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FORECASTING WITH ARTIFICIAL NEURAL NETWORK OF SCIENCE TEACHERS' PROFESSIONAL BURNOUT VARIABLES

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A B S T R A C T

The aim of this study is to predict science teachers' professional burnout and competence variables with artificial neural network. This study is very important for testing with the artificial neural network of professional burnout issues that based on the human factor. Therefore burnout, self-efficacy and competence surveys were carried out to science teachers. An artificial neural network has been established with the data obtained. According to the findings, self-efficacy and competence of science teachers may be forecasted professional burnout at various rates. Predictions of the network for the three dimensions of burnout: emotional exhaustion, depersonalization and personal accomplishment is as follows: The performance of network is 40% for "emotional exhaustion", is 50% for "personal success", is about 20% for "depersonalization" and is 80% for "competence". Finally, according to all the results of the study, some suggestions have been developed.

Keywords: Artificial neural network, Burnout, Self-efficacy, Competence, Science teachers.

INTRODUCTION

Burnout has been a topic of interest for more than 35 years ago. A practitioner (Freudenberger) and one investigator (Maslach) began to work phenomenon of previously unknown (Maslach, Leiter and Jackson, 2012). Today, burnout that can often be observed in the work environment has been first perceived as a social problem in the 1970s (Çiçek Sağlam, 2011). According to Freudenberger (1974), burnout has been a concept that attracted the attention of researchers since 1970 and appeared in the stress literature (Transferring: Korkmaz, 2004). Burnout is a problem in the social environment where people work (Maslach and Leiter, 1997). In other words, stress and burnout that teachers live affect teachers' lives and their families, teacher's executives and consequently their families, teacher's students and their families and the entire community (Friedman and Farber, 1992). When burnout level of teachers increases, they may be unconcerned, nervous and / or cynical to students who they serve. This case can affect classroom success and can reduce the quality of education. When it has been considered place in the individual's life of school and coverage area of its, how students will be happy in the such environment feeled worthless and distressed and how they can take training that they need is discussion topic (Maraşlı, 2005).

Burnout phenomenon covers the whole of a person's life. It affects people's business performance and besides their the social and private relationships (İkiz, 2010). Exhausted human gets away from yourself as emotional and gets away from the business as cognitive (Leiter and Maslach, 1988). Many teachers who live these problems prefer to leave the profession. This case that teachers who want to change careers frequently be idealistic is detrimental to the quality of education. This case is a serious loss for the institutions (Hock, 1985).

Another one of factors that be effective in the quality of the training is self-efficacy that teachers have. Information changes that teacher candidates' competence belief develop and the case how do this change provide the planning of application about teacher competence throughout teachers' preparation education. As teacher candidates develop with methods of science teaching and practical lessons, it may change their efficacy beliefs until they complete their

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education (Cantrell, Young and Moore, 2003).

According to Bandura, teacher competence is based on Bandura's social-cognitive theory. According to Bandura, self-efficacy motivates to specific actions individuals and therefore it has a predictive value. Bandura mentions from the two dimensions of self-efficacy. The first one is personal self-efficacy, it is the belief about individual's capacity. Second one is the product expectation and it is to estimate of likely outcomes such as performance production (Cantrell et al., 2003).

Teachers who personal science teaching competencies is high have successfull teacher preparation program, professional development and experiences about science. These teachers catch the positive results in teaching, learning and improving good experiences in class and in benefiting from their students and themselves. Teachers who personal science teaching competencies is low generally have negative experiences related to science, related to pre-service teacher preparation, about the teachings and professional development (Ramey-Gassert, Gail Shroyer and Staver, 1996).

According to the above description, health of teachers in educational organizations is health of the schools, the education system and community. Assessment and measurement of burnout experienced in teaching and carrying out works related to organizational reasons of it is critical (Erdemoğlu Şahin, 2007).

This study is very important for testing with the artificial neural network of professional burnout issues that based on the human factor. Also, it is remarkable for showing that artificial neural network may be used safely in education. This study has gained a new perspective on the analysis of studies on education.

THEORETICAL FRAMEWORK

There are various models of burnout. Some of them are Cherniss Burnout Model, Edelwich and Brodsky Burnout Model, Pines Burnout Model, Pearlman and Hartman Burnout Model, Meier Burnout Model, Suran and Sheridan Burnout Model and Maslach Burnout Model that is the most widely accepted (Akten, 2007). Maslach model describes burnout in three dimensions. Emotional exhaustion is the collapse of the emotional supply and decrease in feeling. As emotional resources have been exhausted at this stage, no longer workers cannot give a psychological level themselves (Evers, Tomic and Brouwers, 2004; Maslach and Jackson, 1981). Depersonalization; negativity, apathy is to take a stand against people who work together (Evers et al., 2004). The reduction in personal success; it refers to the individual's negative self-assessment related to profession performance. Employees feel unhappy about themselves and don't satisfied with their success on their job (Maslach and Jackson, 1981; Evers et al., 2004).

There are several factors that influence burnout. A type personality, B type personality, workaholism, expectation levels, coping, personality traits, analysis and sharing of personal feelings, demographic characteristics, personality variables, being driven out of control, being lack from self-sufficiency, empathy and emotional control, features such as having unrealistic expectations level are personal factors that affect burnout (Alkan, 2011; Aslan, 2009; Erdemoğlu Şahin, 2007; Güllüce, 2006; Gürses, 2006; Özcan, 2008 and Yüksel, 2009). Client cooperation, competence, autonomy and control, routine and tedium, problems in collegiality and work overload are the organizational factors that affect burnout (Leiter, 1991). When the number of employees increased, in terms of working excessive cognitive, sensory and emotional burden was expected to increase. The amount of number of person's work hours probably gives rise to that person lived fatigue, boredom, stress, burnout and so on (Özcan, 2008).

Perceived self-efficacy is related to the judiciary on how organized the necessary action mold and that discussed the future status of a person. Self-efficacy affects thought patterns, actions and emotional arousal. Self- efficacy helps to explain different phenomena. For example; changes in the fighting, the level of psychological stress reaction, self-regulation of behavior, stamina and despair against the failing experience, self-debilitating effects of the proxy control, fictional ineffectiveness, success efforts, growth of motivation and career effort and so on (Bandura, 1982).

Efficacy beliefs affect operation of people in the four-major process. They are cognitive, motivational, affective and selection process. Persons who self-efficacy is high construct success scenarios to support the performance. Persons who self-efficacy is low think that not might go the way of most things and they might create failure scenarios. Efficacy beliefs contribute to motivation in several ways. For example, it determines how much they effort for aim or how much they will resist against difficulties. When an obstacle or failure is encountered, persons who don't believe their ability occur decrease in their efforts and leave to struggle. But when persons who have strong beliefs about their capabilities

encounter a problem, they exhibit great efforts. Perceived self-efficacy which controls stressors plays a central role in stimulating the worrying thing. The environment which people actually live in is a psychological environment created by themselves. Self-efficacy has very important in controlling people's the worrying thoughts. They shall refrain from action and environment that exceeds their ability. But they prepare to choose their surroundings which they will success and to fight with the event. People develop different qualifications, interests and social networks with the different choice that they make (Bandura, 1995).

