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Development of Peer Bullying Scale (PeBuS)

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Abstract

The aim of this study is to develop a scale that can be used to detect bullying behaviors that can be seen in interpersonal relationships. The sample of the study consists of 381 randomly selected teachers working in primary and secondary schools in the central district of Edirne, Turkey, in the 2021-2022 academic year. In the research, the “Peer Bullying Scale”, which was prepared by the researcher and consisted of 50 Likert type items with 4 options, was used as a data collection tool. Varimax rotated exploratory factor analysis was used to determine the sub-dimensions. To determine reliability, item-total correlation, item residual correlation, Cronbach and Rulon coefficients were calculated. The construct validity of the scale was tested with Confirmatory Factor Analysis. As a result of the statistical processes, it was seen that the scale was valid, reliable and usable.

Keywords: bullying, bully, victim, peer bullying, scale development.

1. Introduction

As children go out of the family environment and their social relationships diversify, the probability of encountering individuals different from themselves increases during their developmental period. While getting together with peers who are different from their own lifestyle, culture, ethnic origin, beliefs and life view, such differences can cause problems in relationships and cause bullying attitudes and behaviors among peers (Kaya & Arslan Şeker, 2022).

In addition to being a guide and model for each other, peers are effective in physical, social, emotional development and psychology. The quality of peer relationships in children’s lives can guide their social and emotional development and psychological health in the future (Gülay-Ogelman, 2018).

When they look at the outside world from their own small window, children who see violence as a problem-solving method, unfortunately, do not hesitate to use this method in their social relations. In recent studies, it has been reported that aggressive behaviors, which are described as “peer bullying”, are frequently encountered among children all over the world (Kılınc, 2022).

Traditional views suggesting that bullying is caused by weakness characterizes socially challenging behaviors as maladaptive behaviors exhibited by children with insufficient social skills (Garner & Hinton, 2010). Social-cognitive theories argue that socially challenging behaviors are strategic behaviors performed by children with different social skills (Volk, Dane et al., 2022). Adolescents may be more likely to engage in bullying when they seek to get ahead of others rather

than social cohesion. Bullying can cause teens to gain popularity, but it can also cause them to lose their likes (Hensums et al., 2023).

It is known that 34% of children have been exposed to bullying in the last month (World Health Organization, 2019). Bullying with serious lasting consequences is a common and important problem among children and adolescents.

1.1 Bullying concept

Peer bullying, which is defined as the continuous negative actions of one or more students against another student, is an example of undesirable behavior. Bullying is an important behavioral problem involving persistence, power imbalance, and willfulness among peers. Bullying is a type of violence that causes one or more students to constantly and intentionally disturb weak students and where the victim cannot protect himself.

The frequent and systematic abuse and assault of some children by other children has been described in literary works, and many adults have personal experience of this from their school days. Bullying behavior usually occurs without explicit provocation and can be considered as peer abuse (Olweus, 1994). Bullying is the physical and psychological pressure applied by stronger individuals or groups to harm less powerful individuals and groups (Olweus, 1993; Gürhan, 2017). For a behavior to be considered as bullying, three criteria must be met: (1) Aggressive behavior with the intent to harm, (2) Continuity, (3) Power imbalance between the bully and the victim (Olweus, 1993). In addition to the power imbalance in bullying, there is continuity and systematic abuse of power (Rigby, 1999). Bullying is a form of interpersonal violence, but bullying is different from aggression. The mechanisms leading to bullying are related to establishing and maintaining social dominance (Olafsen & Viemerö, 2000).

Peer bullying is the physical, verbal, psychological attack, intimidation, and violence behaviors that the stronger child (bully) who has power inequality among them without provocation, aims to inflict fear, anxiety or harm on the other (victim) and repeatedly.

1.2 Types of bullying

Bullying can be relational, physical, verbal, exclusion, spreading rumors, sexual, etc. divided into sub-dimensions (Ayas & Pişkin, 2015). Belittlement, trivialization, exclusion from the group are examples of bullying behaviors (Dogan, 2022). Types of bullying can be classified as physical, verbal, abstraction, spreading rumors, damaging their belongings and sexual (Siyez & Kaya, 2011). Bullying behavior can be categorized as physical (kicking, etc.), verbal (nickname, etc.) and relational (exclusion, etc.) (Berger, 2007). Peer bullying can be handled in five types as physical bullying, verbal bullying, exclusion, spreading rumors and damaging their belongings (Pişkin & Ayas, 2011).

Bullying can be classified as physical, verbal-non-verbal, direct-indirect. Physical bullying is the direct use of force. Verbal bullying is hurting through words. Indirect bullying includes behaviors such as social isolation (Elliott, 2021). Bullying refers to direct or indirect aggressive acts that can be classified as physical, psychological, verbal, sexual, cyber (Özbek & Taneri, 2022).

Physical bullying; punching, kicking, pushing, taking things by force, verbal bullying; teasing, humiliating, insulting, swearing, emotional bullying; excluding, not speaking, not helping, leaving alone (Griffin & Alan, 2004).

Many researchers have presented different views on the types of peer bullying. While Haskaya (2016) diversifies peer bullying directly and indirectly; Olweus (1991) discussed peer

bullying in three categories: physical bullying, verbal bullying and indirect bullying through social aggression. Social aggression is seen as ostracism, spreading rumors, or using “relationships as a weapon” (Simmons, 2002).

Various types of bullying have been classified as a result of a series of studies (Sulak & Altuntaş, 2022): physical bullying (fighting, kicking, punching, hitting), verbal bullying (teasing, swearing, threatening, spreading bad rumors), social bullying (intentionally excluding from a game or group, not inviting to class activities), sexual bullying (i.e. making sexual comments or engaging in sexual acts); cyberbullying (sending annoying and offensive electronic messages over the phone or computer).

1.3 Causes of bullying

The frequency of bullying varies depending on the country, culture and age of the victim. The personality of the child, his family and cultural characteristics, and the role of the social environment he is in also have an effect on bullying behaviors.

Studies indicate that bullies more often choose children and young people who have developmental, emotional, physical differences, health problems, and who do not have strong social relationships as the target of bullying.

The cause of peer bullying may not be the fault of the bullied child or conflict (Olweus, 1993). If the cause of peer bullying is not peer conflict, opinions on the question of what is the reason are varied. Peer bullying, for example, is thought to be for social dominance (Pellegrini & Long, 2002). Children with insufficient psychological resilience have difficulties in peer relations and may become bullies or victims (Gün & Gültekin Akduman, 2022).

Traditionally, bullying is maladaptive behaviors that result from functional deficiencies or inadequacies in the individual. Inability to cope with situations socially due to incorrect or limited social information processing, hostile association style, or poor emotion regulation skills leads to bullying (Hensums et al., 2023).

1.4 Effects of bullying

Being bullied by peers can cause significant problems in the physical, mental, social, academic and professional development of children and young people. Bullying causes the victim to feel bad and worthless in social situations and impairs academic achievement.

Bullying, which is a type of violence, involves repeated physical, psychological or social harm, usually occurs in schools, online and in environments where children gather (World Health Organization, 2019). Bullying can change both the victim’s and the bully’s self-perceptions. At the end of the bullying process, while the bully gains certain gains (intra-group status, money, goods, etc.), the victim experiences a sense of humiliated and helplessness (Gümüş & Talu, 2022). Being exposed to bullying has negative effects on children physically, mentally and socially. It can cause emotional effects such as depression, anger, anxiety, as well as somatic complaints, especially stomachache and headache (Akcan & Odabaş, 2022).

The three actors of bullying are the bully (bullying the other person), the victim/victim (the one who is being bullied) and the spectator (witnessing/bystander of the bullying). Studies have shown that bullying has serious consequences for the bully, the victim, and the audience. All actors of peer bullying experience academic, physical, psychological, social and emotional problems, and may face serious consequences such as low academic achievement, lack of self-esteem, social incompatibility, depression, inferiority, insomnia, and suicide in the short and long term (Özbek & Taneri, 2022).

1.5 Measures of bullying

Detecting bullying, providing solutions and preventing it are important for the healthy development of children and adolescents. Families and educators play a very important role in this regard. Current studies on bullying are based on the idea that peer violence is preventable. Preventive strategies for bullying are concentrated in the field of psychology and educational sciences.

This problem, which starts in the pre-school period, should be recognized first and preventive measures should be taken. In order to reduce bullying, it is important to acquire positive attitudes in children, identify risk groups and create anti-bullying programs.

Bullying in schools has a negative impact on children's perceptions of safety and school experiences. Since they spend a significant part of their days at school with their friends, most children experience the fear of being bullied by their peers with whom they are in constant interaction (White & Loeber, 2008).

Children who are victims of peer bullying need to receive early intervention (Erim, 2022). Measures of bullying; Families should be made aware of bullying, inclusive seminars should be organized about bullying, children who are prone to violence should be directed to social activities, studies should be made to establish empathy, punitive sanctions should be increased, informative publications should be made about bullying in mass media (Akpınar & Akpınar, 2022).

2. Method

The aim of this study is to develop a scale that can be used to detect bullying behaviors that can be seen in interpersonal relationships.

2.1 Participants

Table 1. Sample frequency distribution

		f	%
1) Your age?	• a) 29 and younger	26	6.8
	• b) 30-39	120	31.5
	• c) 40-49	133	34.9
	• d) 50 and older	102	26.8
2) Your gender?	• a) Female	281	73.8
	• b) Male	100	26.2
3) Your education status?	• a) Undergraduate	343	90.0
	• b) Graduate	38	10.0
4) Your professional seniority?	• a) 1-5 year	20	5.2
	• b) 6-10 year	69	18.1
	• c) 11-19 year	113	29.7
	• d) 20 years or more	179	47.0
7) The school level you work at?	• c) Primary school	270	70.9
	• d) Secondary School	111	29.1
Total		381	100.0

The population of the research consists of teachers working in primary and secondary schools in the central district of Edirne in the 2021-2022 academic year. The sample of the study consists of 381 randomly selected teachers.

34.9% of the participants are 40-49 years old, 73.8% are women, 90.0% are undergraduate graduates, 47.0 have 20 years or more of professional service, 70.9% work at primary school level are teachers (Table 1).

2.2 Data collection

In the research, a questionnaire for demographic information and the “Bullying Scale” prepared by the researcher were used as data collection tools. The scale consists of 50 Likert type items with 4 options. There are no reverse-rated items in the scales. Subscale scores were calculated by taking the mean of the items. The scale score was calculated by taking the mean of the subscales. All these scores range from 1 to 4.

2.3 Data analysis

Varimax rotated EFA (exploratory factor analysis) was used as scale development statistics to determine sub-dimensions. To determine reliability, item-total correlation coefficient and item remainder correlation coefficient, Cronbach and Rulon coefficient were calculated. Similarly, t-test was conducted between the upper and lower quartiles to determine the strength of discrimination. As a result of the statistical processes, the scale consisting of 5 subscales has been proven to be valid, reliable and usable.

After the scale was structured with EFA (exploratory factor analysis) and item analysis, its construct validity was tested with CFA (Confirmatory Factor Analysis). CFI (Comparative Fit Index) and RMSEA (Root Mean Square Error of Approximation) fit indices were used to test the suitability of the DFA model. Considering these criteria, DFA models were created. As a result of the statistical processes, it was seen that the scale was valid, reliable and usable.

3. Results

The statistical method used to determine the construct validity of the scale is exploratory factor analysis. The data were found to be suitable for factor analysis with the KMO (0.976) and Barlett (Chi-Square=19264.100 df=1225 p=0.000) tests (Table 2).

Table 2. KMO and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.976
	Approx. Chi-Square
	19264.100
Bartlett’s Test of Sphericity	df
	1225
	Sig.
	0.000

In the analysis, which was carried out in such a way that the components with an eigenvalue of 1 and above were selected, 6 components were formed. The 6 components created in the analysis using the principal components method explain 72.345% of the total variance (Table 3).

Table 3. Total variance explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
F1-1	27.852	55.704	55.704	27.852	55.704	55.704	11.474	22.949	22.949
F1-2	3.097	6.194	61.898	3.097	6.194	61.898	7.647	15.294	38.243
F1-3	1.770	3.540	65.438	1.770	3.540	65.438	6.100	12.199	50.442
F1-4	1.297	2.594	68.032	1.297	2.594	68.032	5.528	11.057	61.499
F1-5	1.116	2.233	70.265	1.116	2.233	70.265	4.158	8.315	69.814
6	1.040	2.080	72.345	1.040	2.080	72.345	1.265	2.530	72.345
7	0.829	1.659	74.003						

Factors and the items they contain were determined according to varimax rotated factor analysis. It was determined that the scale had 5 factors (Table 4).

Table 4. Rotated component matrix

No	Item	Factor	Eigen	No	Item	Factor	Eigen
42	B-17) get offended	F1	0.778	32	B-7) insulting	F2	0.497
43	B-18) offend	F1	0.762	18	A-18) throwing shoulders	F2	0.458
37	B-12) get angry	F1	0.762	19	A-19) pulling hair/ear	F2	0.428
36	B-11) angering	F1	0.744	13	A-13) pushing	F2	0.424
46	B-21) annoying	F1	0.735	14	A-14) hitting on the head/nape	F2	0.366
45	B-20) losing temper	F1	0.725	50	B-25) ignoring	F3	0.779
44	B-19) verbal abuse	F1	0.692	30	B-5) disregard	F3	0.705
35	B-10) name calling	F1	0.674	31	B-6) excluding from the group	F3	0.639
38	B-13) not talking	F1	0.662	47	B-22) not answering their questions	F3	0.598
41	B-16) swearing	F1	0.660	40	B-15) humiliating	F3	0.575
29	B-4) ridiculing	F1	0.652	49	B-24) embarrassing	F3	0.570
27	B-2) making fun of	F1	0.602	28	B-3) insult	F3	0.544
20	A-20) teasing	F1	0.584	48	B-23) threatening	F3	0.526
26	B-1) making cry	F1	0.570	34	B-9) slandering	F3	0.492
39	B-14) scaring	F1	0.561	2	A-2) bump	F4	0.717
33	B-8) gossiping	F1	0.540	3	A-3) tripping up	F4	0.685
23	A-23) hitting	F2	0.697	1	A-1) shouting	F4	0.644
21	A-21) manhandling	F2	0.667	5	A-5) elbowing	F4	0.615
22	A-22) kicking	F2	0.667	7	A-7) poking	F4	0.592
24	A-24) punching	F2	0.643	4	A-4) pinching	F4	0.592
16	A-16) fighting	F2	0.620	10	A-10) scold	F4	0.446
9	A-9) using physical force	F2	0.602	11	A-11) biting	F5	0.810
25	A-25) harming	F2	0.566	15	A-15) locking up in a closed place	F5	0.781
6	A-6) beating	F2	0.555	12	A-12) sticking needles, pencils etc.	F5	0.711
17	A-17) twisting someone's arm	F2	0.519	8	A-8) torturing	F5	0.449

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 11 iterations.

