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## Defining of conceptions related to their department of candidate teacher of mechatronics education

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### Abstract

Mechatronics is the common discipline of mechanical, material, electric / electronics and computer technologies. Although mechatronics education is new in our era, it has created its own working area because of the fade that another research area has interested this subject. Because number of technical teachers and technicians who will work in this area is not sufficient in our country, workforce in this area has been provided. Although this situation seems like a disadvantage it has not only created a synergy with different areas but also gained glance angle of this areas. For example, a Mechanics student has been able to evaluate events with viewpoint by combining area principles gained and principles at electronics. The base of this study composes analyze of problems students who come from different disciplines will meet in the same education and working place. This variety forming mechatronics has created problem of transduction. This adaptation problem has psychology press on the students. It has also decreased students' interest about lessons.

Marmara Universty Technical Education Faculty Department of Mechatronics Education has started education in 2003 - 2004 semesters to educate mechatronics technical teachers with 31 students. Now 121 students have learnt. To date in the vocational education system, there has been no high school education, which will compose a basic for Mechatronics Education Programmer. However, in 2003 -2004 semesters National Education Ministry has been opened new departments in Turkey. In this study, survey has been fulfilled not only to deduce mechatronics department students' problems they have met when their mechatronics education based four different disciplines but also to offer suggestions about problems.

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### 1. Introduction

The most valuable resource of a society that enables it to survive is human power. The education and employment of this resource not only shows the difference of a society from the others, but renders a healthy

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interaction within the society. This difference is only possible with education. There is yet no consensus about the concept of education. There are different definitions of education (1). When we look at education within this framework, the factor which will provide the biggest contribution to the development of the country is the vocational, technical education. The vocational, technical education must serve the society more and more every single day in order to provide for the limitless needs of humans.

Although the fact that vocational, technical education should not ultimately educate people into only one unique mold does not seem to agree to the other concepts of education, vocational improvement will only be possible with the employee who has acquired good vocational background, who can speculate the future and who can present his/her speculation with scientific research. These qualifications are only possible when the individual gets a good vocational education. The group is important for a human. Society is a big mass of humans made up of more than one small group. These groups are the family, relatives, friends, school environment, work environment, and so on. [2]

Social-psychological research which study human interaction within these small groups show there are two basic processes. The first process is the adoption of an individual into a group. The second process is the growth of difference described as individualization and being noticed. Some research emphasizes that humans have a tendency to show their uniqueness and oneness and that they not only try to be like the others by comparison but they also try to find and construct some differences between them and the others. [3]

This research was done in order to find the adoption problems of the students of Marmara University Technical Education Faculty, the Department of Mechatronics to their department and the solutions so that they can complete their education at the optimum level. In the research the problems of adoption of the students to their department were studied.

## **2. Problem And Conceptual Framework**

The quality of education is measured with the quality of these students who are educated by educational institutions. The education of quality students depend on teachers, the education program and the suitable environment. Among these elements the teacher is the most important for the education to achieve the desired aim. Therefore, the teacher is one of the basic elements in our educational system. Rendering the educational system effective; in other words, educating the necessary human power at the optimum level is only possible by continuously observing the teacher-training system and by solving the problems and improving the system. [4]

Williams and Alawiye (2001), had a pilot application program which they called Professional Partnership Program. At the end of the program they observed that it had been a wonderful experience both for the teachers and students of the school; and the primary school students had greatly benefited the teacher candidate's enthusiasm and knowledge (5). Brandon (2000) compared the effect of the teaching application of the teacher candidates, who were second year students, according to the gender variable and found that while the effect of certain teaching qualifications were lower in female candidates before the teaching (application), no difference was found between the genders in skills in teaching (application). [6]

Cambers and Roper (2000), had a study in which the reasons of the dropouts from a one-year teacher program to become a teacher in an English middle school were asked, some students found the school where they were for training was not only helpful but preventive and the teachers there were also unhelpful. (7) It was determined that the reason for their dropping out was the work load, stress, low morale and general unhappiness. Girod and Cavanaugh (2001) considered technology as the agent of change and they suggested the teachers be provided with time, support and creative space to use technology. (8) Halbach (2000) concluded that the teaching application in class was much more effective on the students' viewpoint than what was taught. (9) Lee, Chi and Walker (2000) observed that many teacher candidates had negative beliefs about the school management (10); however, the candidates said they did not expect any change in power relationship although they were not happy about the status quo. (11)

### 3. Method

This research is a case study about the adoption problems of Mechatronic students according to the first and second year students at the Department of Mechatronics at which technical teachers are educated at the graduate level. Therefore, the descriptive survey method was used.