ARTIFICIAL NEURAL NETWORK

Artificial neural network (ANN) technology is one of the most recent product of humanity's struggles such as imitating and searching nature. ANN is programs that are designed to mimic the operation of the simple biological nervous system. It consists of simulated nerve cells (neurons) and these neurons form a network by connecting to each other in various ways. This network has the potentials such as learning, receiving memory and revealing the relationship between data. In other words, ANN produces solutions to problems which normally require human's thinking and natural abilities for visualizing (Durmuş, 2008).

Artificial neural networks are comprised of artificial neural cells. Artificial nerve cells, also referred to as process components in engineering. Each processing element has five basic elements such as inputs, weights, gathering function, activation function and outputs (Öztemel, 2012: 48). The structure of an artificial neuron was shown in Figure 1 (Demirceylan, 2012).

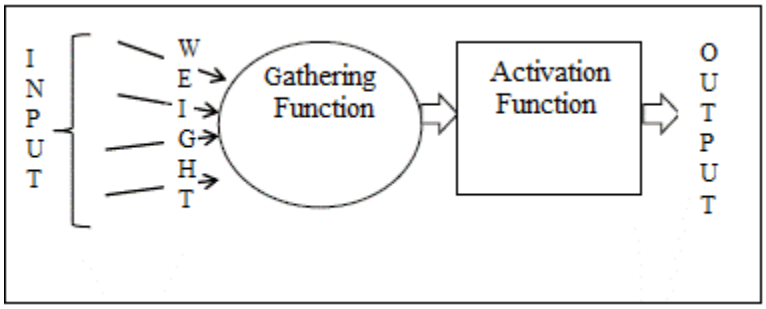

Figure 1. The structure of artificial neural cell.

Input is information that come to an artificial nerve cell. This information may come from the external environment or other nerve cells (Baş, 2006).

Part which show the importance of information that come to an artificial nerve cell and which show the effect of this on the cell are weight. The case which weight be large or small does not mean that input is important or unimportant (Öztemel, 2012: 49).

Gathering function is where is calculated net input in the cell (Öztemel, 2012: 49-50).

Net input process with activation function and then output is determined against input (Kakıcı, 2009).

Determined through activation function, value is the output value (Demirceylan, 2012).

RESEARCH DESIGN AND METHODS

Working group constitutes 51 science teachers who work in secondary school in Zonguldak. As data collection tool, "Burnout Inventory", "Self-Efficacy Scale towards Science and Technology Education", "Ohio Teacher Efficacy Scale" and "Personal Information Form" are used.

Maslach Burnout Scale with 22-item which was developed by Maslach, was adopted the Turkish by Çam (1991, 1992) and was conducted validity and reliability study was used to measure burnout. Reliability coefficients for the subscales were found as frequency (0,89) and intensity (0,86) for "emotional exhaustion", frequency (0,77) and intensity (0,72) for "personal accomplishment" and frequency (0,59) and intensity (0,57) for "depersonalization". Test-post-test reliability coefficients for the subscales were found as frequency (0,82) and intensity (0,53) for "emotional exhaustion", frequency (0,60) and intensity (0,69) for "personal accomplishment" and frequency (0,64) and intensity (0,65) for "depersonalization" (Maslach and Jackson, 1981).

"Self-Efficacy Scale for Pre-service Teacher's Science and Technology Education" which was developed by Kaya, Polat and Karamüftüoğlu (2012) is used to determine self-efficacy beliefs for teaching the science and technology course of pre-service teacher. It is indicated that KMO value, Barlett test value and internal

consistency coefficient of used scale were respectively calculated as 0,81; 654,45 and α = 0,83.

"Ohio Teacher Efficacy Scale" which was developed by Tschannen-Moran and Woolfolk-Hoy (2001) and which was adapted into Turkish by Baloğlu and Karadağ (2008) is used to determine teacher efficacy. Correlations between subscale scores of this scale were ranged from 0,526 to 0,723. Coefficient of internal consistency of the scale (Cronbach's alpha) was ranged from 0,66 to 0,79 for the subscales and was found as 0,929 for the whole scale. Test-re-test the correlation coefficients of scale which means stability ranged from 0,471 to 0,710.

Data was collected from science teachers who serve in the official secondary school within Zonguldak centre and district boundaries. Researcher went to relevant school, discussed face to face with teachers and declared measurement tools for teachers. Then, filling out a questionnaire about their professional burnout and self-efficacy subjects was wanted to by teachers.

Artificial neural network was applied to data obtained from the research to make predictions about the burnout and to determine what extent self-efficecy and competence explain burnout. MATLAB software is used in artificial neural network applications.

FINDINGS AND DISCUSSION

By using artificial neural networks with MATLAB program, it has been searched whether self-efficacy and competence variables which have effect on burnout explained burnout and it has been determined if it can identify, what extent explains. It is also made predictions about the subject of research. Four estimation works were conducted.

Normalization is applied to the data before the data analysis. Thus, it is ensured that the targeted value has been same range with network output. Some researchers who values that constitute examples tried to pull into a certain range use the following formulation for normalization (Öztemel, 2012: 101).

$$x' = \frac{x - x_{min}}{x_{max} - x_{min}}$$

x: Input value

x′: Scaled version of the input value

x_{min}: The smallest possible value of the input set

x_{max}: The largest possible value of the input set

The range of our data is in the [a,b] format. So, the following formulation was used in this study for normalization.

$$V_n = 0{,}8x\left[\frac{V_r - V_{min}}{V_{max} - V_{min}}\right] + 0{,}1$$

V_r , V_n: Normalized data

V_{min}: The minimum value of the corresponding column

V_{max}: The maximum value of the corresponding column

By using the above formulation, the normalization process that is performed on all the data in Excel program is as follows (Figure 2).