The 6 components obtained by factor analysis resulted in 5 factors. The factor structure of the scale is as follows; F1-1: Psychological direct bullying, F1-2: Physical violence, F1-3: Psychological indirect bullying, F1-4: Physically disturb, F1-5: Physical infliction (Table 5).

Table 5. Factors

F1-1	Psychological direct bullying	get offended, offend, get angry, angering, annoying, etc.
F1-2	Physical violence	hitting, manhandling, kicking, punching, fighting, etc.
F1-3	Psychological indirect bullying	ignoring, disregard, excluding from the group, not answering their questions, humiliating, embarrassing, etc.
F1-4	Physically disturb	bump, tripping up, shouting, elbowing, etc.
F1-5	Physical infliction	biting, torturing, etc.
F1-6	-	No item participated in this dimension.

The relationship between factor totals and scale total was tested with item-total correlation and item-remainder correlation coefficients, and internal consistency between factors was tested with Cronbach α (0.870) and Rulon (0.907) coefficients. According to the results of this analysis, it was determined that all the factors in the scale had internal consistency (Table 6).

Table 6. Interdimensional internal consistency analysis

Factor		Item-total correlation coefficient			Item-remainder correlation coefficient		
		r	df	p	r	df	p
F1-1	Psychological direct bullying	0.949	380	p<.01	0.873	380	p<.01
F1-2	Physical violence	0.950	380	p<.01	0.901	380	p<.01
F1-3	Psychological indirect bullying	0.909	380	p<.01	0.861	380	p<.01
F1-4	Physically disturb	0.864	380	p<.01	0.821	380	p<.01
F1-5	Physical infliction	0.629	380	p<.01	0.585	380	p<.01
		Rulon			Cronbach α		
		0.907			0.870		

This process, which was carried out according to the scale total, was repeated separately for each of the 5 factors. Summary statistics on these analyzes of internal consistency are as follows: Cronbach's coefficients F1(0.970), F2(0.960), F3(0.943), F4(0.907), F5(0.793); Rulon coefficients F1(0.977), F2(0.973), F3(0.925), F4(0.904), F5(0.781). According to these results, it was seen that all factors and all items had internal consistency.

Participants were ranked in descending order according to the scale factor total, and it was determined which participants were in the upper or lower quartiles according to this ranking. The difference between the upper and lower quartiles was analyzed using the t-test statistical technique. This process, which was carried out according to the scale total, was repeated separately for each of the 5 factors. According to these results, it was seen that all factors (Table 7) and all items were discriminative between participants with high and low opinions on peer bullying problems.

Table 7. Discriminant coefficients for subscales

	Upper Quarter			Lower Quarter			t	df	p
	n	\bar{x}	S. dev.	n	\bar{x}	S. dev.			
Psychological direct bullying	103	50.796	6.427	103	22.592	4.910	35.220	204	p<.01 0.000
Physical violence	103	38.961	6.452	103	16.515	2.634	32.531	204	p<.01 0.000
Psychological indirect bullying	103	25.204	4.378	103	11.194	2.096	29.152	204	p<.01 0.000
Physically disturb	103	19.136	3.367	103	9.650	2.113	24.101	204	p<.01 0.000
Physical infliction	103	7.650	2.515	103	4.350	0.737	12.718	204	p<.01 0.000

All Pearson correlation coefficients among all factors are statistically significant. Normality tests, kurtosis and skewness coefficients showed that the data were normally distributed. All relations between factors are at a significant level (Table 8).

Table 8. Pearson correlation coefficient matrix of subscales and descriptive statistics

	N	\bar{x}	s. dev.	Skewness	Kurtosis	F1-1	F1-2	F1-3	F1-4	F1-5	F1-T
F1-1	381	2.294	0.741	0.138	-0.751	1	.847**	.861**	.740**	.454**	.910**
F1-2	381	1.974	0.674	0.441	-0.276	.847**	1	.795**	.836**	.647**	.946**
F1-3	381	2.003	0.692	0.401	-0.539	.861**	.795**	1	.714**	.522**	.902**
F1-4	381	2.049	0.622	0.451	0.282	.740**	.836**	.714**	1	.614**	.890**
F1-5	381	1.484	0.531	1.563	2.233	.454**	.647**	.522**	.614**	1	.713**
F1-T	381	1.961	0.574	0.307	-0.397	.910**	.946**	.902**	.890**	.713**	1

** .p< 0.01 (2-tail)

After the scale was structured with EFA (explanatory factor analysis) and item analysis, the scale's 5 sub-dimension structure was confirmed as a result of CFA (Confirmatory Factor Analysis). The model was validated by comparing the indices ($\chi^2(1158) = 3647.113$ p = .000 $\chi^2/df = 3.149$; TLI = .861; NFI = .820; CFI = .869; and RMSEA = .075 (90% CI 0.072 0.078); GFI = .700; AGFI = .670) with the criteria. All items loaded significantly on 5 factors of the scale. Figure 1 shows all the factors, items and values of the scale.

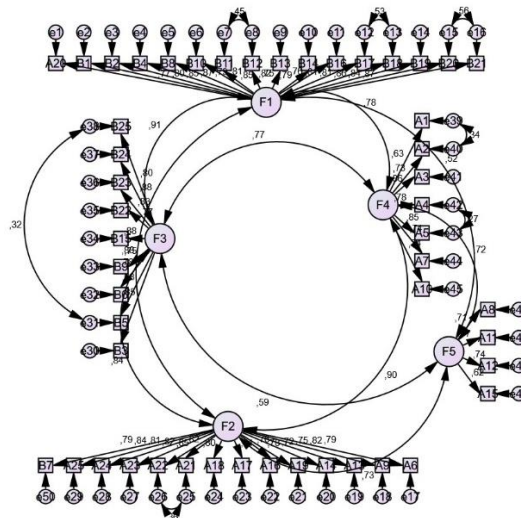


Figure 1. Confirmatory Factor Analysis

4. Conclusion

Statistical analyzes show that the scale has construct validity, discriminant validity and internal consistency reliability. As a result of all statistical analyzes, it was determined that the Peer Bullying Scale, which consists of 5 factors and 50 items, is valid, reliable and usable.

There is no reverse scored item in the scale. High scores on all factors indicate that peer bullying is a high-level problem. It is hoped that the scale will help to better understand the difficulties experienced especially in schools. Thus, it may be possible to make peer relationships healthier.

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Investigation of Social Studies Teacher Candidates' Attitudes Towards Renewable Energy Sources

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Abstract

This research was prepared in order to examine the attitudes of social studies teacher candidates towards renewable energy sources in terms of various variables. Convenient sampling, one of the purposeful sampling methods, was preferred in the research and the sample group of the research consists of 250 teacher candidates, who are the last level students of universities who teach social studies. In the research, the data were collected by taking the necessary permissions and transferring the scale used to the online environment, taking into account the cost and economic conditions. The Attitude Scale Towards Renewable Energy Sources developed by T. Güneş, K. Alat, and A. İ. C. Gözümlü, was used after obtaining the necessary permissions. In addition, the demographic information form prepared by taking the necessary expert opinion within the scope of this research was used as a data collection tool in the research. The Attitude Scale Towards Renewable Energy Sources used in the research was prepared in a 5-point Likert type consisting of 26 items. The causal comparison design, which is among the quantitative methods, was preferred in the research. The data obtained in the study were analyzed using independent groups t-test and one-way analysis of variance (ANOVA).

Keywords: social studies teacher candidates, renewable energy, attitude.

1. Introduction

The environment is the environment in which people, other living things and non-living things in nature live in interaction with each other (Seçgin, Yalvaç & Çetin, 2010). For this reason, the natural environment is important for all living things in the world (Yıldırım, 2016). It can be said that human-environment interaction dates back to ancient times. With the existence of man in the world, his interaction with the natural environment in which he lives has become inevitable. People benefited from the natural environment in order to meet their own needs (Çimen & Yılmaz, 2012).

In recent years, as a result of the rapid increase in the population, many problems have started to emerge with the urbanization problems and the secondization (Çolak, Kaymakçı &

Akpınar, 2015). Problems have occurred in the natural environment due to the increase in seconds and the factors that emerged as a result of the developments in technology (Avan, 2011).

As a result of the increasing human population in the world, the energy needs of societies have also increased. The increase in the energy demands of societies causes an increase in the use of oil, coal and natural gas, which are among the fossil fuels, in energy production (Çakırlar, 2015). It is known that the fossil fuels used to meet the energy needs are not infinite and harm the natural environment (Eroğlu & Aydoğdu, 2016). This leads to the search for sustainable and more environmentally friendly new energy (Bodur & Şenyuva, 2013).

As an alternative to fossil-based energy sources, resources such as solar, wind, wave, hydroelectric, geothermal, biomass and hydrogen energy in nature are called renewable energy sources. These resources can produce energy with the least damage to the environment and can renew themselves in a very short time (Yıldırım, 2016). Due to the high installation costs of renewable energy sources in today's conditions and the problems experienced in the storage of the produced energy, the world still uses fossil fuels in energy production to a large extent (Çolak et al., 2015).

Recently, there are many studies examining the knowledge levels of students and teacher candidates on the use of alternative energy sources and the recycling of materials such as plastic bags, paper, glass, and batteries left to nature (Akanlar, 2019; Alboğa, 2013; Aydın, 2019; Benek, 2019; Birsen, 2020; Can, 2019; Demircan, 2019; Koruoğlu, 2013). There are also studies examining the knowledge levels of teacher candidates about renewable energy sources (Aytar, 2016; Bülbül, 2017; Hür, 2019; Karakaya-Cirit, 2016; Soğancılar, 2018). In Turkey, studies have been conducted to develop an attitude or awareness scale towards renewable energy in the field of education and to measure the attitudes or awareness of teachers in different branches (Morgil et al., 2006; Güneş et al., 2013; Akçöltekin & Doğan, 2013; Bilen, Özen & Sürücü, 2013)

When the relevant literature is examined, there are many studies investigating the awareness levels of students on renewable energy sources and recycling (Arslan, 2019; Şallı, 2011).

Considering the current primary education curriculum in Turkey, it will be easily noticed that the most suitable courses for transferring the subject to students are Social Studies courses in terms of their content. At this point, in addition to the handling of renewable energy resources in the curriculum and textbooks, especially in the Social Studies course, the attitudes of the Social Studies teacher candidates towards renewable energy and their approach to the issue of renewable energy are extremely important as they are the teachers of the future. Because raising conscious students on this subject will be possible with teachers who are conscious and understand the importance of renewable energy. For this reason, examining the attitudes of social studies teacher candidates in Turkey towards renewable energy sources in terms of various variables constitutes the subject of this study.

2. Purpose of the research

This research aims to examine the attitudes of social studies teacher candidates towards renewable energy sources in terms of various variables. In line with the purpose of the research, answers to the questions listed below were sought:

- What are the attitudes of social studies teacher candidates towards renewable energy sources?
- Do social studies teacher candidates' attitudes towards renewable energy sources differ according to gender?

- Do social studies teacher candidates' attitudes towards renewable energy sources differ according to the variable of membership in environmental protection organizations?
- Do social studies teacher candidates' attitude levels towards renewable energy sources differ according to the variable of participation in environmental protection activities?

3. Method

This research is a descriptive survey in terms of revealing the attitudes of social studies teacher candidates towards renewable energy sources. In the research, causal comparison design was used in order to examine various variables of social studies teacher candidates' attitudes towards renewable energy sources. In causal comparative research, researchers, individuals they try to determine the cause or consequences of differences between or between groups (Fraenkel, Wallen & Hyun 2015: 364).

In this context, the difference between the social studies teacher candidates' attitudes towards renewable energy sources in terms of gender, membership in environmental protection organizations, participation in environmental protection activities were examined. In the research, the levels of attitudes towards renewable energy sources were examined to differencing according to gender, environmental protection organization membership and participation in environmental protection activities.

3.1 *Data collection*

Within the scope of the research, the data were collected by It was collected using the Attitude Scale towards Renewable Energy Sources developed by T. Güneş, K. Alat, and Gözüm, A. İ. C. Permission was obtained from the researchers who developed the scale used in data collection.

In the research, scale items were added to the lime survey system on the internet, taking into account the cost and other conditions during the data collection process. An online link address was sent to the participants in order to respond to the scale. Participants gave their answers to the scale online using this link sent to them. The system automatically recorded participant responses and presented them to the researchers. The data obtained within the scope of the research were transferred to the SPSS program to be analyzed by the researcher.

3.2 *Analysis of data*

The answers obtained from the participants in the study were analyzed using the parametric tests in the SPSS program. In the analysis of the data, first of all, the normality distributions were examined with the Kolmogorov Smirnov test. The use of this test in the normality distribution is due to the fact that the number of participants is 250. In quantitative studies, the Shapiro Wilks test is used when the number of participants is less than 29, and the Kolmogorov-Simirnov (Lilliefors) test is used when it is more (Kalaycı, 2008).

