., Gurbuzoglu-Yalmanci, & Gozum, 2013; Ozgen, Tataroglu, & Alkan, 2011; Yenice & Aktamis, 2010; Durmaz, 2005).

The present study draws from the idea that application of the MI theory to education should begin or at least involve teachers' training programs. To date, the theory has been widely explored with both pre-service and in-service teachers. While there are numerous studies offering a rich variety of ways in which MI can be applied in actual practice of teaching (Levy, 2008; Edwards, Carr, & Siegel, 2006; Subban, 2006; Tomlinson, 2005; Goldman & Schmalz, 2003; Stanford, 2003), fewer studies have examined its application to pre-service teachers. In their studies with candidate teachers Verna, Campbell and Tirri (2005) informed their participants on their strengths and asked to develop lesson plans based on their areas of strengths. The findings did not only reveal that the candidate teachers executed these tasks with pleasure and motivation but also showed differing strength areas according to their cultural backgrounds. Studies conducted with samples of pre-service teachers from Turkey as well as those from developing countries such as Mexico, Malesia, Oman and the like involve exploring their MI profiles and examining their scores on MI domains with various personality traits such as learning style, scores on emotional intelligence test etc. (Pursun & Efilti, 2019; Kiremitci, Canpolat, & Yildiz, 2014; Tabia Carlin, Castillo Salazar, & Velazquez Cortes, 2013; Ozgen, Tatatoglu, & Alkan, 2011; Yenice & Aktamis, 2010). Working with an Australian sample of pre-service teachers, White, Dixon and Smerdon (2004) examined effectiveness of "learning through" versus "learning about" MI (Gardner, 1999). Their findings revealed effectiveness of the former.

The aim of education is to provide opportunities for students to acquire knowledge, skills, values and attitudes in order to become accomplished, participating members to a global society. MI theory supplies a useful framework for conceptualization of both the fundamental competencies of all people as well as the unique strengths of individuals (Fasko, 2001). Every individual is different and has an intelligence profile unique to him or herself. In fact, no two individual, not even identical twins have exactly the same profile of intelligences (Gardner, 2004). Effective teaching and learning thus can take place if teachers tailor their work in accordance with students' individual multiple intelligences profiles (Snyder, 2000). MI theory could aid teachers be more specific about their instructional applications (Krechevsky & Seidel, 1998 cited in Fasko, 2001) and lend more efficient tuition and learning (Christodoulou, 2009). Student learning can be built upon their strongest areas of intelligence that will enhance their confidence, self-efficacy and thus motivation for handling harder subject matters (Teele, 2000). In order for these to happen, teachers must first know about their own intelligence profiles so as to be attuned to the needs of their students. As importantly, candidate teachers' awareness about their multiple intelligence profiles will enable them to improve their areas of weaknesses, will facilitate their personal growth and thus allow them to better prepare for their teaching careers. Hence, the purpose of this study is to examine the multiple intelligences of candidate teachers according to their preferences and how their multiple intelligences differ with regard to gender, department and year of study. Answers to the following specific research questions were sought:

1. What are pre-service teachers' MI profiles?
2. Do MI profiles of pre-service teachers differ significantly according to their gender?
3. Do MI profiles of pre-service teachers differ significantly according to their field of study?
4. Do MI profiles of pre-service teachers differ significantly according to their year of study?

Method

Participants

The participants of the current cross-sectional study were 346 pre-service teachers from a public university during the academic year 2018–2019 in Turkey. This convenience sample consisted of 194 females (56.1%) and 152 males (40.5%). Participants' ages ranged between 17-26 years (*M*=21.8, *SD*=1.72). Majority of the participants were at 1st year. A profile of the sample is presented in Table 1. Participation was voluntary. Permission to conduct the study was obtained from the university's administration. Students were given the surveys during their class meetings. Informed consent form was added to the beginning of the scale. They were also provided with brief information about the study orally and they were informed about their rights as voluntary research participants.