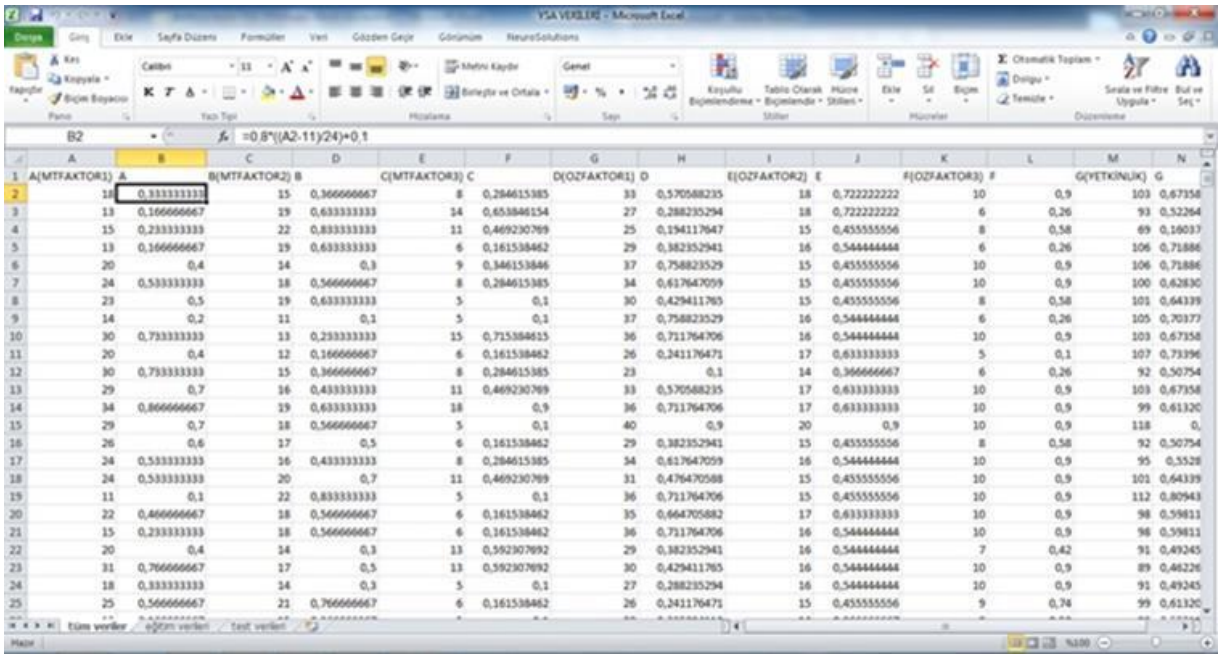

Figure 2. Normalization process that is applied to the artificial neural network data.

357 pieces of data collected for the research is used in practice. The network is compatible with supervised learning styles. Because the desired outputs in the education of network have been introduced to network.

There are slightly proposals for being determined education, verification and testing sets in the literature. Many researchers followed a method based on 80%, 10%, 10% or 70%, 15%, 15% or 60%, 20%, 20% the rule. It should not be forgotten that these proportions closely related with the number of available data (Hamzaçebi, 2011: 77). In this study, 80% of data was used for training and 20% of data was used for testing in the neural network. This rate (¼) is random. One of every five data has been hided and test data has been generated. Besides, output of test data has not been shown to the network. In some studies, 80% of the data was used for training and 20% of data was used for testing (Ergür, 2007 and Güler, 2007). The network is trained with training data, with a variety of learning algorithms and artificial neural network made estimation of the output of the test data.

First, the normalization process is applied to the data before entering Matlab. Negativity that the cumulative totals formed in the processor element prevented with normalizing of data (Saraoğlu, 1998: Transferring: Demirceylan, 2012). After normalization process, educational input and output data set is entered to Matlab program in the matrix format. Then the architecture of the network has been established. Trial and error method has been used to find the optimal artificial neural network architectures for problem. In these trials, network architectures that created a different number of hidden layers and a different number of artificial neural cells have been formed and has been compared with each other. Also, different activation functions are tested to determine the activation function giving the best results for each architecture. As created network is a multi-layered network (MLN), it has one input layer, one hidden layer and one output layer. There is one hidden layer in network because the network has two layer. MLN with single hidden layer is better at solving problems (Hamzaçebi, 2011: 77). It has been selected "feed forward" as the type of artificial neural network and it has been selected "back-propagation" that is, "feed-forward back-propagation" mode to reduce the errors backwards. It has been started with little neurons to determine the number of neurons in the hidden layer of network. Then, neuron number is increased until it is broken performance of the network for verification set and according to the test results, the case that appropriate neuron number is 10 was decided. As all data is positive, it has been selected "Logsig" function as the activation function. It has been selected "LEARNGDM" as learning function and "TRAINLM" as the training function. "Mean squared error (MSE)" getting the squares of error is selected to calculate the error, to punish big mistake as the performance criteria and to eliminate the effects of positive-negative value difference (Smith, 2002: Akt. Gür, 2009). It has been selected 1000 as the number of training trial-again and has been selected 1e-005 as error value having been stopped education from parameters of education.

Data set in the input layer in the "Emotional exhaustion" estimation work is as follows:

a) Confidence on the field information of science teachers
b) Confidence on the performance of science teacher
c) Confidence on the laboratory information of science teacher
d) Competence of science teacher
e) Depersonalization in science teachers
f) Personal achievement in science teachers

Data set in the output layer in the "emotional exhaustion" estimation work is as follows:

Emotional exhaustion in science teachers: Artificial neural network model for prediction of "emotional exhaustion" factor is as follows (Figure 3).

Established network for estimation of "emotional exhaustion" factor after the completion of training is as follows (Figure 4).

Performance chart being in training result for estimation of "emotional exhaustion" factor is as follows (Figure 5).

Regression chart being in training result for estimation of "emotional exhaustion" factor is as follows (Figure 6).

The artificial neural network training results that were formed for "emotional exhaustion" factor are as follows (Table 1).

The following formula is used to measure the performance of the network (Öztemel, 2012).

$$P = \frac{D}{T} \times 100$$

Where;

P: Performance ratio
D: The number of samples that were correctly answered in the test set
T: The total number of samples in the test set