The research covers the opinions and answers to the questionnaire by 112 students of Marmara University Technical Education Faculty, (2007–2008) the Department of Mechatronics, who made up the sample. In order to gather the data of the research, the questionnaire format developed by researchers after scanning the related literature was used. The questionnaire which consisted of 5 independent and 40 dependent variables had two parts. The first part covered the gender, monthly income, the branches of the high schools the students graduated from, and the reasons why they had chosen the Department of Mechatronics. The second part covered fifteen five-choice questions related to the research subject, about the relationships between the sample students and their teachers and other students, their opinions about the content of the subjects they were studying, their parents' influence on them and their opinions about their educational environment. The questions were scaled and graded as "Absolutely Disagree (1)", "Disagree (2)", "Undecided (3)", "Agree (4)", and "Absolutely Agree (5)". The data collected were analyzed according to SPSS version, 13.5 program and the credibility quotient was calculated as  $\alpha=82,7$  after the credibility quotient studies. The frequency and percentages of the data obtained from the questionnaires were calculated. The score intervals used in interpreting the averages were as: 0.50 Absolutely Disagree, 1.00-1.99 Disagree, 2.00-2.99 Undecided, 3.00-3.99 Agree and 4.00-5 Absolutely Agree. The findings obtained were shown in tables and interpreted.

### 4. Findings And Results

Our research was done on the students at Marmara University, Technical Education Faculty, the Department of Mechatronics. Below are the student profiles:

The majority of the students are graduates in Electronics - 60 students (53%) and 31 students (28%) are graduates in Mechanics. The rest of the students from other departments were placed under the titles of Electronics and Mechanics.

When the income of their families was analyzed, it was found that 34% of the families had a monthly income between 501-750 TL and the second major proportion: 31% had an income between 751-1000 TL a month. So 65% of the students came from families with a lower-middle income. 17% of the students came from families with a very low income.

52.3% of the students stayed with friends; 27.9% stayed with families; 18% stayed in dorms. Only 18% stayed alone.

55.9% of the students had chosen Mechatronics themselves. 14.4% had chosen this department following their teachers' advice.

The following results were drawn from the answers to the questionnaires:

**Table 1. The department – The statement, "I find the subject content of the other departments difficult."**  
**variance analysis findings**

	N	Mean	Standart Deviation	Standart Error Mean	t	df	p
<b>Mechanics</b>	49	3,39	1,27	0,18	2,7	92,3	0,00
<b>Electronic</b>	62	2,77	1,04	0,13			

When Table.1 was analyzed a meaningful difference was found between the score averages of the independent variable (department) and "I find the subject content of other departments difficult." [t=2.724 (92.33),  $p<0.05$ ]. According to this difference, the average scores of the graduates in Mechanics (3,39) were higher than the average scores of the graduates in Electronics (2,77). This finding can be interpreted as such: more graduates in Mechanics agreed to this statement; in other words, they found the content of the subjects of Electronics more difficult.

**Table 2. The findings of the t-test of the variable “Department” and the statement “I have difficulty in communicating with the lecturers.”**

	N	Mean	Standart Deviation	Standart Error Mean	t	df	p
Mechanics	49	2,29	1,1	0,16	2,6	105	0,01
Electronic	62	2,84	1,15	0,15			

When Table.2 was analyzed a meaningful difference was found between the score averages of the independent variable (department) and “I find it difficult to communicate with the lecturers of the department.” [t=2.58 (105.01), p<0.05] According to this difference, the average scores of the graduates in Electronics (2,84) was higher than the average scores of the students from the graduates in Mechanics (2,29). This finding can be interpreted as such: More graduates in Electronics agreed to this statement; in other words, they had difficulty in communicating with the lecturers of the department.