Table 1. *The Sample Profile*

Variable	Category	Frequency	Percent (%)
Gender	Female	194	56.1
	Male	152	43.9
Age	17-21	206	59.5
	22-26	140	40.5
Department	Elementary	107	30.9
	Science	106	30.6
	Social Sciences	133	38.4
Year	First	139	40.2
	Second	83	24.0
	Third	77	22.3
	Forth	47	13.6
	Total	346	100.0

Research Instrument

Multiple Intelligence Inventory (MII) for adults was used to determine participants' MI profiles as conceptualized by Gardner (Selcuk, Kayili, & Okut, 2003). MII is made of 80 items, 10 items for each intelligence domain. Participants are given the following optional responses for each item: "Does not apply at all" (0); "partially applies" (1); "somewhat applies" (2); "applies considerably" (3); and "completely applies" (4). Table 2 illustrates participants' level of development in respective MI domains. Cronbach's alpha was found .92 for the overall scale.

Table 2. *Multiple Intelligence Inventory Items' Scores*

Level of development in respective MI domains	Total score on each domain
Highly developed	32 – 40
Advanced	24 –31
Moderately advanced	16 –23
Slightly advanced	8 –15
Undeveloped	0 –7

Data Analysis

To be able to apply any psychological test, it must meet certain psychometric requirements (Kubinger, 2006). Therefore, reliability and validity of the scale were investigated before the main analysis was made. Cronbach's alpha values for internal consistency were calculated using the SPSS22 version. Construct validity was analyzed by confirmatory factor analysis (CFA) using AMOS18. To evaluate model-data fit several indexes of fit were used including the ratio of chi-square to degrees of freedom (χ^2/df), the comparative fit index (CFI), goodness of fit index (GFI) and root mean square error of approximation (RMSEA). Acceptable levels of fit were set at equal to .90 or above for CFI and GFI, below 5 for χ^2/df and equal to .08 or below for RMSEA (Schumacker & Lomax, 1996; Vandenberg & Lance, 2000).

A one-way multivariate analysis of variance (MANOVA) was carried out using SPSS22 to examine differences between pre-service teachers' multiple intelligences (which are related) with regard to their gender, department and year of college. If there are correlated depended variables, MANOVA provide more useful information especially for/in behavioral scientists. Behavioral sciences are usually interested in latent traits and MANOVA tests the differences between underlying unobserved latent variables that are not directly observable such as psychological constructs (Warne, 2014; Zientek & Thompson, 2009). The significance level was set to .05. In the case that MANOVA result is significant, univariate ANOVA with Bonferroni corrections is performed.

Findings

Reliability and Validity Analysis

In this current research, Cronbach's alpha values for each intelligence subscale were calculated to examine internal consistency. Reliability coefficients and sample items are presented at Table 3. Cronbach's alpha values ranged from .61 to .75. Although .70 is considered an acceptable value for Cronbach's alpha (α), according to Furr (2011) the cut-off values of good and poor reliability are not clear. Some researchers have suggested acceptable lower limit for alpha as .60 for exploratory researches (e.g. Cohen, Manion, & Morrison, 2007; Hair, Black, Babin, & Anderson, 2010). Tuckman (1999) asserts that alpha value in personality or attitude tests can be above .50, and that the test is still considered reliable (as cited in Aleksic & Ivanovic, 2016). Thus, overall Cronbach's alpha values were acceptable.

Although a host of studies have been done on multiple intelligence to date, studies specifically focusing on the psychometric analysis of these tools are scarce. Therefore, model-data fit of the scale was assessed with confirmatory factor analysis (CFA). According to suggested cut-of values eight-factor MI model exhibited acceptable model fit (χ^2/df=3.21, GFI=.91, CFI=.91, RMSEA=.08). Likewise, satisfactory values emerged as a result of the model fit assessment for each intelligence domain (Table 3).