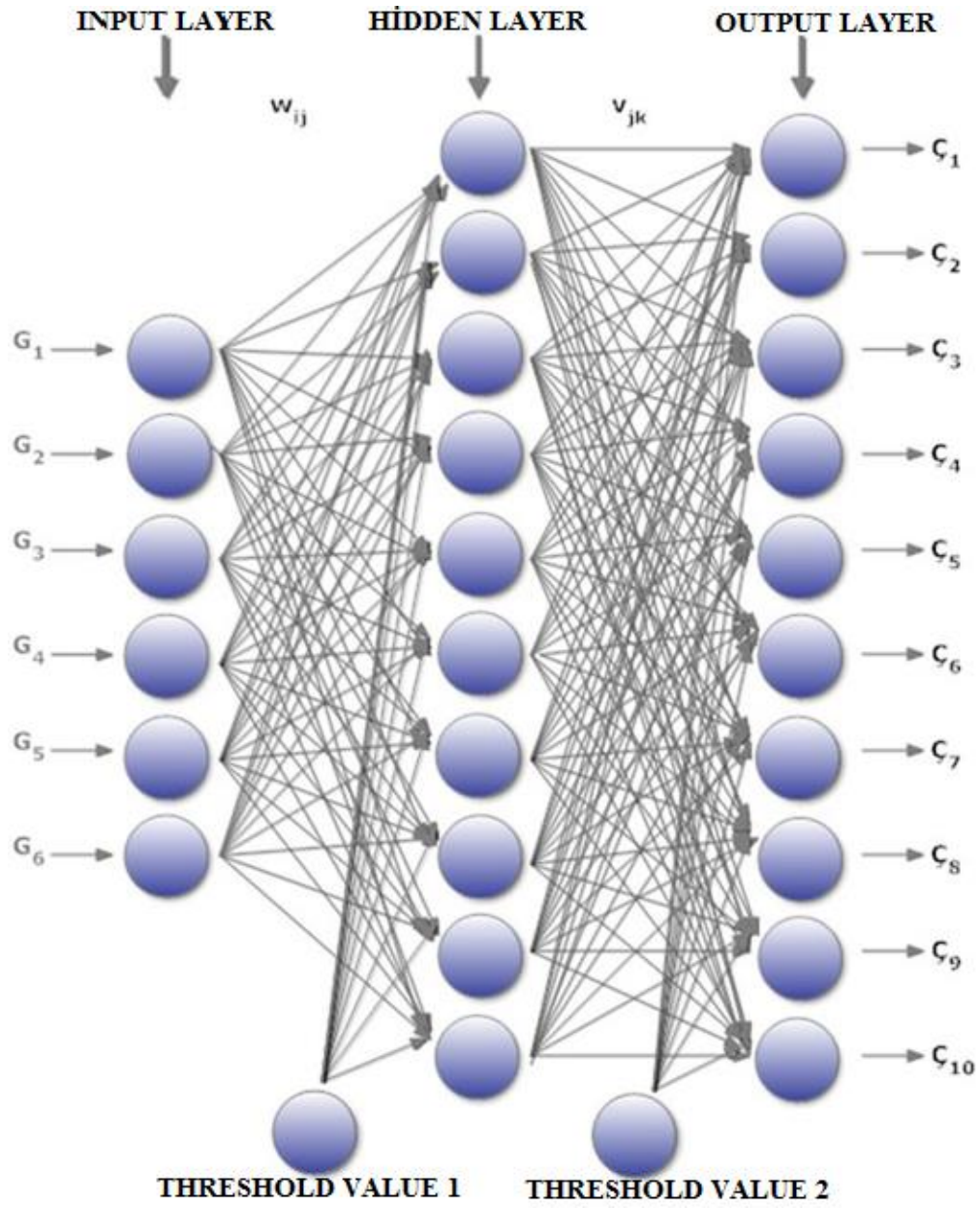

Figure 3. Artificial neural network model for prediction of "emotional exhaustion" factor (G1: Personal achievement, G2: Depersonalization, G3: Confidence on the field information, G4: Confidence on laboratory information, G5: Confidence on performance G6: Competence C: Output and Wij and Vjk: Weight).

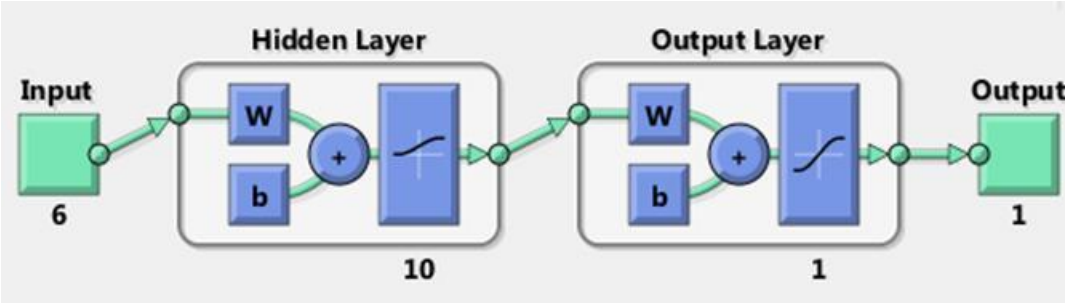

Figure 4. Established network for estimation of "emotional exhaustion" factor after the completion of training.

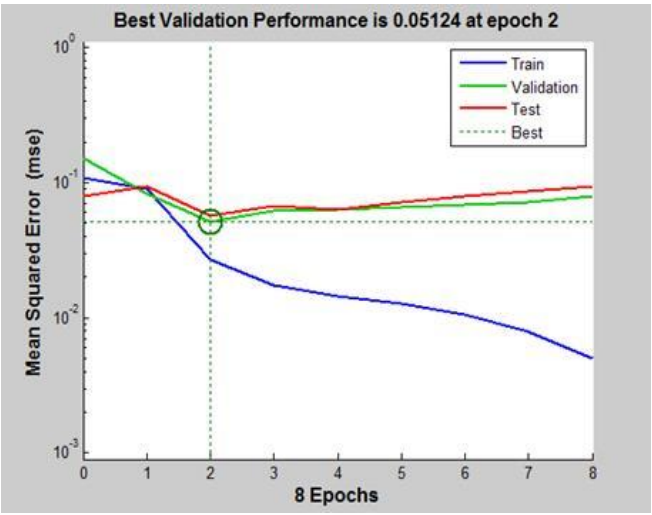

Figure 5. Established network for estimation of "emotional exhaustion" factor after the completion of training.

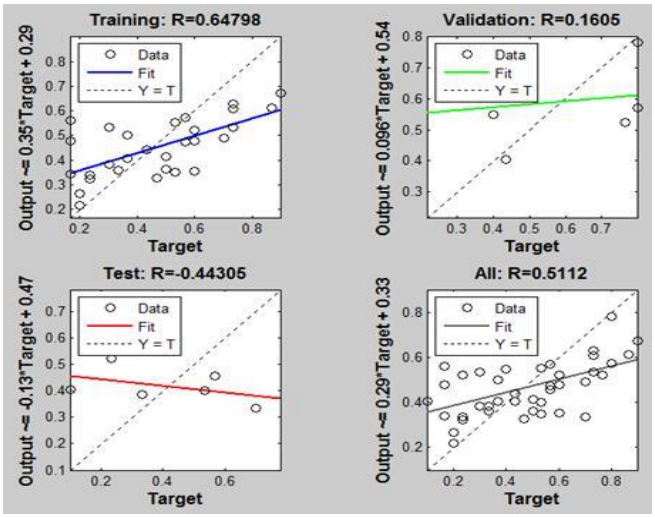

Figure 6. Regression charts of "emotional exhaustion" factor.

Table 1. Expected and network outputs of the artificial neural network that were formed for "emotional exhaustion" factor.

Expected output	Network output
20	21,69*
20	22,86*
26	21,49*
15	21,49
13	21,82
17	22,26
28	22,69*
14	22,73
28	21,96
26	20,39

Table 2. Expected and network outputs of the artificial neural network that was formed for "personal achievement" factor.

Expected output	Network output
20	21,69*
20	22,86*
26	21,49*
15	21,49
13	21,82
17	22,26
28	22,69*
14	22,73
28	21,96
26	20,39

When 15-20% error in the issues concerning human life (psychological tests) is considered being acceptable error, according to Table 1, being 40% of the performance of the network for "emotional exhaustion" is seen.

Data set in the input layer in the "personal achievement" estimation work is as follows:

Data set in the output layer in the "personal achievement" estimation work is as follows:

Personal achievement in science teachers: Artificial neural network model for prediction of "personal achievement" factor is as follows (Figure 7). Established network for estimation of "personal achievement" factor after the completion of training is as follows (Figure 8).

a) Confidence on the field information of science teachers
b) Confidence on the performance of science teacher
c) Confidence on the laboratory information of science teacher
d) Competence of science teacher
e) Depersonalization in science teachers
f) Emotional exhaustion in science teachers

Performance chart being in training result for estimation of "personal achievement" factor is as follows (Figure 9). Regression charts being in training result for estimation of "personal achievement" factor are as follows (Figure 10). The artificial neural network training results that were formed for "personal achievement" factor are as follows (Table 2).