**Table 3. The average income of the family – The statement, “I could not communicate with the students who had finished a different branch in Vocational School,” variance analysis findings.**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	13,26	3	4,42	3,05	0,03	*501-750TL / 1001TL
Between Groups	155	107	1,44			
Total	168,27	110				

When Table.3 was analyzed it was found that there was a meaningful difference between the average scores of the average monthly income of the family and the statement, “I could not communicate with the students who had finished a different branch in Vocational School [F(3-107)=3.05, p<0.05]. In the Tukey test analysis which was done in order to determine from which group this difference came from, it was found that the average score of the students coming from 501-750 TL average monthly income families was higher (2,10) than the average score of the students coming 1001 TL average monthly income families (1,53). This finding can be interpreted as such: the students coming from 501-750 TL average monthly income families found it difficult to communicate with the students who had graduated from different branches.

**Table 4. The average monthly income of the family - The statement, “I expect to become a teacher like my class-mates,” variance analysis findings.**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	11,11	3	3,7	3,74	0,01	*500 TL and under 501-750TL
Between Groups	105,87	107	0,99			
Total	116,99	110				

When Table.4 was analyzed it was found that there was a meaningful difference between the average scores of the average monthly income of the family and the statement, “I expect to become a teacher like my class-mates.” [F(3-107)=3.74, p<0.05]. In the Tukey test analysis which was done in order to determine from which group this difference came from, it was found that the average score of the students students coming from 500-lower than 500 TL average monthly income families was higher (3,65) than the average score of the students coming from 501-750 TL average monthly income families (2,77). This finding can be interpreted as such: the students coming from 500-lower than 500 TL average monthly income families had the same expectation of becoming a teacher.

**Table 5. The average monthly income of the family- “I believe that the Department of Mechatronics will realize my expectations,” variance analysis findings.**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	11,408	3	3,8	3,08	0,03	*500 TL and under 501-750 TL
Between Groups	132,23	107	1,24			
Total	143,64	110				

When Table.5 was analyzed it was found that there was a meaningful difference between the average scores of the average monthly income of the family and I believe that the Department of Mechatronics will realize my expectations. [F(3-107)=3.07, p<0.05]. In the Tukey test analysis which was done in order to determine from which group this difference came from, it was found that the average score of the students coming from 500-under 500 TL average monthly income families was higher (3,80) than the average score of the students coming 501-750 TL average monthly income families (2,87). This finding can be interpreted as such: the students coming from 500-lower than 500 TL average monthly income families believed the statement, “The Department of Mechatronics will realize my expectations.”

**Table 6. The average monthly income of the family- The statement, “I find the activities prepared by our department sufficient.” variance analysis findings.**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	9,115	3	3,04	2,82	0,04	*500 TL and under 501-750 TL
Between Groups	115,44	107	1,08			
Total	124,56	110				

When Table.6 was analyzed, there is a meaningful difference between the average monthly income of the family and the statement, “I find the facilities provided by our department sufficient.” [F(3-107)218,P<0,05]. It was found that the average score of the students coming from 500-under 500 TL average monthly income families was higher than (2,50) the ones whose monthly income is between 500 / 750 TL (1,74) depending on Tukey test which was done to sort out the groups who cause this difference. This finding can be interpreted as such: the students coming from lower income families than the ones coming from average income families find the activities sufficient.

**Table 7. Residence- Findings of Varynas analysis- The statement "I think I'll be unsuccessful in this department."**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	12,947	3	4,32	3,49	0,02	*With Family / Dorms
Between Groups	132,15	107	1,24			
Total	145,1	110				

Studying Table.7 it was found that there is a meaningful difference between the place of residence and the statement, "I think I will be unsuccessful." [F(3-107)=3,49;P <0,05]. In the analysis of the Tukey test which was conducted to determine the source of this difference, it was found that the average grade of the students living with their family (2,42) is higher than the ones staying in dorms (1,50).

**Table 8. Residence- Findings of Varynas analysis - The statement, "My success at school is rewarded by my family".**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	10,607	3	3,54	3,38	0,02	*Dorms / With famliy
Between Groups	111,79	107	1,05			
Total	122,4	110				

Studying Table.8, it was found that there is a meaningful difference between "the place of residence" and "My success at school is rewarded ". [F(3-107)=3,38 , P<0,05]. According to Tukey test done to determine the source of this difference, it was seen that the average of the students staying in dorms (3,80) was higher than the average of the students (3,10) living with their friends and families (2,90). This finding can be interpreted as such: the students staying in dorms are rewarded more than the ones living with their families or friends.