Table 1. Normality test

Renewable Energy Sources Attitude Level	Kolmogorov Smirnov		
	Statistic	df	p
	.840	250	.245

When Table 1 is examined, it is seen that the significance level of the normality test of the data obtained from the answers given by the research participants is $p > 0.05$. The value obtained as a result of the normality test shows that the data exhibit normal distribution. For this reason, parametric tests were preferred in the analysis of the data obtained in the study.

Within the scope of the research, descriptive statistics were used to measure the attitudes of social studies teacher candidates towards renewable energy sources. Since the scale of attitude towards renewable energy sources used in the research is of 5-point scale, average scores between 1.00 and 1.99 are very low, average scores between 2.00 and 2.99 are low, average scores between 3.00 and 3.99 are high, and average scores between 4.00 and 5.00 are very high. In addition, one-way analysis of variance (ANOVA) was applied to analyze the attitudes of social studies teacher candidates towards renewable energy sources according to the variables of membership in environmental protection organizations and participation in environmental protection activities. In case of a significant difference, the Scheffe test was applied by looking at the homogeneity of within-group variances in order to determine which group or groups favored this difference. In the study, independent groups t-test was used in the analysis of social studies teacher candidates' attitudes towards renewable energy sources according to the gender variable.

4. Findings and interpretation

In the study, descriptive findings including the attitudes of social studies teacher candidates towards renewable energy sources are given in Table 2.

Table 2. Descriptive findings of social studies teacher candidates' attitudes towards renewable energy sources

Scale	N	X	Standard error	Standard deviation	Maximum	Minimum
Renewable Energy sources attitude level	250	3.75	0.0512	0.503	5.00	1.00

When Table 2 is examined, it is seen that the social studies teacher candidates' level of attitude towards renewable energy sources is $X = 3.75$. The findings obtained in the study show that the participants' level of attitude towards renewable energy sources is high.

In the study, the attitudes of social studies teacher candidates towards renewable energy sources were analyzed by using independent groups t-test according to the gender variable. The obtained results are given in Table 3.

Table 3. Attitude levels towards renewable energy sources and their findings on gender variable

Scale	Gender	N	X	Standard deviation	t	sd	p
Renewable Energy sources attitude Scale	Male	138	3.67	0.38	1.057	246	0.004
	Female	112	3.84	0.96			

When Table 3 is examined, it is seen that the attitudes of the participants towards renewable energy sources differ in favor of female according to the gender variable ($p < 0.05$). In the study, female social studies teacher candidates' attitudes towards renewable energy sources are higher than male teacher candidates ($X = 3.84 > X = 3.67$). This finding obtained in the study is similar to the findings of the previous study by Baydar, Ersoy and Ongun (2022). In this study, it was determined that female teacher candidates had higher environmental awareness levels than male teacher candidates. Due to the close relationship between environmental awareness and the use of renewable energy resources, it can be stated that female teacher candidates may have higher attitudes towards the use of renewable energy resources.

In the study, ANOVA findings in which the attitudes of social studies teacher candidates towards renewable energy sources were examined according to the variable of membership in environmental protection organizations are given in Table 4.

Table 4. ANOVA test of findings related to the variable of membership to environmental protection organizations of teacher candidates' attitudes towards renewable energy sources

Scale	membership in environmental protection organizations	N	X	SS	Sd	F	p
Renewable Energy sources attitude Scale	does not have any membership	142	3.35	0.42	246	2.74	0.020
	1-2 organizations	76	3.92	0.37			
	3+ organizations	32	3.98	0.39			

When Table 4 is examined, it has been determined that the attitudes of social studies teacher candidates towards renewable energy sources differ significantly according to the variable of membership in environmental protection organizations ($p = 0.020 < 0.05$). Scheffe test was used to see which group or groups favored this significant difference. The findings of the Scheffe test are given in Table 5.

Table 5. Scheffe test of findings related to the variable of membership to environmental protection organizations of teacher candidates' attitudes towards renewable energy sources

Renewable Energy sources attitude	X	Difference Between Means	p	
does not have any membership	1-2 organizations	3.92	-0.506	0.02*
	3+ organizations	3.98	-0.602	0.01*
1-2 organizations	does not have any membership	3.35	0.506	0.02*
	3+ organizations	3.98	-0.005	0.17
3+ organizations	does not have any membership	3.35	0.602	0.01*
	1-2 organizations	3.92	0.005	0.17

At the end of the Scheffe analysis conducted in the research, a significant difference was found between the participants who are members of 1-2 organizations and those who are not members of any organization, in favor of the participants who are members of 1-2 organizations ($p = 0.02 < 0.05$). At the end of the Scheffe analysis conducted in the research, a significant difference was found between the participants who are members of 3 or more organizations and

those who are not members of any organization, in favor of the participants who are members of 3 or more organizations ($p=0.01<0.05$). In line with this finding obtained in the research, it can be said that the candidates who are members of any environmental protection organization have higher attitudes towards renewable energy sources than candidates who are not members of environmental protection organizations ($X=3.92>X=3.35$ and $X=3.98>X=3.35$).

The ANOVA findings in which the attitudes of social studies teacher candidates towards renewable energy sources were examined according to the variable of participation in environmental protection activities are given in Table 6.

Table 6. ANOVA test of the findings related to the variable of participation in environmental protection activities of teacher candidates' attitudes towards renewable energy sources

Scale	Level of Participation In Environmental Protection Activities	N	X	SS	Sd	F	p
Renewable Energy sources attitude Scale	those who do not engage in any activity	85	3.07	0.51	246	3.12	0.001
	1-2 Activities	110	3.98	0.63			
	3+ Activities	55	4.20	0.58			

When Table 6 is examined, it has been determined that the attitudes of social studies teacher candidates towards renewable energy sources differ significantly according to the variable of participation in environmental protection activities ($p=0.001<0.05$). Scheffe test was used to see which group or groups supported this significant difference. The findings of the Scheffe test are given in Table 7.

Table 7. Scheffe test of findings on the variable of participation in environmental protection activities of teacher candidates' attitudes towards renewable energy sources

Renewable Energy sources attitude	X	Difference Between Means	p	
those who do not engage in any activity	1-2 Activities	3.98	-0.813	0.01*
	3+ Activities	4.20	-0.996	0.01*
1-2 Activities	those who do not engage in any activity	3.07	0.813	0.01*
	3+ Activities	4.20	-0.047	0.30
3+ Activities	those who do not engage in any activity	3.07	0.813	0.01*
	1-2 Activities	3.98	0.047	0.30

As a result of the Scheffe analysis conducted in the research, a significant difference was found between the participants who participated in 1-2 activities and those who did not participate in any environmental protection activities, in favor of the participants who participated in 1-2 environmental protection activities ($p=0.01<0.05$). As a result of the Scheffe analysis conducted in the research, a significant difference was found between the participants who participated in 3 or more environmental protection activities and those who did not participate in any environmental protection activities in favor of the participants who participated in 3 or more environmental protection activities ($p=0.01<0.05$). According to this finding reached in the

research, it can be said that social studies teacher candidates participating in environmental protection activities have higher attitudes towards renewable energy sources than those who do not participate in any environmental protection activities.

5. Discussion, conclusion, and recommendations

In this study, it was concluded that the social studies teacher candidates' attitudes towards renewable energy sources were high. Celikler and Kara (2011) aimed to determine the awareness of primary school mathematics and social studies teacher candidates about renewable energy according to various variables with their article titled "Primary school mathematics and social studies teacher candidates' awareness on renewable energy." When the awareness of teacher candidates about renewable energy sources was examined, a significant difference emerged in favor of social studies teacher candidates. This result is similar to the results of the research. Firat, Sepetcioğlu and Kiraz (2012) aimed to reveal the attitudes of pre-service teachers towards renewable energy and whether they differ according to some variables with their article titled "Examination of pre-service teachers' attitudes towards renewable energy." According to the findings, it was determined that the attitudes of teacher candidates towards renewable energy vary on the basis of department, gender, class and environmental education they received at the university. In general, the attitudes of teacher candidates towards renewable energy sources are positive. These results are similar to the results of the research.

In the study, the level of attitudes of social studies teacher candidates towards renewable energy sources was examined according to the gender variable. It was concluded that female teacher candidates' attitudes towards renewable energy sources differ significantly compared to male teacher candidates. Bilen, Özel, and Sürücü (2013) aimed to examine the attitudes of pre-service teachers towards renewable energy with their article titled "Attitudes of pre-service science teachers towards renewable energy." In the study, it was determined that there was no significant difference according to the gender variable. Similarly, Bozdogan and Yigit (2014), in their article titled "Examination of pre-service teachers' views on alternative energy sources in terms of different variables," found that there was no significant difference between the concepts that prospective teachers put forward about renewable energy and the gender variable. These results contradict with the research results. Firat, Sepetcioğlu, and Kiraz (2012) concluded in their study that teacher candidates' attitudes towards renewable energy differ significantly in favor of female candidates according to the gender variable. This result is similar to the results of the research.

In the study, it was concluded that the attitudes of social studies teacher candidates towards renewable energy sources differed significantly according to the variable of having membership in environmental organizations. It has been concluded that social studies teacher candidates who are members of at least 1 environmental protection organization have a higher level of attitudes towards renewable energy sources than candidates who are not members of any environmental protection organization. In the study, it was determined that the attitudes of social studies teacher candidates towards renewable energy sources differed significantly according to the variable of participation in environmental protection activities. It was concluded that the pre-service teachers who did not participate in any environmental protection activities had lower attitudes towards renewable energy sources than the pre-service teachers who participated in at least one environmental protection activity.

In this study, the attitudes of social studies teacher candidates towards renewable energy sources were examined in terms of various variables. In line with the results obtained in the study, the opinions of teacher candidates on renewable energy sources can be the subject of further studies. Educational courses can be given in authorized institutions for teacher training for renewable energy sources. Environmental protection organizations for renewable energy

sources can be promoted by teacher candidates. Participation of teacher candidates in environmental protection activities for renewable energy sources can be supported.

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Soft Skills and Competence Education in Promoting the Twenty-First Century Philosophy of Life

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Abstract

The present paper aims to explore the construct and effects of soft and transversal skills to developing efficiently competent students. The methodological construct of the present study is a mixed one. The study design is probabilistic and the method used in it is of the transversal typology. The final answers were collected in a sample cohort of 500 valid responses in three years of undergraduate studies at the Mediterranean University of Albania with a gender distribution of 335 girls (67%) and 165 boys (33%). The results revealed that the sub-tests with the major significant indices were positive attitude and spirit of initiative ($r=.567$; $p<0.05$), teamwork and collaboration ($r=.601$; $p<0.05$), and communication channels ($r=.81$; $p<0.05$). Pearson inter-correlations indices for the 1st and 2nd factor of the soft-skills sub-skills found that the most significant index is related to the sense of motivation axis (optimism and control of the future, legitimate anger, self-esteem, and self-efficacy) (Sig2. $p=0.01<0.05$, $r=.7054$) over the communication resources (persuasion, adversity management, and creativity) (Sig2. $p=0.01<0.05$, $r=.504$). ANOVA test indices showed a strong difference in females ($F=1.874$; $MS=3.2003$; $df=1.5$) and an inverse but the stable difference between the male gender and optimism for the future ($F=1.3085$; $MS=-1.111$; $df=1.5$). In conclusion, indices of the current work revealed the impact that a healthy and optimistic motivation cause on the willingness of learning new skills and competencies and developing an efficient student for the working world. The authors recommend drawing attention to conducting more training programs within the academic curricula for fostering and providing students with basic and advanced skills and competencies to be fully adjusted to the European Union philosophy of life and employability world.

Keywords: soft skills, competencies, motivation, communication, employability.

1. Introduction

In recent decades, the term competence has been given numerous meanings (Leon et al., 2017; Quendler et al., 2013; Cazden, 2011; Mewton et al., 2009; Bubas, 2001). In addition to the semantic disquisition, it is necessary to clarify the meaning of competence unambiguously, as in the last two decades it often also appears in legislative documents and ministerial procedures intended for schools and universities. Etymologically speaking, *competing* means “tending to meet at one point is in a figurative sense” and, figuratively, it can refer to the Latin *Cum* (with) and *Petere* (to head towards but also to seek). It is in the twentieth century that the word competence appears repeatedly and in two specific contexts, sometimes assuming different meanings: (1)

competent in the workplace is someone who acts as an expert in a specific field, and (2) *competent* in the educational field which describes the person who solves a problem by adopting the best solution or performs a task by mobilizing different skills. The educational field uses the term “knowledge” to mean the abstract representation of facts, procedures, principles, and theories in a particular domain or sector, information drawn from observations, experiences, beliefs, and prejudices in any sector of life (Cresswell, 2021). But knowledge is not to be confused with “understanding”. Reproducing information does not necessarily imply understanding it. Knowledge refers to entities that can be stored and recalled from memory, skills, or cognitive abilities and are associated with mental processes that manage it. Cognitive skills are the mental activities that occur in the brain as we use, transform, or increase available knowledge. These skills are often associated with high-level cognitive activities such as problem-solving, reasoning, thinking, and the ability to draw conclusions and include the ability to analyze, synthesize and evaluate aimed at reproducing or extending existing cognitive structures (Marziano & Kendall, 2007). As Noam Chomsky argued in 1965, competence consists of a set of rules governing behavior, or, more specifically, of a set of observable acts grouped into useful actions (Chomsky, 1965). Behavior is not just the response to a stimulus, but an action functional to a result. The activation of competence includes knowledge, know-how, and attitudes. In the same line are considered the observable behaviors that must be easily describable by an external observer, who, in turn, should be able to express them with an infinitive verb (e.g., calculate, add, break down, summarize, etc.). By comparing the performances related to the individual observable behaviors, the “best performance” among the many possible ones is sought. It is considered “competent” in this sense, the one who, given a performance that corresponds to an observable behavior set as a goal, performs it in the shortest possible time, with the least number of errors. While performance is the same for everyone, competence depends on the speed and precision with which it is performed. Constructivist and philosophical scholars open the path to a new form of education based on competencies (Competency-based Education) that conceived competence as *expertise and experience*, or rather “mastery of the concrete” in which the subject mobilizes all his resources (motivations, knowledge, skills) to face and solve continuously emerging problems in a versatile and flexible way by using “authentic tasks” and real-life learning environments (Anderson, 2018; Rivers et al., 2019; Henrich, 2016; Rainwater, 2016; Gruppen et al., 2016). Constructivist authors believed that knowledge does not exist independently of the subject in training, but results from the relationship between an active subject and reality. Knowledge is therefore a subjective construction starting from a personal reworking of sensations, knowledge, beliefs, and emotions. Perception, thought, learning, reasoning, problem-solving, attention, language, and emotions are structures that process input data by providing output information (Nordin, 2011; Bakracevic et al., 2010). As stated in the purpose of the present work, we will try to highlight the significance of mapping the diversity of soft skills and competencies with which students can achieve goals in the working world.