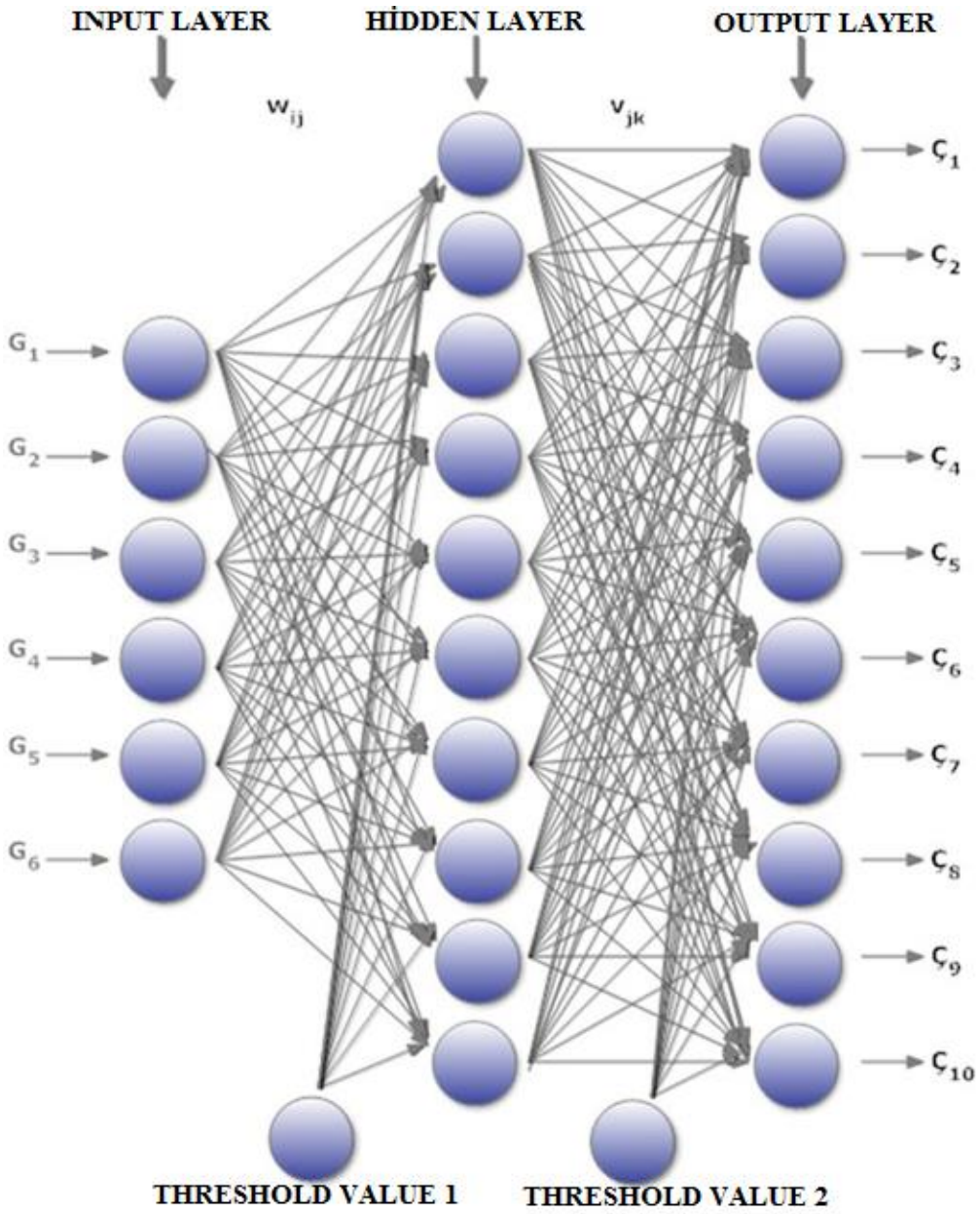

Figure 7. Artificial neural network model for prediction of "personal achievement" factor (G1: Emotional exhaustion, G2: Depersonalization, G3: Confidence on the field information, G4: Confidence on laboratory information, G5: Confidence on performance and G6: Competence).

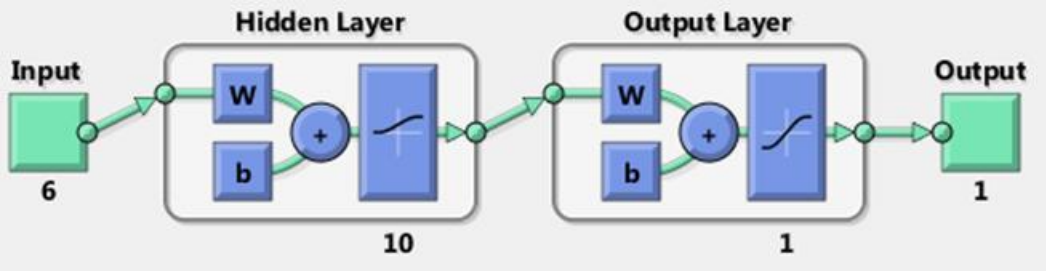

Figure 8. Established network for estimation of "personal achievement" factor after the completion of training.

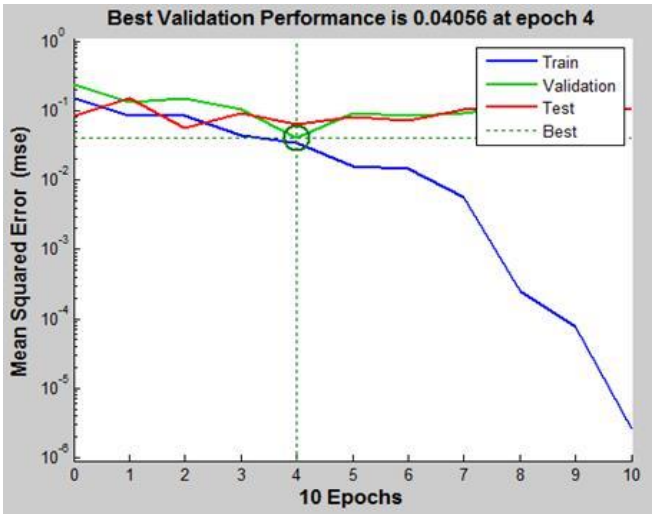

Figure 9. Performance chart of "personal achievement" factor.

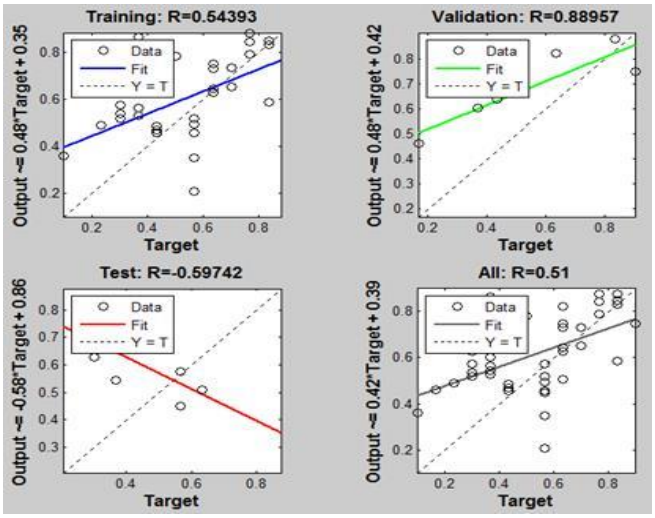

Figure 10. Regression charts of "personal achievement" factor

According to Table 2, being 50% of the network performance for "personal achievement" was observed.
Data set in the input layer in the "depersonalization" estimation work is as follows:

a) Confidence on the field information of science teachers
b) Confidence on the performance of science teacher
c) Confidence on the laboratory information of science teacher
d) Competence of science teacher
e) Emotional exhaustion in science teachers
f) Personal achievement in science teachers

Data set in the output layer in the "depersonalization" estimation work is as follows:

Depersonalization in science teachers: Artificial neural network model for prediction of "depersonalization" factor is as follows (Figure 11). Established network for estimation of "depersonalization" factor after the completion of training is as follows (Figure 12). Performance chart being in training result for estimation of "depersonalization" factor is as follows (Figure 13). Regression charts being in training result for estimation of "depersonalization" factor are as follows (Figure 14). The artificial neural network training results that were formed for "depersonalization" factor are as follows (Table 3).
According to Table 3, being approximately 20% network performance for "depersonalization" is seen.