**Table 9. Residence- Findings of Varynas analysis – "I have difficulty in focusing on a topic".**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	16,527	3	5,51	3,96	0,01	*With Friends
Between Groups	148,95	107	1,39			
Total	165,48	110				

Studying Table.9, it was found that there is a meaningful difference between the place of the residence during education and the statement "I have difficulty in focusing on a topic." [F(3-107)=3,95 , P<0,05]. According to the Tukey test conducted to determine the source of this difference, it was understood that the students staying with friends had a higher average (3,40) compared to the ones living alone (1,00). This finding can be interpreted as such: the students living with friends can focus better on a topic than the ones living alone.

**Table 10. The reason for choosing their department - Findings of Varynas analysis- The statement " I'm sharing the same career expectations with my friends."**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	20,261	5	4,05	4,4	0,00	*Family Suggest / Point Obliged
Between Groups	96,73	105	0,92			
Total	116,99	110				

Studying Table.10, we see a meaningful difference between the average scores of the reason for choosing the department and the statement, "I'm sharing the same career expectations with my friends." [F(5-105)=4,39 , P<0,05]. In the analysis of the Tukey test done in order to understand which groups caused this distiction, it was seen that the average of the students who had chosen their departments according to their families' suggestion was higher (4,67) than the ones who had chosen it because of their grades (2,33). And this finding can be interpreted as such: the students who accepted their families' suggestions shared the same career expectations more than their classmates who had chosen their departments because they had the desired grades.

**Table 11. The reason for choosing the department - Finding of Varynas analysis- The statemen,t " I'm very bored in class."**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
Within Groups	20,791	5	4,16	3,24	0,01	*Willingly / Point Obliged
Between Groups	134,63	105	1,28			

<b>Total</b>	155,42	110				
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When Table.11 was analyzed, it was observed that there was a meaningful difference between the average scores of the reason for choosing the department and the statement, "I'm very bored in class." [F(5–105)=3,24; P<0,05]. In the analysis of the Tukey test done to understand which groups caused this difference; the average of the students who chose their departments willingly (2,56) is lower than the average of the ones (3,78) who were obliged to choose because of their grades. And this finding can be interpreted as such: the ones who had chosen their departments willingly are less bored compared to the ones who were obliged to choose their departments.

**Table 12. The reason for choosing the department - Findings of the Varynas analysis**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
<b>Within Groups</b>	17,962	5	3,59	3,48	0,01	*Willingly / Point Obligated
<b>Between Groups</b>	108,38	105	1,03			
<b>Total</b>	126,34	110				

When Table.12 was analyzed, it was observed that there was a meaningful difference between the average scores of the reason for choosing the department and the statement, "I'm very bored in lab studies." [F(5-105)=3,48; P<0,05]. In the analysis of the Tukey test done to understand which groups caused this difference; it was found that the average of the students (2,21) who chose their department willingly was lower than the ones who was obliged to do so (3,33). This finding can be interpreted as such: the ones who had to study in their departments got more bored than the ones who had chosen their departments willingly.

**Table 13. The reason for choosing department - Findings of the Varynas analysis - The statement, "I find the rules and demands at school unnecessary."**

Source of Variance	Sum of Square	Degree of Freedom	Mean Square	F	p	Significance Difference
<b>Within Groups</b>	17,599	5	3,52	2,75	0,02	Willingly/Family suggest
<b>Between Groups</b>	134,64	105	1,28			
<b>Total</b>	152,23	110				

Table.13 it was found that there was a meaningful difference between the average scores of the reasons for choosing their departments and the statement, "I find the rules and demands at school unnecessary." [F(5-105)=2,74; P<0,05]. In the analysis of the Tukey test done to understand which groups caused this difference; the average of the students who had chosen their departments according to their families' advice was lower (1,33) than the ones who had chosen their departments (3,75) because it was a new branch. And this finding can be interpreted as such: the ones who had chosen mechatronic department because it was new find the rules and the demands of school more unnecessary than the ones who had chosen it following their families' advice.