Table 3. *Multiple Intelligence Reliability Coefficients and Model Fit Indices*

Sub-scales	Sample Item	α	χ^2/df	CFI	GFI	RMSEA
Verbal-linguistic	Books are important to me.	.64	2.15	.90	.96	.058
Logical-mathematical	I can easily make calculations in my mind.	.63	2.06	.92	.97	.055
Visual-spatial	I enjoy solving visual puzzles.	.61	1.84	.92	.97	.049
Musical-rhythmic	I can repeat melodies of a variety of songs.	.75	2.36	.93	.96	.063
Bodily-kinesthetic	I enjoy doing hands-on work.	.71	2.04	.93	.96	.055
Naturalist	I enjoy working with soil and plants.	.73	2.33	.92	.96	.062
Interpersonal	I feel at ease in crowded settings.	.61	1.85	.92	.97	.050
Intrapersonal	I am thinking about important questions about life.	.62	1.58	.94	.97	.041

Descriptive Statistics

The first aim of this study was to determine scores of multiple intelligences subtests of pre-service teachers. Descriptive statistics of pre-service teachers' scores on MI subscales were presented in Table 4 below. According to mean of the MII-subscales, scores of pre-service teachers' in the relevant intelligence domains ranged between approximately 25.5 and 28.5, indicating that their intelligence levels are advanced. While results showed that naturalist, interpersonal and intrapersonal intelligences were their strongest domains, whereas musical-rhythmic and verbal/linguistic intelligences were their domains of weakness.

Table 4. *Descriptive Statistics for MI Subscales*

Multiple Intelligences	*Mean*	*SD*	*Min*	*Max*	*Skewness*	*Kurtosis*
Verbal/Linguistic	26.25	5.20	12	38	.031	-.458
Logical/Mathematical	26.32	5.38	11	39	-.063	-.428
Visual/ Spatial	27.88	5.07	17	39	.031	-.699
Musical/Rhythmic	25.55	6.71	10	39	-.188	-.436
Bodily/Kinesthetic	27.71	5.75	12	40	-.135	-.496
Naturalist	28.51	5.91	12	40	-.308	-.294
Interpersonal	28.42	4.73	16	40	-.305	-.160
Intrapersonal	28.42	5.13	13	40	-.322	-.184

Preliminary Analysis and Testing Assumptions

Preliminary assumption testing was conducted to check for outliers, normality, multicollinearity and homogeneity of multivariate variance-covariance matrices. There were no missing data or outliers. Normal distributions for all dependent variables (MI subscales) were examined across the independent variables groups. Normality assumptions were fulfilled with checking skewness and kurtosis. Also Q-Q plots were used for assessing normality visually (Field, 2009; p. 822).

Absence of multicollinearity, the correlation between the dependent variables should be low to moderate. Any correlation over .80 presents a concern for multicollinearity. Correlations among MI subscales were presented in Table 5 below. As seen in Table 5 each pair of correlations of MI subscales did not exceed the .62, which were evidence that multicollinearity assumptions were meet.

Table 5. *Pearson Correlations among MI Subscales*

Multiple Intelligences	2	3	4	5	6	7	8
1.Verbal/Linguistic	.568	.551	.473	.433	.513	.542	.620
2. Logical/Mathematical		.616	.361	.513	.482	.535	.534
3. Visual/ Spatial			.497	.620	.545	.555	.555
4. Musical/Rhythmic				.534	.476	.353	.437
5. Bodily/Kinesthetic					.523	.584	.499
6. Naturalist						.549	.509
7. Interpersonal							.562
8. Intrapersonal							1

The homogeneity of multivariate variance-covariance matrices were checked with Box's tests across the all groups using $p<.001$ as a criterion. For current analysis Box's test statistics were not

significant at $p<.001$. Therefore, the assumptions were fulfilled and Wilk's Lambda was elected as an suitable test to use.