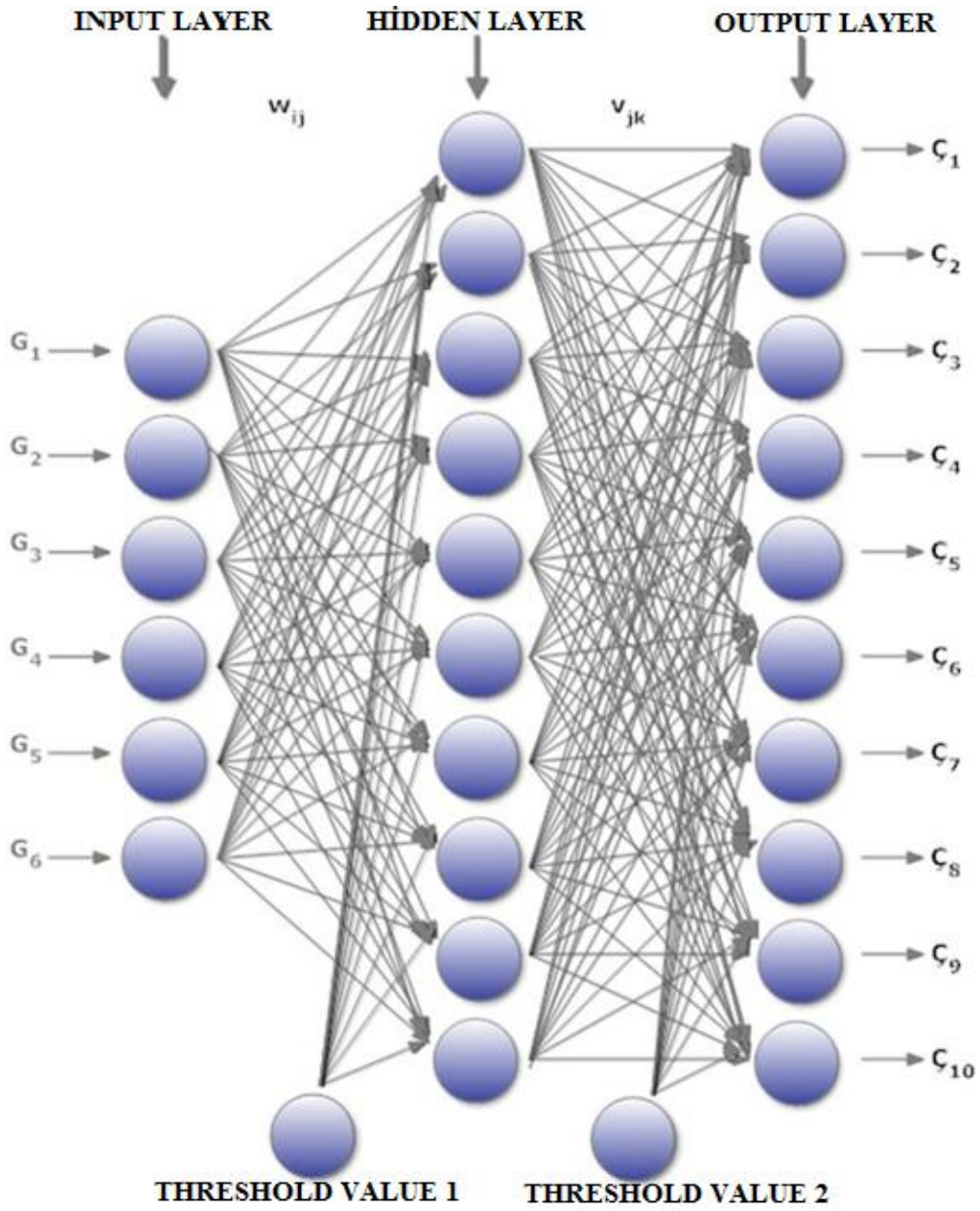

Figure 11. Artificial neural network model for prediction of "depersonalization" factor (G1: Personal achievement, G2: Emotional exhaustion, G3: Confidence on the field information, G4: Confidence on laboratory information, G5: Confidence on performance and G6: Competence).

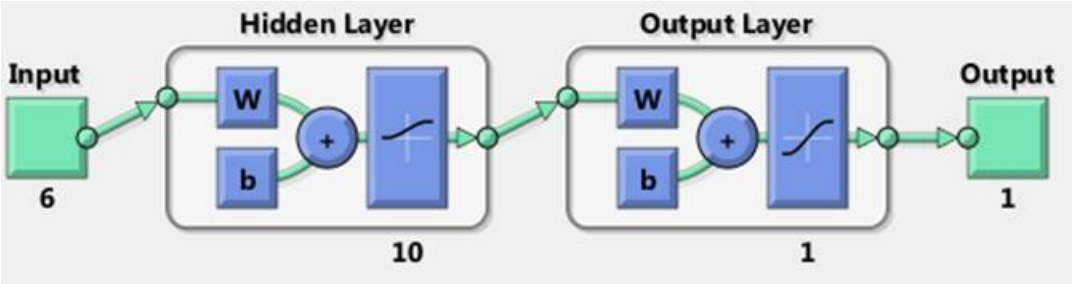

Figure 12. Established network for estimation of "depersonalization" factor after the completion of training.

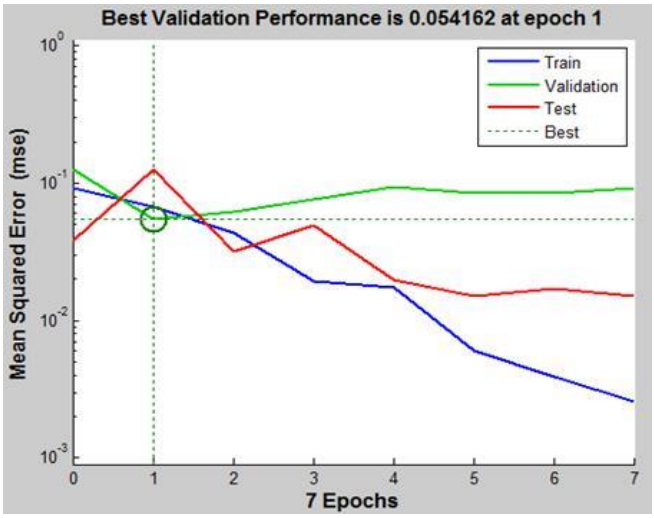

Figure 13. Performance chart for estimation of "depersonalization" factor.