2. Competences and soft skills

Skills are generally macro-categories into, basic, transversal, and professional technical skills.

The basic skills, as commonly known today, are the “key competencies” that the citizen and the worker need to be employed. Nowadays these skills have a much stronger and more decisive impact on life and social and professional integration projects than a few decades ago (Robles, 2012). The European Commission has given the following definition of key competencies: *“The key competencies constitute transferable and multipurpose baggage of knowledge, know-how, and dispositions, which are necessary for completeness and personal development, for inclusion in social and civil life and everyone’s employment. They are assumed to be acquired at*

the end of the compulsory training period and to form the foundation of lifelong education and training” (Council recommendation ..., 2018).

Not only did the EC define these skills, but it expressly felt the need to update them in 2021, considering technological developments and the labor market. This update, although not substantial, after only 12 years after the first definition, made the Commission reflect on the fast change in the current thinking and work context of people’s life.

The second macro-category concerns transversal skills or soft skills. OECD defines this kind of skill as: *a set of broad-based skills which are involved in numerous types of tasks, from the most elementary to the most complex, and which are carried out in situations that are different from each other and therefore broadly generalizable (2015).*

In general, it can be said that transversal skills refer to fundamental operations and activities of any subject, placed in front of a task that is not necessarily working. One of the peculiarities of soft skills is their presence in all the life experiences of the subject. Another peculiarity is the transferability in different tasks and contexts, therefore usable on a wide range. Yet, they cannot be “taught”, but are developed by the subject, mostly in an experiential context.

A definitive list of soft skills has not yet been compiled, and will probably never see the light of day, but some European studies and projects have identified a certainly interesting number.

In the European Strategy for Employment 2021-2030 (Rodriguez Contreras & Sanz, 2022), the Commission is placing skills at the heart of the EU policy agenda, steering investment in people and their skills for a sustainable recovery. Businesses need workers with the appropriate skills to master the green and digital transitions, and people need to get the right education and training to be adjusted to the new life work.

The aim of the Strategy is to ensure that the right to training and lifelong learning, as stated in the European Pillar of Social Rights (<https://ec.europa.eu/social/main.jsp?catId=1226>), becomes a reality all across Europe, from cities to remote and rural areas to the benefit of everyone.

Thus, the European Skills Agenda was built on 12 actions to improve the importance of skills in the EU to strengthen sustainable competitiveness:

(1) *Pact for Skills* – The Pact will mobilize a concerted effort for quality investment in skills for all working-age people across the Union. The Pact for Skills will bring together all stakeholders, private and public, which share the objective of up and reskilling Europe’s workforce to enable people to participate in the twin transitions. All these stakeholders will sign a *Charter*, which will define the key principles that are essential to up and reskill the workforce, within their organizations but also across their value chain or ecosystem (anti-discrimination and gender considerations). The Pact will facilitate public-private cooperation. It will set up *large-scale partnerships*, including at the regional level, in strategic industrial ecosystems and priority areas identified in the European Green Deal to achieve ambitious commitments. These partnerships will involve all stakeholders, notably SMEs who struggle with access to skills. Stakeholders will be encouraged to pool expertise, resources (EU Industrial Strategy, 2020), and funding towards concrete up- and reskilling actions with clear commitments that will allow people to keep, change, or find new jobs. The Pact will also *facilitate access to information on EU funding* instruments for skills by offering a single-entry point at the EU level.

(2) *Strengthening skills intelligence* – using big data analysis of job vacancies and making it widely available so it will be possible to acquire online information “in real time” on the demand for skills. To strengthen and disseminate skills Intelligence, the Commission will support the development of new and deepened skills intelligence, including at regional and sectoral levels. The Commission will also promote the

participation of social partners in labor market projections and the identification of training needs to develop skills intelligence. The Commission will Encourage the use of skills intelligence by the public and private employment services and, encourage the public employment services (PES) network to promote the early identification of skills shortages and trends linked to growing job opportunities, including to better draw on the potential of intra-EU mobility and migration from third countries. It will also present skills intelligence information tailored to individuals' needs in Europass, the EU platform for people to manage their learning and careers. This will assist individuals in their study, training, and work choices, and help counselors and mentors, inter alia in Public Employment Services.

(3) *EU support for strategic national upskilling action* – working with Member States on modern and comprehensive national skills strategies and joining forces with national public employment agencies to achieve this. The Commission will support all Member States to prepare holistic, whole-of-government national skills strategies. This will build on the work already done with the OECD in 11 Member States as well as on other existing skills strategies at the Member State level. The Commission will support the establishment or review of strategies where needed and help monitor progress in implementing them. The Commission will encourage the breaking of gender and other discriminatory stereotypes. It will put a particular focus on the importance of transversal and entrepreneurial skills as well as skills to accompany the digital and green transitions such as those delivered through Science, Technology, engineering, and Mathematics (STEM) studies.

(4) *Future-proof vocational education and training (VET)* – taking a fresh approach to making vocational education and training more modern, attractive for all learners, and flexible and fit for the digital age and green transition.

(5) *Rolling out the European Universities Initiative and up-skilling scientists* – building long-term transnational alliances between higher education institutions throughout Europe and developing a core set of skills for researchers.

(6) *Skills to support the green and digital transitions* – developing a set of core green skills, statistical monitoring of the greening of our workplaces, and boosting digital skills through a Digital Education Action Plan and ICT jump-start training courses.

(7) *Increasing STEM graduates, fostering entrepreneurial and transversal skills* – encouraging young people, especially women, into Science, Technology, Engineering, and Mathematics. The EU's Skills Agenda also aims to strengthen support for entrepreneurs and the acquisition of transversal skills such as cooperation and critical thinking.

(8) *Skills for life* – supporting young people and adult learning on issues such as media literacy, civic competencies, and financial, environmental, and health literacy.

(9) *Initiative on individual learning accounts* – it will explore if and how portable and quality-checked training entitlements could help stimulate lifelong learning for all.

(10) *A European approach to micro-credentials* – training courses are becoming shorter and more targeted and are often online. European standards that should help recognize the results of such training will be created.

(11) *New Europass platform* – the Europass platform was completely renewed and today it offers online tools and guidance on CV writing, suggests tailored jobs and learning opportunities, provides information for job seekers, available in 29 languages.

(12) *Improving the enabling framework to unlock investment* – a key element of the skills Agenda is the much-boosted EU budget to catalyze Member States and private actors to invest in skills.

The EU will work on improving transparency around skills investment and explore novel financing mechanisms, placing a particular emphasis on the need to invest in skills as a key priority to foster the EU's recovery and prepare European workers and citizens for the green transition and digital transformation.

Table 1. Soft-skills classification according to the EU Strategy of Employment

Social	Methodological	Personal
Communication	Creativity/Innovation	Learning
Orientation of customer/user	Decision-making	Engagement
Teamworking	Analysis	Professional ethics
Leadership	Management	Tolerance to stress
Negotiation	Adaptability	Self-awareness
Mediation	Object-oriented	Personal equilibrium
Networking	Continuous improvement	Cultural adaption
	Research and management of information	

3. Factors that influence the development of skills and competences

Scholars deduced some considerations regarding the impact and value that lifelong learning in general, and schools and universities *in primis*, can provide to the employability of human capital (Ahmad & Ahmad, 2020; Succi & Canovi, 2019; Fernandez & Liu, 2019; Kotzab, 2018).

Three phenomena interpenetrate and influence each other:

- *Uncertain and rapidly changing future*: in the last decade, the world of work and business has profoundly changed, with both destabilizing and rapidly evolving factors having entered heavily. The acronym VUCA has even been coined to define these times: Volatility – Uncertainty – Complexity – Ambiguity (Taskan et al., 2022).
- *Centrality of human capital*: the growing digitization of production and sales processes, from Industry 4.0 to digital marketing has indeed marked the importance of technology, but also the centrality of the human resource that must govern these processes (Kert et al., 2020).
- *Training & Updating*: workers are constantly updated in making use of technologies, quickly and continuously, to the world of work so they can be trained in detail in the necessary technologies, basing specific training on solid cultural foundations, i.e., both knowledge and skills (Viviers et al., 2016).

The effectiveness of the training, therefore, becomes an essential factor in quickly achieving the result. In this area, however, it is necessary to note a clear separation between company training and institutional training. While corporate training, mostly provided by specialized companies and consultants, must deal with both the effectiveness required by the client (the client company) and with foreign competitors, institutional training has rarely set up its activities focusing on the immediate effects of the result (moreover not easily measurable).

If universities and higher education institutions were also committed to enhancing the emotional and social skills of students, companies, and society would derive a huge economic advantage (Krishnaveni & Monica, 2018; Nordin, 2011; Cherniss & Goleman, 1998). It should be noted here that learning a transversal skill is different from learning a cognitive skill. Two

different areas of the brain are involved in each of them: the *libidinal system* and *amygdala* for the former and the *neocortex* for the latter. While hard skills are based in the rational area of the brain, where learning takes place through listening or reading and therefore in extremely rapid times new knowledge is added to the already existing memory; soft skills also require the involvement of emotional centers located deep in the center of the brain, where social and emotional habits are located. These skills require time and constant exercise to be transformed and improved (Goleman et al., 2013). Training related to the technical part of a job is easy to learn, just add new data to the old, but much more difficult is to change behavior habits and learn to be flexible, work in a team, be conscientious, and skilled in interpersonal relationships (Goleman, 2006). Emotional learning requires a deeper change at a neurological level, through the weakening of the pre-existing habit and subsequently its replacement with a better one. This process requires considerable effort and greater timing, but the increase in knowledge obtained occurs within the individual (ibidem). Students must be supported in the implementation of a process of intentional change that allows them to achieve their professional future and develop their own identity (Viviers et al., 2016). Understanding the distinction of the brain areas involved in the learning processes of the two types of skills is essential for understanding the most effective method to use in teaching Transversal skills and Emotional Intelligence. Scholars distinguish three teaching methods through which the development of skills can take place: (1) *Learning by absorbing*: learning takes place passively, through frontal lessons where a set of theoretical concepts are presented to the students, (2) *Learning by doing* is based on the same idea where experiential methods are used such as laboratory activities, field research, and simulations often carried out individually, where there is greater involvement of the student, and (3) *Learning by interacting with others*: participants learn and acquire knowledge through interaction and sharing experiences with others (Chowdhury & Miah, 2016). Based on these three ways of learning, various tools are used to increase the possession of skills, but for the focus of the present work, we will describe only the main ones. Classroom lessons are the quintessential tool used for the transmission of knowledge, but they can be effective in developing competence only if the professor manages to get the students to participate actively through debate and comparison. This favors the recognition of one's abilities which is one of the fundamental elements of the process of change and development of competencies, it is itself a competence (Goleman, 2006). The exercises are a method used to develop problem-solving instead, where, for example, it is proposed to solve a working problem, using specific skills (Rigio & Saggi, 2015). Like exercises, there are simulations, which have the purpose of making people reproduce certain behaviors, in a precise work situation, used both for measuring and developing emotional stability, they favor the learning of decision-making skills in critical situations, resistance to stress, organization and planning, delegation and control. Coaching, mentoring, and counseling are tools that can be used directly in the workplace, both at an individual and group level, to improve performance in terms of effectiveness and efficiency, increase company well-being, increase motivation, and encourage communication. Learning within a group allows the student to develop numerous social and relational skills such as empathy, self-control, conflict management, and especially leadership (Charoensap-Kelly et al., 2015).

4. Life skills education

The term Life Skills is used to denote skills that allow individuals to challenge the needs and changes of daily life. The World Health Organization (WHO, 1993) suggested that social skills and critical thinking that may be considered essential for promoting healthy habits and competencies in the youth include:

- (a) *Decision-making*, the ability to actively decide and evaluate the possible alternatives and the consequences of each of them;

- (b) *Problem-solving*, the ability to face and constructively solve the problems of everyday life;
- (c) *Encouraging critical thinking*, through the ability to objectively analyze information and situations by critically evaluating various influencing factors;
- (d) *Encouraging creative thinking* through the ability to find original solutions and respond appropriately and flexibly to everyday life situations;
- (e) *Promoting effective communication* through the ability to express oneself well towards situations and interlocutors both verbally and non-verbally;
- (f) Encouraging the *development of interpersonal relationships* through the ability to create and maintain positive relationships in the family environment and beyond and to receive emotional support;
- (g) *Self-awareness* through the ability to know oneself, one's personality, and one's strengths and weaknesses;
- (h) *Empathy* through the ability to feel and understand someone else's life, needs, and feelings;
- (i) *Emotional management* through the ability to recognize the emotions of oneself and others and to respond to them appropriately;
- (j) *Stress management* through the ability to identify tension mood and understand the effects it creates to consistently adjust.

5. The present research. Method. Purpose

The purpose of the current study is to explore the role and manifestations of soft skills and competencies in the overall development of undergraduate students in Albania.

Research administration

To evaluate the development of transversal skills following participation in activities falling within the university-work alternation (in short ASL and now "paths for transversal skills and orientation" - PCTO), it was decided to propose a questionnaire highlighting some soft skills, delivered to students in two steps: before and after participation in the ASL experience.