A one-way MANOVA was conducted to determine if pre-service teachers' scores on the eight MI subscales differed significantly according to gender. In other words, there was a statistically significant difference between gender groups [*Wilk's* λ = .952, $F(8,337) = 2.144$, p =.031; partial η^2 = .048] on a linear combination of the eight dependent variables, but multivariate effect size was very small. Because the MANOVA was significant, the univariate ANOVA results were examined to follow-up tests. Univariate ANOVAs revealed that pre-service teachers' scores on Visual/Spatial [$F(1,344) = 3.94$, p = .048], Musical/Rhythmic [$F(1,344) = 8.97$, p = .003], Bodily/Kinesthetic [$F(1,344) = 4.54$, p = .034], Naturalist [$F(1,344) = 10.45$, p = .001] and Intrapersonal [$F(1,344) = 5.23$, p = .023] differed significantly with respect to gender. Female pre-service teachers had higher scores on these factors than their male peers. Table 6 presents the group means for multiple intelligences according to gender.

Table 6. *The Group Means for Multiple Intelligences according to Gender*

Multiple Intelligences	Females		Males		
	M	*SD*	*M*	*SD*	*Sig.*
Verbal/Linguistic	26.69	5.30	25.68	5.02	.074
Logical/Mathematical	26.41	5.70	26.20	4.97	.715
Visual/ Spatial	28.36	5.13	27.27	4.93	.048*
Musical/Rhythmic	26.49	7.04	24.27	6.07	.003*
Bodily/Kinesthetic	28.29	5.97	26.97	5.38	.034*
Naturalist	29.40	6.05	27.36	5.52	.001*
Interpersonal	28.82	4.67	27.92	4.75	.079
Intrapersonal	28.98	5.22	27.72	4.93	.023*

One-way MANOVA was conducted to determine if pre-service teachers' scores on the MI subscales differed significantly according to their departments of study. The Wilk's Lambda test showed that the department had a significant effect [*Wilk's* λ = .876. $F(16,672) = 2.866$, p = .000; partial η^2=.064] on MI subscales. The effect size indicates that department does not have a particularly powerful statistical relationship with the MII-subscales. Because of the MANOVA was significant, the univariate ANOVA results were performed. Univariate ANOVAs revealed that pre-service teachers' scores on Logical/Mathematical [$F(2,343) = 4.35$, p = .014], Visual/Spatial [$F(2,343) = 4.75$, p = .009], Musical/Rhythmic [$F(2,343) = 7.81$, p = .000], Bodily/Kinesthetic [$F(2,343) = 9.63$, p = .000] and Naturalist [$F(2,343) = 5.28$, p = .006] differed significantly with respect to departments of study. Table 7 presents the group means for multiple intelligences according to departments.

Table 7. *The Group Means for Multiple Intelligences according to Departments*

Multiple Intelligences	Elementary		Science		Social Studies			
	M	*SD*	*M*	*SD*	*M*	*SD*	*F(2,343)*	*Sig.*
Verbal/Linguistic	27.01	5.43	25.85	5.05	25.95	5.09	1.67	.189
Logical/Mathematical	27.32	5.53	25.17	5.34	26.42	5.05	4.35	.014*
Visual/ Spatial	29.12	4.88	27.34	4.89	27.30	5.02	4.75	.009*
Musical/Rhythmic	27.54	6.18	24.08	6.66	25.11	6.82	7.82	.000*
Bodily/Kinesthetic	29.39	5.31	26.01	5.01	27.71	6.25	9.63	.000*
Naturalist	30.02	5.77	27.87	5.73	27.78	5.95	5.28	.006*
Interpersonal	29.30	5.01	28.21	4.25	27.88	4.78	2.89	.057
Intrapersonal	28.68	5.52	27.89	4.83	28.63	5.02	.81	.444

According to multiple comparisons of departments, elementary education pre-service teachers had higher scores on Logical/Mathematical, Visual/ Spatial, Musical/Rhythmic, Bodily/Kinesthetic and Naturalist factors than their science and social studies peers. Table 8 presents multiple comparisons according to department of MII-subscales.