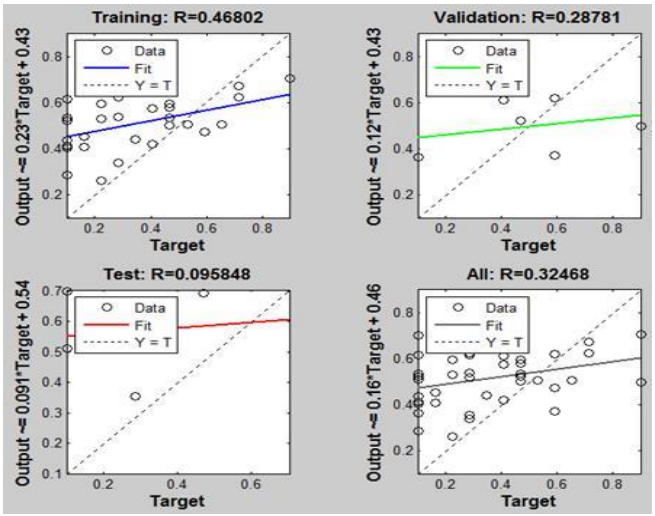

Figure 14. Regression charts of "depersonalization" factor.

Table 3. Expected and network outputs of the artificial neural network that was formed for "depersonalization" factor.

Expected output	Network output
9	10,58*
6	9,601
6	10,33
6	10,23
5	9,75
7	9,75*
5	10,40
6	9,47
7	10,55
14	10,11

Table 4. Expected and network outputs of the artificial neural network that was formed for "competence" factor.

Expected output	Network output
106	120,41*
107	97,69*
92	103,17*
98	120,64
98	108,18*
103	116,06*
117	120,42*
102	118,375*
103	120,53*
84	119,58

Forecasting with artificial neural networks of the three dimensions of burnout: emotional exhaustion, depersonalization and personal achievement variables are as above. Estimation with other variables of the competence variable in this study has been wondered. The work of estimation with artificial neural network of competence is as follows.

Data set in the input layer in the "competence" estimation work is as follows:

a) Confidence on the field information of science teachers
b) Confidence on the performance of science teacher
c) Confidence on the laboratory information of science teacher
d) Emotional exhaustion of science teacher
e) Depersonalization in science teachers
f) Personal achievement in science teachers

Data set in the output layer in the "competence" estimation work is as follows:

Competence in science teachers: Artificial neural network model for prediction of "competence" factor is as follows (Figure 15). Established network for estimation of "competence" factor after the completion of training is as follows (Figure 16). Performance chart being in training result for estimation of "competence" factor is as follows (Figure 17). Regression charts being in training result for estimation of "competence" factor are as follows (Figure 18). The artificial neural network training results that were formed for "competence" factor are as follows (Table 4).

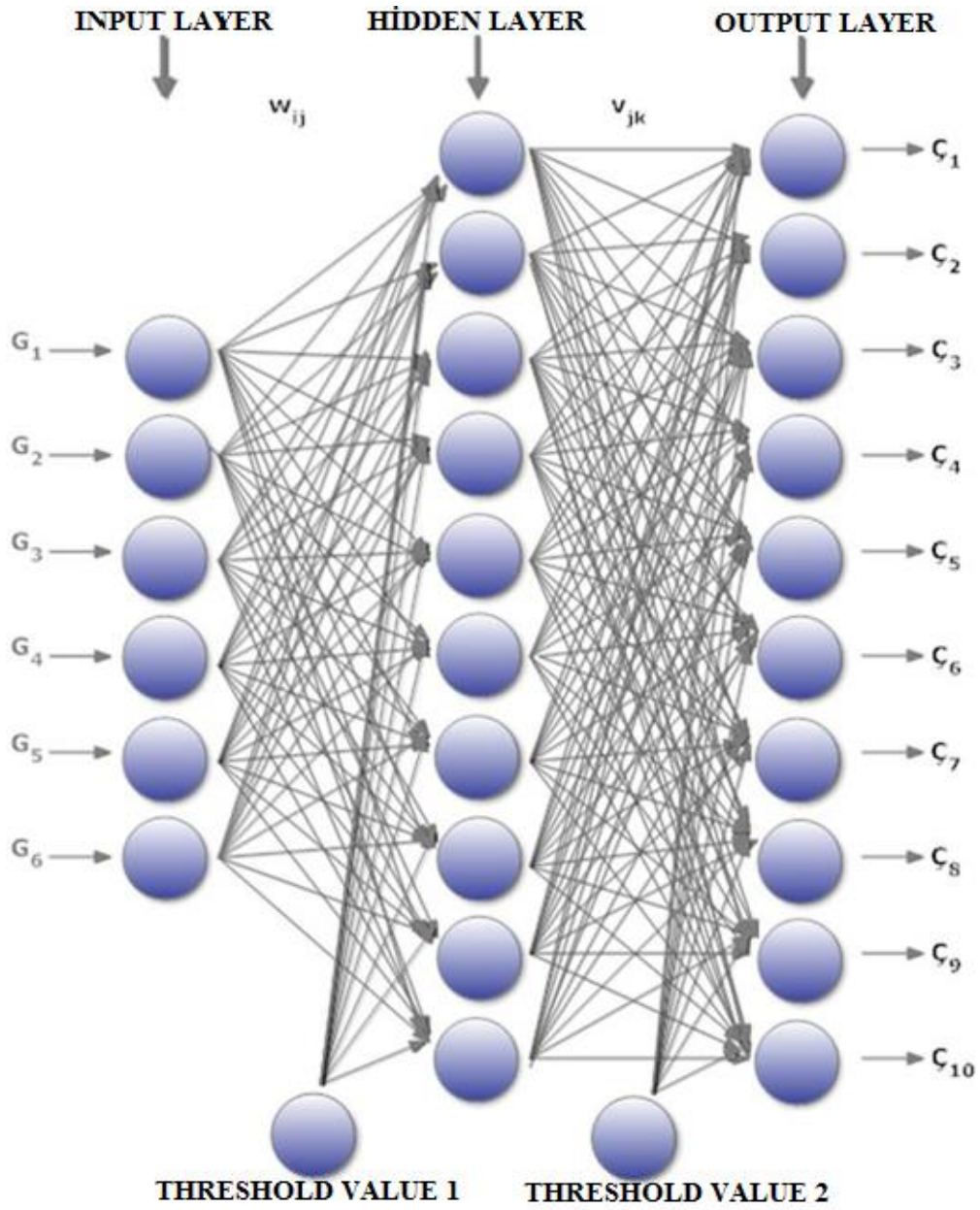

Figure 15. Artificial neural network model for prediction of "competence" factor (G1: Personal achievement, G2: Emotional exhaustion, G3: Depersonalization G4: Confidence on the field information, G5: Confidence on laboratory information, G6: Confidence on performance).