As far as the reference target is concerned, students in the 3rd year undergraduate have been opted for who usually begin the ASL course in the 2nd quarter or the five months with simulation activities or visits, eventually concluding it with an external experience between May and the end of lessons.

The transversal skills considered to be assessed in the present work include:

- Positive attitude and spirit of initiative;
- Communication;
- Teamwork and collaboration,
- Problem-solving and critical thinking;
- Creativity and innovation.

Objectives

To meet the main purpose of the study, two main objectives were set:

Objective 1: To explore the role that soft skills play in the improvement of competencies of undergraduate students.

Objective 2: To identify statistically and clinically significant differences of representative profiles between sexes and the role of gender in competencies diversity.

Research hypotheses

For analyzing the data of the current study, two hypotheses have been raised as follows:

H₁ = Soft-skills development plays a specific role in raising awareness and empowerment of undergraduate students for their future work.

H₂ = Gender differences have a clinically significant impact on establishing the profile of an efficient and competent student.

6. Materials and procedures

This is a transversal type of research that uses non-random sampling within random to research the social and epistemological experiences and interactions of the target population. The research method is mixed, with quantitative data collected from the questionnaire conducted with the preliminary data and the pilot stage of testing as well as with qualitative data of the study stage that are based on the micro-analysis of quantitative data. Quantitative data processing was performed with SPSS v.27 software while correlative and interpretive analysis in MAXQDA. The content analysis described in the present study was analyzed through SPSS v.27 statistical programs and functional analysis of MAXQDA models.

7. Research design

The study was divided into two stages: the pilot and the research stage. To create the validity and reliability of the questionnaire in the context of the university, we applied a pilot test with 120 students aged 19 years in the first-year undergraduate program of the Mediterranean University of Albania. The participants of the pilot stage were selected according to access and ease of physical contact, a selection in line with the technique according to which the sample can be selected from the nearest population or easy to access. 70% of the participants in the pilot stage were female (70) and 30% were male (30).

8. Sample

In the research stage, the sample consisted of 500 student participants to reach a more representative distribution. Participants had equal distribution between undergraduate programs. 335 girls (67%) and 165 boys (33%). The selection of subjects was random (random) in all the undergraduate programs of the Mediterranean University of Albania. The aim was to collect the most representative data to analyze reliable results and interpret an overall picture within the accepted time and subjective approaches. The questionnaire was submitted for the first time between the end of November 2022 and February 2023 and subsequently between March and April 2023. The administration mode was online and varied from 1 to 2 weeks.

9. Instruments

In the second phase, we created a *Guide to research activities* based on the data from the pilot phase.

(1) *Demographic data questionnaire*. This questionnaire, created by the authors, was intended to collect data related to gender, age, level of education, marital status, place of residence, familiarity with the concepts of “soft skills” and “competencies”, the perception of a successful person in his or her community, the perception, and attitude of people towards competencies that university provide to students. Demographic data did not include personal data such as Name and Surname; they were coded according to the procedures approved by the EU Personal Rights Protection Law of 2018 and the subsequent quantitative and qualitative analyzes were carried out based on these codifications.

(2) Questionnaire of assessment of skills for employability. This box was developed by the authors with a questionnaire with a mix of evaluation of soft skills and sub-skills suitable for self-assessment as referred by the EU Employment Strategy.

Sub-test of Communication skills. Communication skills refer to the ability to convey effective messages to external audiences, both orally and in written form. As amply demonstrated, communication skills are fundamental in the employability of young and old because effective communication is the basis for persuasion, negotiation, and leadership (Kaburise,2016).

Persuasion skills. The negotiation and persuasion sub-competence is a fundamental component of the communication skill and refers to the ability to convince others of one’s point of view. The questions relating to persuasiveness for the present questionnaire box were taken from the evaluation scale proposed by Kyndt and Baert (2015). The scale ranges from 1 (low presence of competence) to 6 (high presence of competence).

Ability to interact with others. The sub-competence suitable for a self-assessment relates to interaction, tested according to the scale of Rubin and Martin (1994). The scale goes from 1 (low presence of competence) to 5 (high presence of competence).

Sub-test for assessing creativity and innovation. Creativity and innovation have been highlighted as extremely relevant areas of entrepreneurial and social engagement (Moberg et al., 2013). Creativity includes developing new ideas to create value, including better solutions to existing challenges; innovation concerns those processes concerning the introduction and application of new or improved ideas, processes, products, or procedures (West, 2002). Creativity and lateral thinking competency refer to solving problems through an indirect and creative approach, using reasoning that is not immediately obvious and involving ideas that may not be achievable using traditional step-by-step or linear logic alone (Malinin, 2018). The sub-competence is suitable for a self-assessment is related to the resolution of creative problems, tested according to the scale of Morris et al. (2013). The scale goes from 1 (low presence of competence) to 5 (high presence of competence).

10. Ethical issues

For conducting the current study with human subjects, the working group took care to respect the research criteria of the Declaration of Helsinki and the following observance of ethical aspects such as:

- *Approved consent and allowance of subjects*. Through the platform in which the questionnaires were completed, a detailed description was presented regarding the purpose, conditions, and method of the study that would be used, as well as what their assistance consisted of. Participants were made aware of the voluntary nature of participating in the study and the possibility of withdrawing from the study if they did not wish to participate.
- *Maintaining the confidentiality and anonymity of participants* under which the authors, the student’s coordinator, and the Research Office informed about the treatment of personal data of juveniles and that the data collected would be used only

for research purposes respecting the principle of anonymity and confidentiality under the Data Privacy Protection Rule.

11. Results

Statistical and correlational data, not presented in this article, revealed that the sub-tests with the major significant indices were positive attitude and spirit of initiative ($r=.567$; $p<0.05$), teamwork and collaboration ($r=.601$; $p<0.05$) and communication channels ($r=.81$; $p<0.05$). A significant but inverse correlation was revealed for the sense of power ($r=-.76$; $p<0.05$) and adversity management ($r=-.74$; $p<0.05$). These indices reveal that under a task demand, students are more likely to perform with a positive attitude, use good communication modes, and are prone to collaboration. Nevertheless, when the demands increase, students tend to show their sense of power and have issues in managing adversity, thus, decreasing their subtle communication form and soft skills. For the factorial analysis, all components that were not below the limit 0,4 that we have decided as significant were submitted for further analysis in the second stage. Pearson inter-correlations indices, not presented in the present paper, for the 1st and 2nd factor of the soft-skills sub-skills found that the most significant index is related to the sense of motivation axis (optimism and control of the future, legitimate anger, self-esteem, and self-efficacy) (Sig2. $p=0.01<0.05$, $r=.7054$) over the communication resources (persuasion, adversity management, and creativity) (Sig2. $p=0.01<0.05$, $r=.504$). Both the Kaiser criterion and the Scree-test highlighted the presence of two main dimensions which, in the initial solution, reproduced altogether almost 70% of the total variability. It was therefore decided to extract two dimensions and to use the Oblimin rotation. After the rotation, the variance reproduced overall by the two components amounted to almost 70%; the first dimension (motivation axis) explained 52%, and the second (communication resources) accounted for 48% of the overall weight.

Table 2. Descriptive statistics of soft-skills sub-scales before and after the rotation

Soft skills by sub-categories		Before				
		Low	High	Median		Difference/median
1	- optimism and control of the future	4	1	2.5	2.08	14%
		4	1	2.5	2.20	14.5%
	- legitimate anger	4	1	2.5	1.99	25%
2	- self-esteem and self-efficacy					
	- sense of power or helplessness	4	1	2.5	3	-2.5%
		1	6	3.4	4	22%
3	- perseverance					
	- adversity management	1	6	3.4	4.1	19%
4	- persuasion	1	6	3.4	4.1	18%
5	- interaction	1	5	4	3.7	21%
6	- creativity	1	5	3	3.8	19%
Recognizing opportunities						

To understand whether there is a difference in distinguishing students in their involvement in soft-skills usage, we performed the multivariate analysis of MANOVA and discriminant function analysis. Results showed that female students have a significant potential for social interaction, optimism for the future, and a sense of power ($\alpha = , 0413$; $\eta^2 p = , 701$) compared to males.

Table 3. Descriptive analysis of the first rotated dimension

	Gender	Motivation Axis
Valid	500	500
Missing	0	0
Mean	1.500	1.050
Std. Deviation	0.503	0.750
Minimum	1.000	1.000
Maximum	3.000	3.000

Of the descriptive indices of the Motivation axis, the mean ranges are in line with the general gender distribution ($M=1.500$) while the standard deviation indices show a discrete but sufficient cohort distribution for further processing ($SD=0.750$). The chi-square test showed a positive and stable value in the calculation $X^2=11.367$ for $p<.001$. To understand the influence of gender and displaying competencies, we performed the ANOVA test. The indices showed a strong difference in females ($F=1.874$; $MS=3.2003$; $df=1.5$) and an inverse but the stable difference between the male gender and optimism for the future ($F=1.3085$; $MS=-1.111$; $df= 1.5$). This means that women have shown a stronger tendency to use efficiently soft skills under task performance than men.

12. Discussion

The theoretical framework of the present paper relates to the development of soft skills and their impact on empowering students' life skills in the world outside the university. These concepts also include the exploration of factors, mutual influences, and dynamics that are based on skills and competencies. The studies cited in the paper have explored some of these models and tried to give a comprehensive review of different views of the connection between soft skills and human capital (Succi & Canova, 2019; Krishnaveni & Monica, 2018; Malinin, 2018; Leon et al., 2017; Viviers et al., 2016; Hsin & Xie, 2016; Riggio & Saggi, 2015). Results of the current study revealed that the sub-tests with the major significant indices were positive attitude and spirit of initiative ($r=.567$; $p<0.05$), teamwork and collaboration ($r=.601$; $p<0.05$), and communication channels ($r=.81$; $p<0.05$). Of the descriptive indices of the Motivation axis, the mean ranges are in line with the general gender distribution ($M=1.500$) while the standard deviation indices show a discrete but sufficient cohort distribution for further processing ($SD=0.750$). A significant but inverse correlation was revealed for the sense of power ($r=-.76$; $p<0.05$) and adversity management ($r=-.74$; $p<0.05$). Pearson inter-correlations indices, for the 1st and 2nd factor of the soft-skills sub-skills found that the most significant index is related to the sense of motivation axis (optimism and control of the future, legitimate anger, self-esteem, and self-efficacy) (Sig2. $p=0.01<0.05$, $r=.7054$) over the communication resources (persuasion, adversity management, and creativity) (Sig2. $p=0.01<0.05$, $r=.504$). The chi-square test showed a positive and stable value in the calculation $X^2 = 11.367$ for $p<.001$. Results of MANOVA and discriminant function analysis showed that female students have a significant potential for social interaction, optimism for the future, and a sense of power ($\alpha=.0413$; $\eta^2 p=.701$) compared to males. ANOVA test indices showed a strong difference in females ($F=1.874$; $MS=3.2003$; $df=1.5$) and an inverse but the stable difference between the male gender and optimism for the future ($F=1.3085$; $MS=-1.111$; $df=1.5$). All supportive studies in line with this work results have shown that people who have a high degree of transversal skills and competencies development are more satisfied with life, motivated to be engaged in the future, and exhibit fewer behavioral issues (Ahmad et al., 2020; Krishnaveni & Monica, 2018; Viviers et al., 2016; Charoensap-Kelly et al., 2015; Morris et al., 2013).

13. Conclusion

The current work has generally contributed to the exploration and deepening of knowledge on educating soft and life skills students, as a prelude to their future employability.

The results of the present work revealed a statistically significant social impact on motivation and future perception in highlighting the way students get engaged in interactions and involve in social dynamics. What was pointed out by the present work is the significance of identifying employability motives and social capital resources to develop the right soft skills and competencies. It is also of significant influence on the usage of the mixed sub-scales that can provide interesting data either on the site when the data are collected or in orienting students toward the world of work.

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Student Opinions of Humor in Educational Communication

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Abstract

The purpose of this paper is to investigate the opinions of primary school and high school students regarding the role of humor as a practice in the management of educational communication on the part of the teacher. More specifically, it is investigated whether and to what extent humor affects the students' behavior towards the teacher, the educational process as well as their personality. First, a theoretical approach to the subject is made, in order to highlight the idea that teacher-student pedagogical communication is considered to be the most lively and dynamic part of the educational process, because through it all the messages that signal action, attitude and, in general, teacher's behavior is conveyed. This means that the form of communication chosen by the teacher, either consciously or unconsciously, affects not only his relationship with the student, but also the content and the result of the educational processes. In this case, we have chosen humor as a pedagogical communication practice, given that the research data identify it as an important, effective means between the teacher and the students, the effect of which is particularly beneficial for the educational process, the classroom climate and the relationship between the teacher and the students as well as for the student himself. To implement the purpose of the research, a questionnaire with closed-ended questions was created, which was distributed to primary school and high school students in the first ten days of May 2023 in the city of Ioannina. The findings of the research are considered particularly interesting confirming the majority of the theoretical data that preceded it. The paper ends with conclusions and final remarks.

Keywords: humor, educational communication, student opinions.

1. Introduction

Social communication presents particular research interest from a pedagogical point of view, given that it is the core of every social relationship, influencing its content. In particular, pedagogical communication among teacher and students is considered the most lively and dynamic part of the educational process, because through it all the messages marking the action, the attitude and, in general, the behavior closely connected with the teachers' role are conveyed. In this sense, every action of the protagonist of the communication processes at school, i.e., the teacher, transmits messages with specified or undefined interpretations, which determine not only the type of communication, but, to a significant extent, the attitude of the receiver of the messages in the educational school activities and, therefore, his general behavior and, of course, the formation of his personality. The teacher knows, or at least should know, from a pedagogic point of view, that the form of communication he chooses, consciously or unconsciously, affects and

determines not only his relationship with the student, but also the content and the result of the educational processes.

Specifically, pedagogical communication is a key feature of pedagogical interaction consisting of all the practices -speech and action- of teachers and students in the context of the pedagogical relationship. Pedagogical communication between participants in school life is achieved through the use of symbols, which are signified in social reality. Because language is a vast system of symbols, it is also, therefore, the basis of communication. As a meaningful process, it encompasses mechanisms for encoding and decoding messages through symbols (Brunner & Huber, 1989; Konstantinou, 2015).