Table 8. *Multiple Comparisons according to Department of MII-Subscales (Bonferroni)*

Multiple Intelligences	(I) Groups	(J) Groups	Mean diff. (I-J)	*Standard error*	*Sig.*
Logical/Mathematical	Elementary	Science	2.148*	.731	.004
Visual/ Spatial	Elementary	Science	1.772*	.688	.010
		Social studies	1.821*	.652	.005
Musical/Rhythmic	Elementary	Science	3.457*	.902	.000
		Social studies	2.429*	.855	.005
Bodily/Kinesthetic	Elementary	Science	3.374*	.769	.000
		Social studies	1.678*	.728	.022
Naturalist	Elementary	Science	2.151*	.799	.007
		Social studies	2.246*	.758	.003

Note: Only statistically significant differences have been taken.

One-way MANOVA was conducted to determine if pre-service teachers' scores on the eight MI subscales differed significantly according to year of college. There was a multivariate difference among the four years of college [*Wilk's* λ = .748, $F(24,972) = 4.258$, $p = .000$; partial $\eta^2 = .092$]. In other words, there were significant differences between year of college groups on a linear combination of the eight dependent variables. However, multivariate effect size was very small indicates that 9.2% of multivariate variance of the dependent variables is associated with the group factor. Because of the MANOVA was significant, the univariate ANOVA results were examined. Univariate ANOVAs revealed that pre-service teachers' scores on all MI subtests differed significantly with respect to the year of college. Table 9 presents the group means for multiple intelligences according to year of college. According to multiple comparisons, 3rd year pre-service teachers had higher scores on these factors than their 1st, 2nd and 4th year peers.

Table 9. *The Group Means for Multiple Intelligences according to Year of College*

MI	1st year		2nd year		3rd year		4th year			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(3,342)	*Sig.*
V-L	25.06	5.76	25.57	4.97	29.01	5.35	26.45	4.99	11.07	.000*
L-M	25.92	5.38	25.37	4.73	28.66	5.44	25.36	4.44	6.78	.000*
V-S	27.16	5.15	26.90	5.16	31.05	4.64	26.53	3.85	14.67	.000*
M-R	23.93	6.42	24.51	6.28	28.12	7.10	27.98	5.77	9.89	.000*
B-K	27.15	5.52	26.11	5.84	30.53	6.07	27.60	4.94	9.42	.000*
N.	27.60	6.13	27.40	4.62	30.16	7.00	28.43	4.58	5.96	.001*
Interp.	27.96	5.19	27.34	3.93	31.06	4.49	27.40	3.64	11.65	.000*
Intrap.	27.78	527	27.83	3.82	30.65	5.17	27.74	5.71	6.52	.000*

V-L:Verbal/Linguistic; L-M: Logical/Mathematical; V-S: Visual/ Spatial; M-R: Musical/Rhythmic; B-K: Bodily/Kinesthetic; N: Naturalist; Interp: Interpersonal; Intrap: Intrapersonal

Discussion

The purpose of this study was to compare pre-service teachers' MI domains according to their gender, department of study and year in college. Findings showed all pre-service teachers' scores on MII subscales were at the advanced level. This finding can be interpreted as follows: Turkey has a unique education system from preschool through high school. After the preschool a compulsory education begins and all students have to take all subjects such as music, art/painting, physical education, math, social studies, life sciences and Turkish for eight years. The aim of the eight-year compulsory primary education is to provide the basic knowledge and skills to every student. Moreover, since entry to university can be obtained through highly competitive national examinations, students have to acquire certain degree of competence in almost all subject matters through their primary education. This is indeed inline with Gardner's claim that education and experience can foster improvements in domains of intelligences (Gardner, 1983, 1993). Yet, in order to make any firm conclusion further empirical evidence with diverse samples is needed.