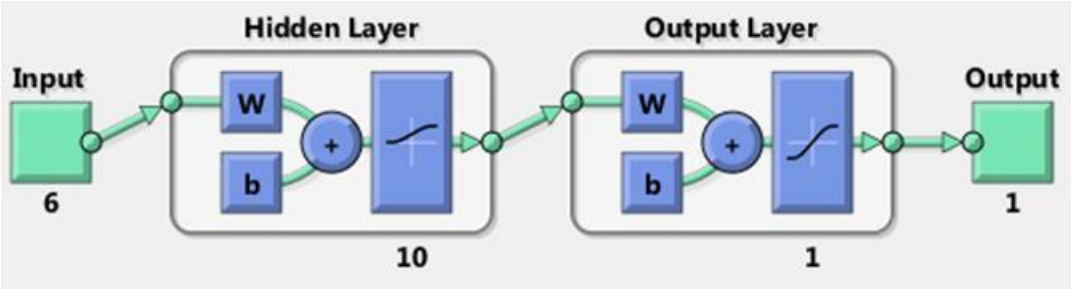

Figure 16. Established network for estimation of "competence" factor after the completion of training.

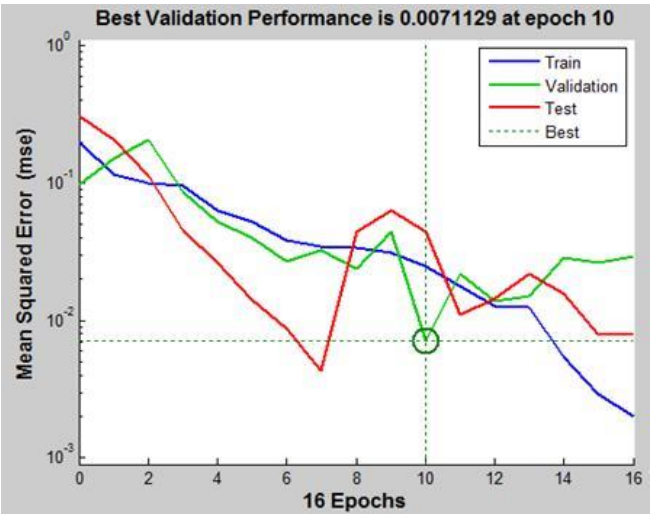

Figure 17. Performance chart for estimation of "competence" factor.

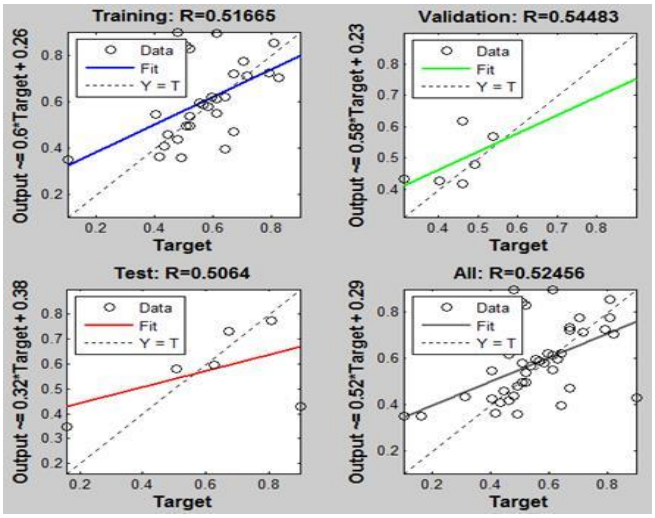

Figure 18. Regression charts of "competence" factor.

According to Table 4, being 80% of network performance for "competence" is seen. According to the literature, it has shown that there are several studies that burnout is examined from different angles. The subjects of this studies are as follows: It is revealed the relationship between demographic characteristics and professional burnout (Alkan, 2011; Aslan, 2009; Avşaroğlu, Deniz and Kahraman, 2005; Balkıs, E. Duru, Buluş and S. Duru, 2011; Başol and Altay, 2009; Besler, 2006; Coşkun, 2012; Dincerol, 2013; Gündoğdu, 2013; İkiz, 2010; Karabıyık Özipek, 2006; Kayabaşı, 2008; Maraşlı, 2005; Özdoğan, 2008 and Türker, 2007). There are a number of studies which determine the burnout level (Acun, 2010; Akten, 2007; Aslan, 2009; Cihan, 2011; Dolunay and Piyal, 2003; Gürses, 2006; İkiz, 2010; Kırılmaz, Çelen and Sarp, 2003; Korkmaz, 2004; Topaloğlu, Koç and Yavuz, 2007; Türkçarpar, 2011 and Yılmaz, 2013). The relationship between burnout and job satisfaction has been identified (Avşaroğlu, Deniz and Kahraman, 2005; Ertürk and Keçecioğlu, 2012 and Toprak, 2013). As it is seen, studies examining together emotional and cognitive variables, that is, together burnout and self-efficacy / competence variables are little. In addition, a study that burnout is examined with the artificial neural network in literature search has not been found.

CONCLUDING REMARKS

According to the results of the artificial neural network; four estimation works such as "emotional exhaustion", "personal achievement", "depersonalization" and "competence" were conducted.

Some estimates which are produced in response to input of artificial neural network were closer to the real output value with acceptable error rate.

Thanks to the artificial neural network, it was revealed estimates of emotional exhaustion, personal achievement, depersonalization and competence variables. Variables predicting emotional exhaustion are competence, confidence on the performance, confidence on the laboratory information, confidence on field information, personal achievement and depersonalization. Variables predicting personal achievement are competence, confidence on the performance, confidence on the laboratory information, confidence on field information, emotional exhaustion and depersonalization. Variables predicting depersonalization are competence, confidence on the performance, confidence on the laboratory information, confidence on field information, emotional exhaustion and personal achievement. Variables predicting competence are confidence on the performance, confidence on the laboratory information, confidence on field information, emotional exhaustion, personal achievement and depersonalization.

Thanks to the artificial neural network, whether teacher experienced professional burnout is determined by looking at competence, emotional exhaustion, personal achievement and depersonalization performance. It may also be expressed as a numerical degree of burnout what they live.

Based on the results of the research, artificial neural network may be used safely to predict the variables that affect burnout. Thus, a new perspective has been obtained to the analysis of research data in the field of education.

The recommendations developed regarding the results of this survey are listed below.

1. In this study, the artificial neural network has been shown to give good results in the estimates of the variables that affect the burnout. Therefore, artificial neural network may be used to estimate the burnout affecting the quality and efficiency in education, having major impact on social and business life of teacher. Thus the situation of teachers who experience burnout will be determined and it may try to eliminate problems by going to intervene work.
2. Due to the qualitative part of the study, this study was carried out with 51 the teachers. The performance of the artificial neural network may be examined by increasing the number of samples. When the number of people increased, the difference between the expected output and network output in the artificial neural network application may be turned off.
3. One of the aims of this study was to identify the variables that influence burnout and may predict the burnout. Intervention works for teachers who experienced burnout may be the subject of another studies.
4. According to analysis results, professional burnout score of teachers is related to self-efficacy and competence of their, so it is found that the affective and cognitive characteristics are associated with each other. For this reason, it has been seen that professional burnout does not depend only on demographic information, but also influence from other variables such as self-efficacy, competencies. Therefore, the researchers are advised to look at from this perspective.

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