Every communication is defined by two dimensions: the relationship and the content. Where two people communicate, there is the corresponding social relationship, in the context of which the communication unfolds. This communicative relationship is the interpretive key to understanding the second dimension, i.e., content, which concerns the information (knowledge) containing more than one messages. These messages, which may be clear or implied, verbal or non-verbal, concern the content of the education and are mainly sent out by the teacher. When, therefore, for a specific or non-specific reason, the teacher-student communication relationship is disrupted, e.g., due to the ironic attitude of the first, then, despite the fact that the teacher is considered an expert in his subject, there usually follows a rejection of the content of the teaching, i.e., of the education (knowledge, ideas, messages) and, consequently, of the teacher himself (Hobmair u.a, 2002; Konstantinou, 2015; Watzlawick, Beavin & Jackson, 1969).

2. The role of humor in educational communication

The type of practice used by the teacher in his pedagogical communication with the students affects not only the relationship between them but also the content of the teaching, learning and, in general, the educational process. In this case, we have chosen humor as a pedagogical communication practice, given that the research data identifies it as a very important, beneficial and effective medium between the teacher and the students. It is a communicative tool that applies to all aspects of everyday life, inside and outside the school (Chaniotakis, 2011; Konstantinou, 2003).

In a more meaningful approach, humor is defined as “the perception of things and life from their funny and comic side, as well as the expression of this aspect both in (one’s) oral and written speech in a clever, witty way” (Babinotis, 2005: 1952-53). According to a shorter definition with positive characteristics, “humor is a special form of communication that aims to provoke laughter” (Chaniotakis, 2011: 31). In a somehow different formulation, the concept of humor “means the teacher’s ability to deal with the child’s concerns and distresses from a position of power”, i.e., detached and without identifying emotionally with the child (Bollnow, 1964, as. ref. Chaniotakis, 2011: 32). This means that humor management involves both mental processes for creating, perceiving and understanding a joke, and emotional reactions to it (e.g., laughing, smiling). Thus, positive or friendly humor can, among other things, turn even negative emotions into positive ones (Martin & Ford, 2018).

However, there is also negative or aggressive or self-deprecating or “black” humor, which includes derogatory elements of another person’s personality, such as sarcasm, irony, mockery, nationalistic, racial or cultural jokes, and sexual innuendos. This type of humor can cause pain, anxiety, hostility, feelings of shame and lowered self-esteem in one’s personality. Also, the research data highlights the negative impact it has on learning, when the teacher uses this particular form of humor in the educational process. Therefore, this type of humor is, obviously, unsuitable as a means of communication either in everyday social relations or, even more, in

pedagogical relations between teacher and students (Chabeli, 2008; Chaniotakis, 2011; Papadopoulou, 2020).

Based on the above, it becomes clear that humor as a concept includes both emotional and cognitive characteristics. According to this, the teacher can effectively manage a problematic situation in the classroom, such as a student's misbehavior or stress in an examination process using positive or friendly humor, as a pedagogical practice that causes laughter. Consequently, the effect of positive humor, from its pedagogical perspective, is particularly beneficial for the educational process, the classroom climate and the relationship between the teacher and the students, as well as for the student himself. Specifically, it favors social interaction and relationships between the teacher and students, but also between students, encourages school learning, especially for children with learning difficulties, enhances students' performance and self-esteem, frees students' ability to express themselves, creates feelings of pleasure, relieves and softens moments of tension and anxiety, while, at the same time, it cultivates the important social skill and attitude of managing everyday issues. Also, the frequent use of humor as a practice by the teacher forms conditions for promoting the creative and critical ability, as well as the emotional intelligence of the student (Askildson, 2005; Chabeli, 2008; Chaniotakis, 2011; Papadopoulou, 2020).

These positive elements of pedagogical communication contribute to limiting behavior problems and strengthening good mood and good relations between the teacher and the students, but also between the students themselves. Additionally, positive humor can also be used as a means of de-escalating a student's unruly or aggressive behavior. Moreover, humor as a pedagogical practice affects the educational process in two indirect ways. The first is to stimulate and maintain students' interest in the educational process. In this case, the use of humor during the teaching process is considered particularly important, since it encourages students who feel boredom, tediousness, insufficiency, or have some learning difficulty to better understand the lesson and show increased performance in school tests. The second way is the positive effect on the school climate and social interaction in the classroom. In this sense, these two factors ensure the smooth operation of the educational process, promote the pedagogical content and contribute significantly to the development of desirable behavior practices and, overall, the student's personality (Chaniotakis, 2011; Deneire, 1995; Kontogiannis & Krokou, 2020; Konstantinou, 2015; Papadopoulou, 2020).

In conclusion, positive or friendly humor is considered, from a pedagogical point of view, an important component of a successful practice in the educational process as well as in everyday life, as long as it is used in an appropriate pedagogical way, taking into account the prevailing conditions and the peculiarities of the students, in order to be easily understood and to bring about the desirable result. This fact is also confirmed by relevant research (Kailari, 2019; Konstantinou, Chatzisavva & Logotheti, 2022; Konstantinou & Konstantinou, 2021; Samikou, 2016), according to which students of primary and secondary education in Greek schools in their evaluation of the qualities of a "good" teacher rank in the highest scales (1st preference) his ability to use humor as a component of his communication with his students.

Despite the positive effects of humor, many teachers avoid integrating it into their teaching, possibly due to the pressure of the curriculum or the perception that humor does not fit in with their teaching and their role or for fear of losing control of the classroom, as well as the respect they think they deserve. This means that the use of humor can become an unsafe learning tool, endangering the smooth functioning of the classroom and creating additional difficulties in the educational task, if the teacher does not manage it wisely and carefully, taking into account a number of conditions, which can ensure its smooth integration into the educational process. First of all, the teacher must know the safe limits between teaching and the jokes he will use, showing respect to the age, individual characteristics, needs and interests of the children. It is necessary that his humor is addressed to all students indiscriminately leaving out jokes about the individual

characteristics of the students, since even a well-intentioned teasing in the school environment can have negative consequences for achieving a balanced climate in the school unit (Chaniotakis, 2011; Logotheti, 2017).

The experience of humor is well-known to all people and constitutes a universal practice. Every person, regardless of age, gender, socio-economic level, in all civilizations and cultures, has experienced humor. Differences in its use and the circumstances in which it is considered appropriate or inappropriate may occur between different cultures, but the response to humor, namely laughter, is common to all cultures. It is pointed out, however, that while people are capable of perceiving a stimulus as funny and laugh at it, regardless of age, gender, social or economic status, culture and time, the way of receiving and evaluating a stimulus as a joke differs from person to person. This means that some external, individual and social characteristics can influence the evaluation of whether something is or is not humorous. Characteristics such as nationality, culture, emotional mood, intellectual capacity of the recipient, gender, age, which are strong differentiation factors of the way individuals perceive, accept and create humor belong in this category (Martin, 2007; Martin & Ford, 2018).

Since, therefore, the specific form of pedagogical communication affects not only the behavior of the student and the relationship between the participants in the educational process, but also creates favorable conditions for the learning content, we thought that it is of particular research interest to deal with this topic.

3. Research purpose and methodology: Questionnaire

As mentioned in the introductory part, the purpose of this research is to investigate the opinions of primary school and high school students on the role of humor as a practice in the educational communication between the teacher and the students. In particular, it is investigated whether and to what extent humor affects the students' behavior towards the teacher, the educational process, but also their personality.

The present research was conducted at a local level and due to the fact that the sample is very specific there might be some limitations in generalizing the results. However, this does not mean that the research and pedagogic value of the findings is not quantifiable and recognizable, given that, in any case, through the findings, a specific trend regarding the purpose of the research emerges. We need to point out that this particular research constitutes one of the first attempts (maybe the very first) to investigate students' opinions in Greek bibliographic data. The questionnaire consists of seventeen (17) closed-ended questions which enable the student to grade his answers. The questionnaire was distributed to a total of 178 students of the 6th grade of primary school and 1st, 2nd and 3rd grade of high school (60 and 118 respectively) in the city of Ioannina (randomly selected schools) in the first ten days of May 2023. Before it was distributed to the students, a pilot test of the questionnaire was carried out with the participation of five (5) high school students and five (5) primary school students respectively, from which it was possible to improve the language formulation of some questions. The completion of the questionnaire, which lasted approximately ten (10) minutes, was carried out in the presence of the researchers, in order to clarify any questions on the part of the students.

3.1 *Statistical test: Validity and reliability of the research*

To ensure the validity of the questionnaire, we used the relevant theories that define the concept of humor and its role in pedagogical communication and the educational process. Also, the pilot test of the questionnaire acted as reinforcement in this direction.

Regarding the statistical test, we point out that by coding the answers and applying the two-tailed t-test for independent samples, we examined whether there is a statistically significant difference between the answers of boys and girls and found out that no statistically significant difference was found in all questions except for the question “I prefer the teacher to communicate with me without using humor” ($p\text{-value}=0.036 < 0.05$). In this question, the boys stated that they prefer the teacher to communicate with them without using humor. In addition, we examined whether there is a statistically significant difference between the responses of primary school and high school students. From this particular examination we found out that there is no statistically significant difference between the two grades ($p\text{-value}<0.05$) in 13 out of the 16 questions of the questionnaire. Specifically, a statistically significant difference ($p\text{-value}=0.009$) was found in the question “I am used to others making humor to me”, in which primary school students stated that they are more used to receiving humorous comments compared to high school students. A statistically significant difference ($p\text{-value}<0.045$) was also detected in the question “I prefer the teacher to communicate with me without using humor”, in which high school students prefer more than primary school students the teacher not to communicate with humor with them. Finally, in the question “How much does humor affect you in your educational relationship with the teacher?”, a statistically significant difference was also found ($p\text{-value}=0.011$). In this question, the high school students seem to have been more influenced by the teacher’s humor and state that this affects their relationship with the teacher.

In addition, an internal consistency check of our questionnaire measurement scales was carried out and it was examined whether the questions show a high coherence or correlation both with each other and with the object of our research. The internal consistency and reliability of the factors created were examined by means of Cronbach’s alpha coefficient. Cronbach’s alpha index was found in all questions higher than 0.7. This means that the results of the questionnaire survey are characterized by high reliability and consistency. Therefore, the questionnaire is, in any case, reliable.

4. Comprehensive presentation of research findings

4.1 *Demographics*

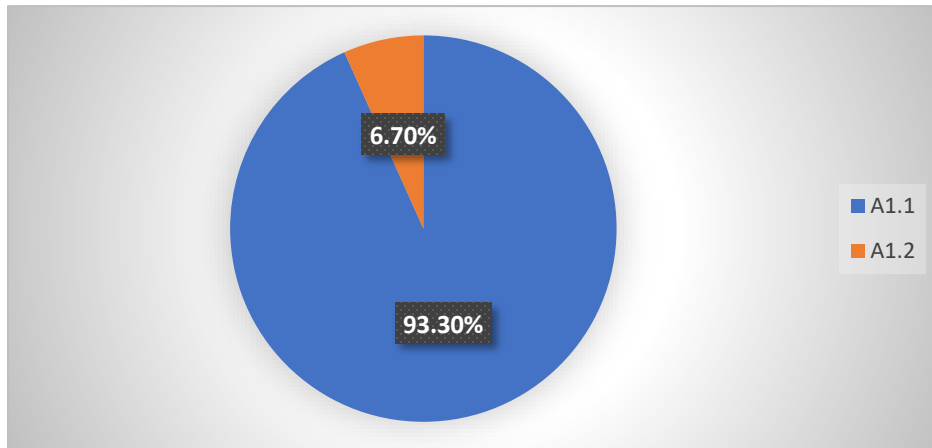
The students of the 6th grade of the primary school and the 1st, 2nd and 3rd grades of the high school, who participated in the research, amount to 178, with a slight numerical superiority of girls over boys ($N=94$ and $N=84$ respectively). Also, high school students outnumber primary school students (118 and 60 respectively).

4.2 *Students’ views on the concept of humor*

Question A1: What does the word (concept) “humor” mean to you?

A1.1 It means that someone tells a joke that causes me to smile or laugh.

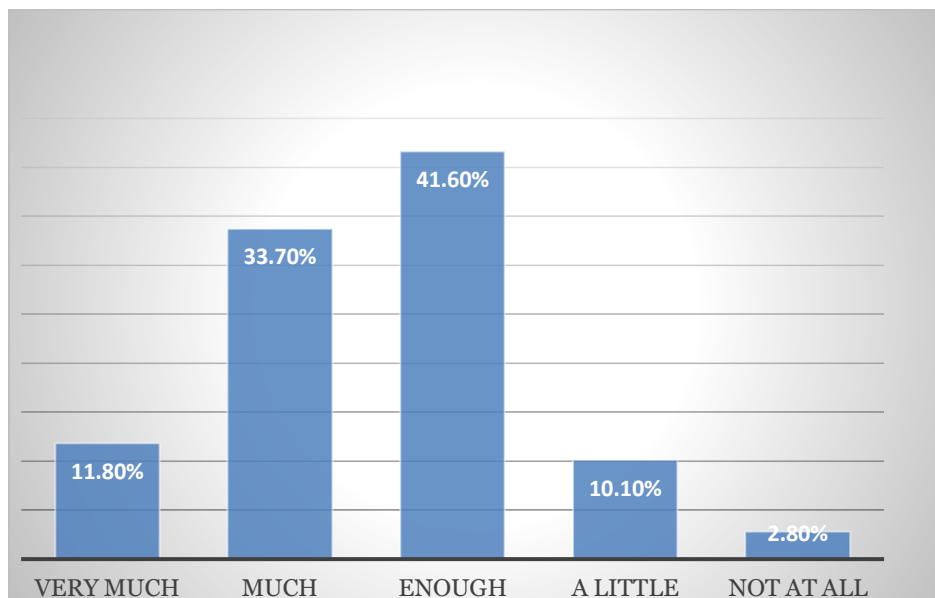
A1.2 It means that someone says something that is not funny and requires me to laugh.