Although pre-service teachers scored at advanced level, their weakest areas were in the musical-rhythmic and verbal/linguistic domains. Working with a sample of candidate science teachers, Yenice, Ozden and Alpak-Tunc (2016) also found these two domains as the areas of relative weakness. Likewise, Yenice and Aktamis (2010) explored pre-service elementary education teachers' MI profiles and found that the teachers' lowest scores were in these two domains. Indeed several studies working with samples of Turkish pre-service teachers found parallel results (Akkaya & Sezgin-Memnun, 2015; Aksu, Aktas, Gokmen, Ekinci, & Gulay Ogelman, 2012; Dogan & Alkis, 2007; Ekinci, Gulay, & Taskin, 2008; Korkmaz, Yesil, & Aydin, 2009; Kozagac, 2015; Sezek, Zorlu, & Zorlu 2016). Given that verbal/linguistic intelligence has to do with effective use of one's native language and effectively communicating one's thoughts and feelings to others, it is quite curious that candidates of a profession whose very nature requires effective conveying of messages to pupils would have this domain as one of their areas of weakness. Moreover, the Turkish Ministry of National Education (Milli Egitim Bakanligi [MEB], 2018) sets fostering verbal/linguistic competence of every pupil in the educational system as one of the most important national priorities. This weakness could at least in part be attributed to the fact that the Turkish Educational System is a heavily dependent upon multiple-choice examinations. In other words, students' entry to high schools and universities and thus the quality of education they receive depends on their scores on multiple-choice national exams. As such, children begin preparing for these exams as early as the third grade. Such reliance on multiple-choice exams might impede with enrichment of students' oral and writing skills.

One of the findings of this study was that pre-service teachers scores in naturalist, interpersonal and intrapersonal domains were significantly higher than their scores on other domains of MII. Working with a sample of pre-service teachers, Ozturk, Ozsoy, Vural, and Baysal (2017) found similar results. In fact, their sample consisted of students attending to science education, music education, painting and psychological guidance and counseling programs and scored higher in these three domains than other domains. The authors viewed this as a "curious finding" because a host of previous studies reported logical/mathematical intelligence as the highest among the domains of MI (Berkant & Ekici, 2007; Ekinci, Gulay, & Taskin, 2008; Kozagac, 2015; Sezek et al., 2016; Yenice & Aktamis, 2010).

Significant gender differences were found in several domains of MI. Female pre-service teachers had higher scores on visual/spatial, musical/rhythmic, bodily/kinesthetic, naturalist and intrapersonal intelligence than their male peers. Similarly in some studies, the female students were stronger on intrapersonal (Furnham & Budhani, 2002; Loori, 2005; Snyder, 2000), musical (Furnham & Budhani, 2002; Gogebakan, 2003; Kaur & Chhikara, 2008; Saban, Isik, & Kayiran, 2016; Snyder, 2000) and visual-spatial (Atas & Erisen, 2016) intelligences. Some studies have detected gender differences that were not statistically significant. Some reported higher mean scores by females on visual/spatial intelligence (Loori, 2005; Zare-Ee, Mohd Don, Knowles, & Tohidian, 2015) and bodily/kinesthetic (Zare-Ee, Mohd Don, Knowles, & Tohidian, 2015) intelligences than males.

On the other hand, majority of studies comparing MI according to gender found that males scores significantly higher on bodily/kinesthetic and visual/spatial intelligence domains than females (Kaur & Chhikara, 2008; Rammstedt & Rammsayer, 2002; Sarac, 2007; Snyder, 2000). Likewise, studies typically report higher female scores on verbal/linguistic intelligence than males (Agarwal & Surahsha, 2017; Atas & Erisen, 2016; Saricaoglu & Arikan, 2009). Therefore, current findings regarding gender are unique in that respect.

According to findings, pre-service teachers studying elementary education had significantly higher scores on logical/mathematical, visual/spatial, musical/rhythmic, bodily/kinesthetic and naturalist intelligences. Findings of previous studies regarding the field of study have been inconsistent. For example, Sezek et al. (2016), reported that those pre-service teachers studying science teaching had significantly higher scores on visual/spatial, naturalist and interpersonal intelligences than their peers in the fields of mathematics, social studies and elementary education. On the other hand, Oral (2001) found that those studying mathematics and science education had higher scores on logical/mathematical intelligence. A look at the required coursework in elementary education might at least partially provide some insight into this finding of the current study. The program involves courses in music, teaching of music, physical education and sports culture, physical education and teaching of play, art education, teaching of visual arts and environmental education. These courses were not found in the programs of other departments of study.