## 5. Results

1. Students find the subjects in their department which are different from the subjects they studied in high school more difficult [t=2,724(92,33),p<0,05]. According to this difference, the average success of the graduates in Mechanics (3,39) is higher than the graduates in Electronics (2,77).
2. Students have difficulty in communicating with the lecturers. [t=2,58(105,01), p<0.05]. The graduates in Electronics agree to this idea more (2,84) than the graduates of the Mechanicsry department (2,29).
3. It was seen that there is a meaningful difference in the way of the communication of the students depending on the variable of the income of the family and the students from different departments [F(3–107)=3,05; p<0,05]. This distinction leads us to the finding that the average of the students whose income is between 501–750 TL a month (2,10) is higher than the ones whose income is 1001 TL a month (1,53).

4. The variable of the family income changes the expectations of the students to become teachers.  $[F(3-107)=3,74; p<0,05]$ . This difference takes us to the finding that the average of the students whose monthly income is 500 TL or lower (3,65) is higher than the ones whose monthly income is between 501–750 TL (2,77).
5. The variable of the family's monthly income is effective on the students expectations from the department of mechatronics  $[F(3-107)=3,07; P<0,05]$ . This difference takes us to the finding that the average of the students whose monthly income is 500 TL or lower (3,80) is higher than the ones whose monthly income is between 501–750 TL (2,87).
6. The variable of the family's income has an influence on the opinion of the students' satisfaction with the facilities offered by the department.  $[F(3-107)=2,18, p<0,05]$ . This difference takes us to the finding that the average of the students whose monthly income is 500 TL or lower (2,50) is higher than the ones whose monthly income is between 501–750 TL (1,74).
7. The place of residence causes the students to think they will be unsuccessful in their departments  $[F(3-107)=3,49, p<0,05]$ . It was seen that the average of the students who live with their parents (2,42) is higher than the ones living in dorms (1,50).
8. The place of residence of the students affects the behaviour of the families' approval of the students  $[F(3-107)=3,38, p<0,05]$ . This difference shows that the average of the students living in dorms (3,80) is higher than the ones living with their families (2,90) and friends (3,10).
9. There is a relationship between the students' place of residence and their having difficulty in focusing on a subject  $[F(3-107)=3,95; p<0,05]$ . This distinction show us that the average of the students who live with friends (3,40) and the ones who live alone (1,00).
10. The reason for choosing a major and the statement, "I'm sharing the same career expectations with my friends," underlines a meaningful difference  $[F(5-105)=4,39; p<0,05]$ . This difference makes clear that the average of the students who chose their departments depending on their families (4,67) is higher than the ones who chose their departments because of their adequate grades (2,33).
11. It was understood that students might be bored in classes  $[F(5-105)=3,24; p<0,05]$ . This is seen mostly with the students who had to choose their departments because of their grades.
12. The students explained that they are bored in lab studies  $[F(5-105)=3,48, p<0,05]$ . This is especially found within the students who entered their department because of their grades.
13. There is a meaningful relation between the students' reason for choosing their departments and their opinion of the unnecessary school rules and demands  $[F(5-105)=2,74; p<0,05]$ . This difference shows that the average of the students who chose their departments according to their families' advice (1,33) is lower than the ones who chose (3,75) because it is a new department.

## 6. Suggestions

Education means the experiences of a person gained at school or out of school through his life time [12]. M.U. Technical Education Faculty, the Department of Mechatronics should observe the adaptation problems of their students at certain intervals. Depending on this suggestion, the contents of the subjects should be updated to wider the horizons of the students and the behaviours of the lecturers should be observed. As science and technology are developing and the needs of the society increase, the branches in academic studies grow in variety [13]. Lecturers should guide the students in many ways. Organizational leadership means the combination of the qualities of natural leadership and the qualities required by regulations [14]. That's why lecturers should give the students the concept of their professions by working together with the groups of students and the industry. Seminars and extracurricular activities should be organised in order to enlighten the students about different topics. Students' life standards and conditions should be followed closely. Naturally, the first and the most important factor in a person's life is the family. The family is the first institution which socializes an individual [15]. However, the lecturers should not only be the students' professional counselors but also guide them and watch over them [16]. Useful constructive advice should be given to the students about their professional career. In order to get the students to realize their talents they should be given the opportunity to recognize themselves instead of motivating them from outside and their self-esteem should be increased by rewarding their success.

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