The vast majority of students, at a rate of 93.3%, gave an unequivocal answer regarding the definition of humor facilitating the interpretation of their answers in the subsequent findings directly related to its meaning. There is, of course, a percentage of the order of 6.7%, which either does not know the concept or has not realized humor in practice.

4.3 Students' views on their experiences of humor.

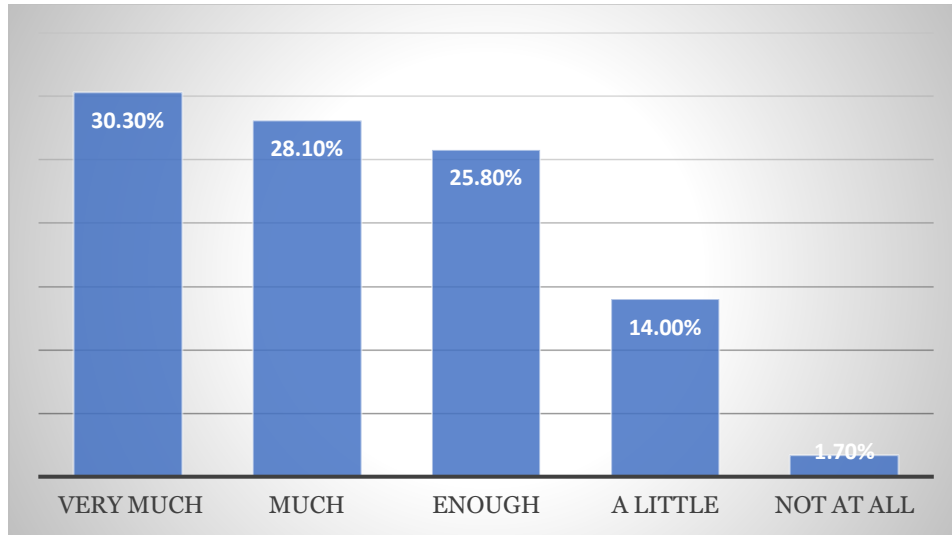
Question A2.1: I am used to being made fun of



Summing up the three positive ratings “too much” (11.8%), “a lot” (33.7%) and “quite a bit” (41.6%), one finds out that 87.1% of the students have experienced humor, obviously in their family, school and wider social environment. This percentage is almost exactly in accordance with the above finding (A1), demonstrating at the same time a small percentage of ignorance or absence of experiences of humor as a practice. Certainly, the remaining cumulative percentage of 12.9% of “a little” (10.1%) and “not at all” (2.8%) ratings is not negligible for students, who are not used to humor. This means that their respective responses that follow are affected by their lack of experiencing humorous situations.

4.4 Students' wishes for the teacher's humor in the classroom

Question A2.2: Would you like your class teacher to make humor in class?



The sum of the three positive ratings “very much” (30.3%), “a lot” (28.1%) and “enough” (25.8%) gives us the percentage of 84.2%, which clearly emphasizes that the vast majority of students crave humor as a classroom practice. Of course, there is also here a cumulative percentage of 15.8% of ratings “a little” (14%) and “not at all” (1.7%), which does not want humor. Based on the previous finding (12.9%), this percentage is probably related to the students who lack experiences of humor. In other words, students who have not experienced humor in practice.

4.5 The students' opinions about the teacher's non-use of humor in the communication between them

Question A2.3: I prefer the teacher to communicate with me without making humor		
Graduation	Frequency	Percentages %
Not at all	53	29.8
A little	84	47.2
Enough	28	15.7
Much	5	2.8
Very much	8	4.5
In total	178	100.0

In this specific finding, adding the two negative ratings “a little” (47.2%) and “not at all” (29.8%), a percentage of 77% is extracted, according to which the students express the desire for the teacher to prefer humor in his communication with them. This specific finding confirms the previous one and clearly shows the students' desire for the teacher to use humor as a practice in their communication.

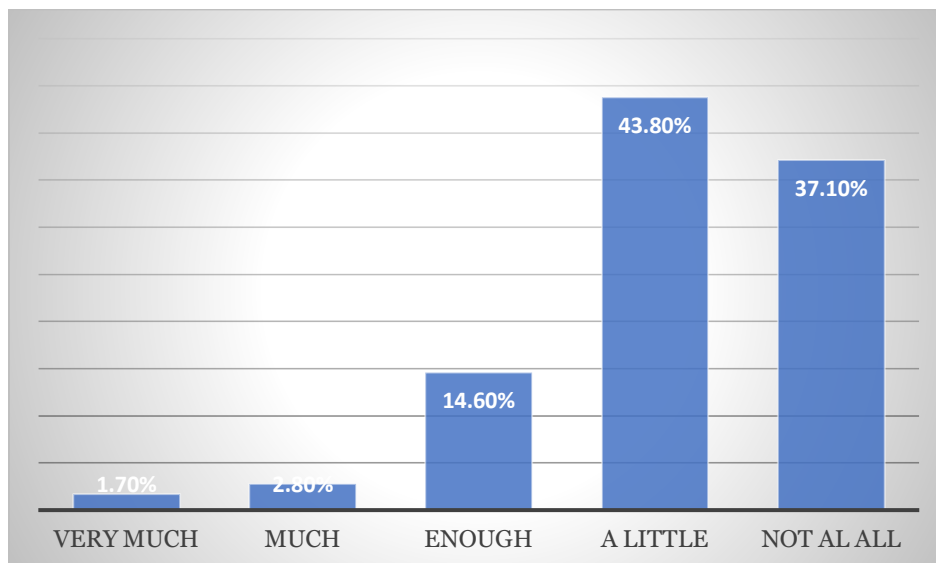
4.6 *The students' opinions about the teacher's humor in his communication with their classmates*

Question A2.4: Do you want the teacher to make humor only with your classmates?	
Frequency	Percentages %
100	56.2
44	24.7
20	11.2
10	5.6
4	2.2
178	100.0

Based on the sum of the two negative ratings “a little” (24.7%) and “not at all” (56.2%) we are led to an overwhelming percentage of 80.9%, according to which the students confirm previous findings. That is, they want the teacher to communicate with humor not only with their classmates but also with them personally.

4.7 *The students' preferences for the strict teacher*

Question A2.5: *I prefer the teacher to be strict with his students*



Adding the two negative ratings “a little” (43.8%) and “not at all”, (37.1%) one finds out that the vast majority of students (80.9%) do not prefer a strict teacher. Obviously, the students want the teacher to be more pleasant and familiar to them. However, there is also a cumulative percentage (19.9%) of the three positive ratings “very much” (1.7%), “a lot” (2.8%) and “enough” (14.6%), which is not inconsiderable, which, perhaps due to experiences and a different perception of things, wants him strict.

4.8 The students' views on the effect of humor on their relationship with the teacher

A2.6 How much does humor affect you in your educational relationship with the teacher?		
Graduation	Frequency	Percentages %
Not at all	18	10.1
A little	40	22.5
Enough	47	26.4
Much	44	24.7
Very much	29	16.3
In total	178	100.0

The percentage of 67.4%, obviously slightly lower than the previous ones, summing up the three positive ratings “very much” (16.3%), “a lot” (24.7%) and “enough” (26.4%), shows that the students are of the opinion that humor affects, apparently positively, their relationship with the teacher. Of course, the remaining percentage 32.6% of the ratings “a little” (22.5%) and “not at all” (10.1%) is clearly considerable for the students, who, for various reasons, express an opposite opinion.

4.9 Students' views on the role of humor in changing their mood in the classroom

Question A2.7: Does your mood change when the teacher makes humor in class?		
Graduation	Frequency	Percentages %
Not at all	6	3.4
A little	16	9.0
Enough	44	24.7
Much	53	29.8
Very much	59	33.1
In total	178	100.0

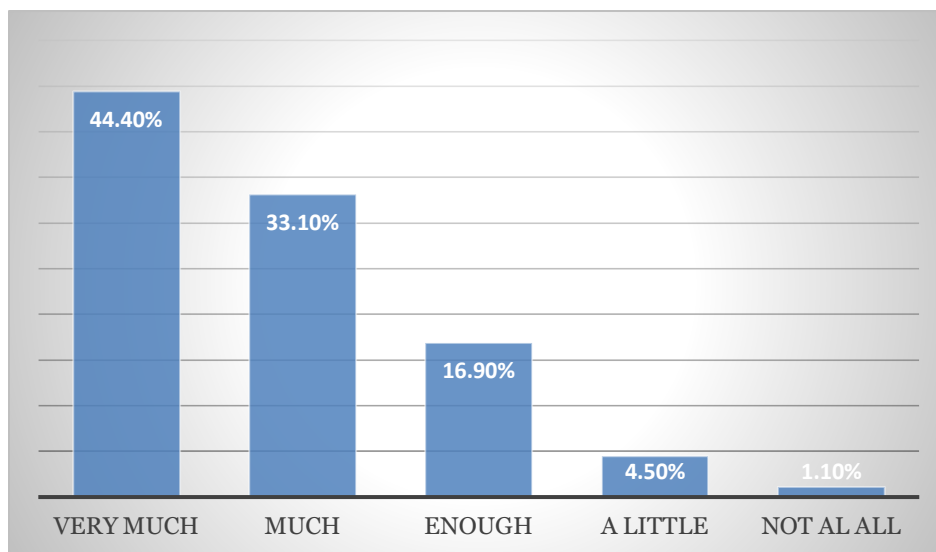
As regards the change in students' mood brought about by humor in class the percentage is very high. More specifically, adding up the three positive ratings “very much” (33.1%), “a lot” (29.8%) and “enough” (24.7%) there is the overwhelming percentage of 87.6 %, which clearly demonstrates that humor changes the mood of students in a positive direction. However, there is also a 12.4% of students, the sum of the ratings “a little” (9%) and “not at all”

(3.4%), which, either due to ignorance or due to lack of experience in humor, implies they are not affected by humor.

4.10 *Students' views on the contribution of humor in the creation of a good climate among them*

Question A2.8: Do you think that humor helps having a good climate in the classroom and among the students?

The almost absolute percentage of 94.4%, as a product of the sum of the three positive ratings “very much” (44.4%), “a lot” (33.1%) and “enough” (16.9%), leaves little doubt that humor clearly contributes to the formation of a good climate among them. Even a percentage of students without experiences or ignorance of the practice of humor, seems to express a positive opinion on this matter.



4.11 *Students' views on the effect of humor in teaching*

Question A2.9: Does humor affect teaching/learning, i.e., does it make you more interested in the lesson?

Graduation	Frequency	Percentages
Not at all	7	3.9
A little	27	15.2
Enough	62	34.8
Much	50	28.1
Very much	32	18.0
In total	178	100.0

From the sum of the three positive ratings “very much” (18%), “a lot” (28.1%) and “enough” (34.8%), there occurs another overwhelming percentage of 80.9%, according to which students emphatically state that humor increases their interest in the lesson. This finding acquires

notable importance, given that it forms very positive conditions for the active participation of the student in the lesson, a decisive point in the organization of the teaching and learning process for the teacher.

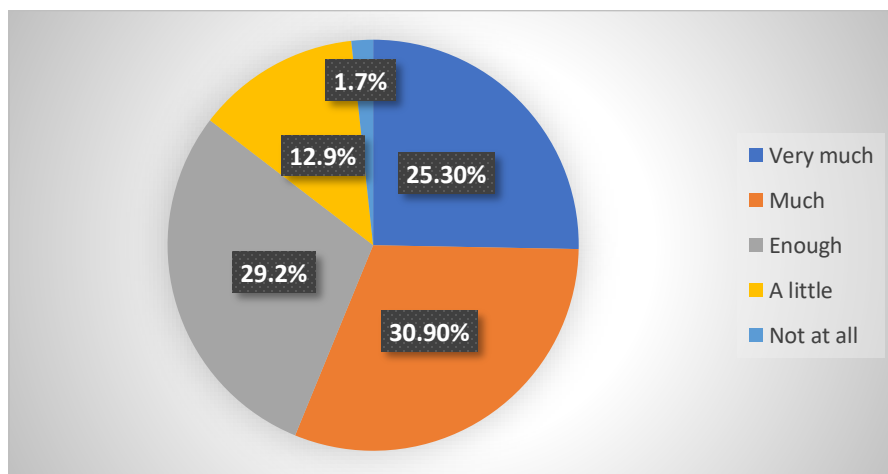
4.12 *Students' views on the contribution of humor to the student's free expression of opinion*

Question A2.10: Does humor make you feel brave enough to speak your mind freely?		
Graduation	Frequency	Percentages %
Not at all	8	4.5
A little	32	18.0
Enough	51	28.7
Much	58	32.6
Very much	29	16.3
In total	178	100.0

An overwhelming percentage of 77.6%, almost the same as the previous findings, occurs from the sum of the three positive ratings “very much” (16.3%), “a lot” (32.6%) and “enough” (28.7%), regarding the contribution of humor to the free expression of opinion. A very high majority of students state that humor encourages them to speak their mind freely. Therefore, humor turns out to be a very good “counselor” for the development of dialogue and the cultivation of student democracy.

4.13 *Students' views on the role of humor in relieving tension and stress in the classroom*

Question A2.11: When there is tension, worry and anxiety in the classroom, does humor relieve you and make you feel more comfortable and cheerful?