The last finding of this study revealed that MI scores significantly differed in terms of year of college. While no significant differences were found among 1st, 2nd, and 4th years, the 3rd year students had higher scores. This finding might in part be attributed to the existing training programs and perhaps maturation even. Hence, one would raise the question as to why the 4th year students did not score higher than the first two years? This also might be at least partially due to 4th year faculties of education students' all over Turkey being heavy involved in preparing for a highly competitive exam determining their employment by the Ministry of National Education. In other words, these students deal with their coursework, teaching internship as well as exam preparation. Such heavy workload might eliminate their chances for engaging in various extra-curricular and recreational activities and thus might cause temporary changes in their perception of their capacities.

While interpreting findings of this study the following limitations should be kept in mind. First, since this was a non-experimental study, the relationships reported above should not be viewed as implying any cause and effect relationship. Experimental studies can be used to determine whether unique course work and/or experiences of each respective field of study contributed to students' scores on MI domains. Second, sole reliance on self-report measures poses a limitation to the study. Indeed, performance-based activities such as projects, portfolio, and integration organized for each intelligence domain could provide a more accurate profile of functionally used intelligence areas. Third, the sample was drawn from individuals attending to only one university in Turkey, was a convenience sample, thus the result cannot be generalized to all pre-service teachers in Turkey. Future studies should utilize larger samples selected through random sampling to improve generalizability of the results. Forth, data of the study was based on a single administration of the instruments. Thus, longitudinal studies at pre-service teachers will provide richer insight into the possible changes in their MI profiles through time.

Conclusion and Implications

Findings of this study showed that all pre-service teachers' scores on MII subscales were at the advanced level with their weakest areas being the musical-rhythmic and verbal/linguistic domains. Considering that teaching heavily relies on verbal skills of teachers, a striking finding of this study was that candidate teachers had relatively lower scores in the verbal/linguistic domain which might be considered as an alarming evidence for teacher training programs to develop intervention programs for improvement in this particular domain. In mid-1990s the number of colleges of education in Turkey was thirty-three. In the year 2020, this number is 97. Despite this increase in such relatively short time in

institutions of teachers' education, not much has been done to ensure their quality. Therefore, colleges of education should incorporate contemporary research findings (including those of the current study) in improving quality of teachers' training programs particularly given that majority of institutions have vital shortcomings such running academic programs with one or two faculty members. In short, quality of the future of the education in the country will depend upon the quality of teachers' education.

Despite the accumulated research in MI, discussions surrounding IQ and MI have not reached any consensus. In his extensive literature review involving 500 neuroscientific reports on both general IQ and MI, Shearer (2018) claims that neuroscientific findings show evidence is in support of both views on intelligence and thus both should be incorporated in education. He goes further to delineate five principles drawn from these studies; "culture matters, every brain is unique-activate strengths, know thyself, embodied cognition/emotional rudder, and make it mean something" (p.1). Thus, both research and educational reform policies might benefit from a through synthesis of findings regarding both views on intelligence as opposed to focusing on only one from an "either or" mentality.

Although there have been numerous conclusions drawn from MI with respect to its application to educational settings as well as daily life, considerable further work is needed to incorporate neuroscientific findings with those of cognitive science and then to "translate" this information in specific applications. Shearer (2018) puts it eloquently: "This is where MI theory serves as a "user interface" between our neural hardware and the cognitive software that activates learning "apps" in the classroom (as well as in everyday life)" (p.3). Therefore, both educational researchers and policy makers could support enrichment of research in these areas and benefit from scientific knowledge from the "hardware," "interface" as well as promoting a rich array of "apps."

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Conflict of Interest

Author has no conflict of interest to report.

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