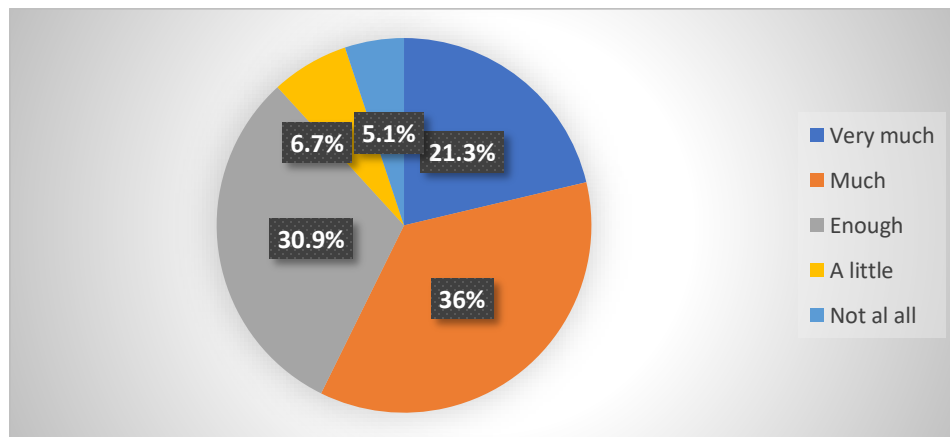


As far as the role of humor in relieving tension and stress in class is concerned the percentage of the sum of the three positive ratings “very much” (25.3%), “a lot” (30.9%) and “quite

a bit” (29.2%) is even higher. Specifically, the students, at a rate of 85.4%, are of the opinion that humor contributes decisively to the reduction of tensions and stress. In other words, the practice of humor relaxes, relieves and helps to change their mood in a positive direction.

4.14 *Students’ views on the contribution of humor to making a greater effort to participate in the lesson*

Question A2.12: When you have a teacher with a sense of humor, does it make you try to participate more in class?



Regarding the contribution of humor to making a greater effort to participate in the lesson, the percentage from the sum of the three positive ratings “very much” (21.3%), “a lot” (36%) and “enough” (30.9%) is clearly higher. More specifically, the vast majority of students, at a percentage of 88.2%, state that humor encourages them to participate more enthusiastically in the lesson, which is in line with a similar finding mentioned above.

4.15 *Students’ views on the role of humor in the improvement of grades improvement of grades*

The percentage of students (73.6%) who claim that humor helps them improve their grades is very high, but slightly lower than the previous findings. This percentage results from the sum of the three positive ratings “very much” (14%), “a lot” (30.9%) and “enough” (28.7%).

Question A2.13: When you have a teacher with a sense of humor, do you feel motivated to get better grades?		
Graduation	Frequency	Percentages %
Not at all	11	6.2
A little	36	20.2
Enough	51	28.7
Much	55	30.9
Very much	25	14.0
In total	178	100.0

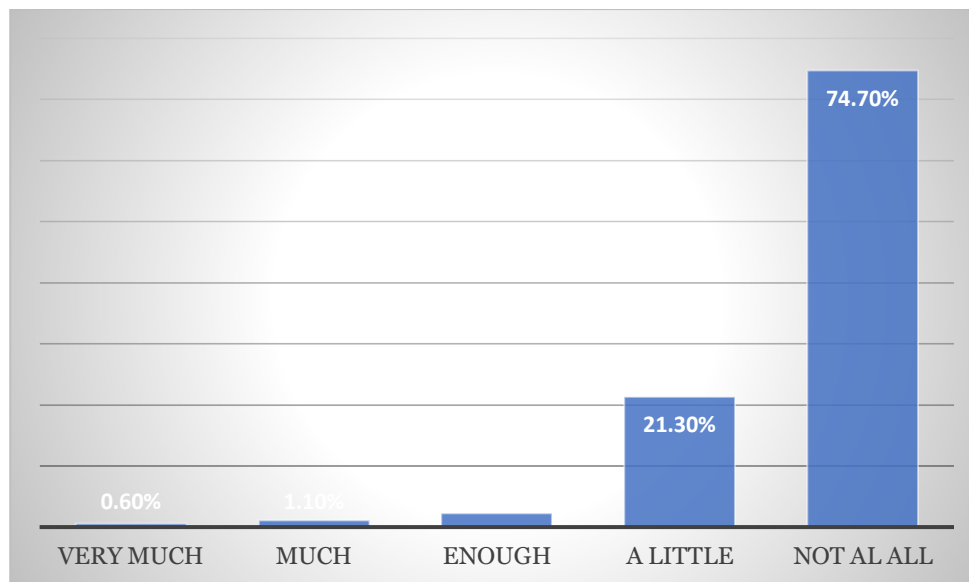
4.16 *The students' opinions on the teacher as a humor model in their daily life*

Question A2.14: Do you want to be like the teacher and use humor in your everyday life?		
Graduation	Frequency	Percentages %
Not at all	11	6.2
A little	33	18.5
Enough	56	31.5
Much	51	28.7
Very much	27	15.2
In total	178	100.0

The percentage of students from the sum of the three positive grades “very much” (15.2%), “a lot” (28.7%) and “enough” (31.5%), who are of the opinion that they are willing to imitate the teacher's sense of humor in their daily lives is almost similar to the previous one (75.4%). In this case it is proven that the teacher becomes a positive model of behavior for his students.

4.17 *The students' views on the necessity of humor in human relationships*

Question A2.15: Do you think that humor is not needed, because it does not help to create good relationships among people?



The highest of all percentages in the survey findings (96%) concerns students' views of humor as a necessary component of social relationships. Specifically, from the sum of the two negative ratings “a little” (21.3%) and “not at all” (74.7%) it turns out that the students, in their overwhelming majority, are of the opinion that humor contributes, to a catalytic degree, to the creation of good social relationships.

4.18 Students' experiences of their teachers' use of humor

Question A2.16: Do you have experiences of teachers who used humor in your class?		
Graduation	Frequency	Percentages %
Not at all	7	3.9
A little	24	3.5
Enough	54	30.3
Much	55	30.9
Very much	38	21.3
In total	178	100.0

Finally, regarding the students' experiences of humor from their teachers, there also turns out an overwhelming percentage of 82.3%. In particular, adding up the three positive ratings "very much" (21.3%), "a lot" (30.9%) and "enough" (30.3%), there occurs a very positive element in the management of communication by teachers. More specifically, the students state that they have, at a very high percentage, positive experiences from their teachers in the use of humor as a practice in their communication.

5. Interpretation of findings and final conclusions

As we mentioned in the theoretical part, the teacher knows or, at least, should know from a pedagogical point of view that the form of communication he chooses, consciously or unconsciously, affects not only his relationship with the student, but also the content and the result of the educational processes. In order to investigate the topic, we chose humor as a pedagogical communication practice, given that the research findings identify it as a very important beneficial and effective means between the teacher and the students. It is a communicative tool applicable to all aspects of everyday life, inside and outside school.

All the theoretical and research data highlight humor as an educational practice, which favors social interaction and relationships between the teacher and students, but also between students, encourages school learning, especially for children with learning disabilities, strengthens students' performance and self-esteem, frees students' ability to express themselves, creates feelings of pleasure, relieves and softens moments of tension and palliates anxiety, while, at the same time, cultivates the important social skill and attitude to manage everyday issues. Also, the frequent use of humor as a practice by the teacher forms conditions for promoting the creative and critical ability, as well as the emotional intelligence of the student.

Indeed, from the overall findings of our research, there are confirmed, to an indisputable degree, all the beneficial effects of humor in educational communication. Besides, even from a rational point of view, it would be paradoxical for students not to accept an educational practice that causes smiles and laughter, when we know from research that at school, as a social and pedagogical institution, normative conditions prevail, i.e., the application of rules, obligations, pressure, scoring, competition, etc.

From the initial findings, it turns out that the vast majority of primary school and high school students (93.3%) conceptually know what "humor" means, which leads to more solid conclusions regarding their answers. Also, the majority has experienced humor as a practice in

their immediate and wider environment. There is, of course, also a minority, approximately an average of 13%, which showed not to have perceived or experienced humor in practice. These students' opinions can also be demonstrated by the following questions of the questionnaire, in which it is found that they "ignore" the beneficial qualities of humor. Interpreting the two specific findings, we consider that they constitute a self-evident sociological and pedagogical fact in accordance with these students' experiences which are linked to the prevalence of different education and socialization processes in their family as well as in their school and wider social environment.

The findings that impress with their overwhelming percentages (95% and above) are those that have as reference points the acceptance of humor as a practice that contributes to the positive climate among students promoting good human relations. The rest of the research findings also demonstrate (at an overwhelming percentage of 75%) the clearly positive effect that humor has on teaching, on students' expressing free opinion, their being activated in lessons, their performance, the change of their mood, the release of tensions and stress, their relationship with the teacher and, more broadly, the climate of the classroom and the conditions of the school.

In conclusion, it is confirmed by the findings of our research and, in fact, at overwhelming percentages, that humor constitutes a practice that is very close to the needs and desires of the student and which, with almost absolute certainty, has exclusively beneficial properties for the educational communication and process, the student and the teacher. Therefore, humor constitutes a pedagogical recommendation to the teacher to utilize and properly cultivate as an important social skill in the educational communication and his relationship with his students.

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Standard Setting with Artificial Neural Networks: TIMSS 2015 Mathematics Case

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Abstract

This study aims to demonstrate the optimal way to determine the cut-off score to be used to interpret the total scores obtained from an achievement test or scale using the Artificial Neural Networks method. To this end, the multiple-choice item responses in the Booklet-11 Mathematics subtest at the 8th grade level in the TIMSS 2015 Turkey sample dataset were used to determine the cut-off score for the achievement test. The item responses in the “Students Like Learning Mathematics Scale” in the TIMSS 2015 8th grade Mathematics Student Questionnaire were used to determine the cut-off score for the scale. The data were accessed from the TIMSS international database and the data were analyzed in MATLAB R2017b software. As a result of the study, the most appropriate cut-off score to be used for the evaluation of the total scores obtained from the TIMSS 2015 8th grade level Booklet-11 Mathematics subtest was determined as 45.5 out of 0-100 points with the Artificial Neural Network analysis method. The overall level of agreement between the cut-off score and the pass/fail classification based on 400 points, which is the lowest level of the TIMSS International Benchmark, was determined as 81%. The most appropriate cut-off score to be used for the evaluation of the scores obtained from the Students Like Learning Mathematics Scale (SLLSS) in the TIMSS 2015 8th grade student survey was determined as 19.6 out of 9-36 points. The overall level of agreement between the cut-off score and the classification of students who like/don't like learning mathematics using the criterion based on the expression given in the original scale description was found to be 83%. The results concluded that the validity of the standard-setting studies conducted with the artificial neural network method was high. As a result, researchers are recommended to use the Artificial Neural Networks method to determine the cut-off score to be used in the interpretation of the total scores obtained from the achievement test or the total scale scores obtained from the scales.

Keywords: artificial neural networks, standard setting, cut-off score, TIMSS 2015.

1. Introduction

It is essential to measure and evaluate achievement in education, recruitment, scientific research, and many other contexts. These measurements are a fundamental tool for assessing the performance of individuals or processes, making decisions, and monitoring progress. In measurement practices, the cut-off scores used to interpret the results of achievement tests or scales play a critical role. Cut-off score determination is also a standard-setting process. The literature hosts numerous standard setting methods. The current study addresses the Artificial Neural Networks (ANN) for standard setting.

ANNs are among data mining models as statistical classification techniques based on a predictive approach. ANN is an artificial network system inspired by the neural network structure of the brain. It is a mathematical model of brain activities (Shah & Murtaza, 2000). ANN is similar to the brain in that information is acquired by passing through a learning process and using the link power among neurons to store this information (Haykin, 1999). In this respect, the work of ANN is to gain learning, generalization, and recollection characteristics for the systems (Saraç, 2005). ANN can be used for nonlinear, multidimensional, complex, uncertain, missing, and error-prone data, especially when no mathematical model or algorithm exists for solving problems. ANN performs functions of prediction, classification, data association, data filtering, recognition and matching, diagnosis, and interpretation (Öztemel, 2003).

Artificial neural networks do not require assumptions regarding the distribution of data. In clustering studies, artificial neural networks can be employed instead of classical statistical methods. The most commonly used artificial neural networks in clustering studies are Self-Organizing Maps (SOM) neural networks. SOM networks are single-layer networks. SOM algorithm is indeed an unsupervised learning algorithm. The data to be used in the training of this network does not contain dependent variables. Often, these variables are referred to as features (Kohonen, 2001).

SOM networks are preferred for both clustering and visualization of data. These networks reduce multidimensional data into a two-dimensional map. SOM networks can fulfill the functions of both K-means and multidimensional scaling methods in classical statistics. That is, it both clusters and maps the elements in the data set. Therefore, these networks have become very popular in recent years (Bircan et al., 2010).

Despite the limited use of ANN in education, it appears to be widely used in transportation, medicine, biomedical industry, finance, stock exchange, and computer technology. However, research has revealed that ANN produces more accurate estimates and classification percentages than other regression and classification methods (Gorr et al., 1994; Ibrahim & Rusli, 2007; Subbanarasimha et al., 2000; Wilson et al., 1994;). Accordingly, the ANN analysis can be used as an alternative method in educational studies.

Scales and tests developed today are used in recruitment, education, choice of profession, decision-making about individuals, and clinical areas. Many researchers have problems with how and according to what to interpret the scores obtained from the scale/test they have developed. Within the scope of the current study, demonstrating how to determine the cut-off score based on the ANN method will help researchers in this regard. In addition, providing evidence on the validity of the cut-off score, which is neglected in many studies, increases the importance of the study.

2.1 Purpose of the research

This study aims to demonstrate how to determine the cut-off score to be used to interpret the total scores obtained from an achievement test or scale using the Artificial Neural Networks (ANN) method. The study also aims to examine the validity of the cut-off scores. To these ends, answers to the following questions were sought:

- What is the most appropriate cut-off score to be used to evaluate the total scores obtained from the TIMSS 2015 8th Grade Booklet-11 Mathematics subtest with the ANN analysis method?
- What is the distribution of students' achievement status according to the cut-off score determined by ANN for TIMSS international proficiency levels and Mathematics subtest?

- What is the most appropriate cut-off score to be used for the evaluation of the scores obtained from the “Students Like Learning Mathematics” scale in the TIMSS 2015 8th grade student questionnaire with the ANN analysis method?
- What is the accuracy between the cut-off scores of the Students Liking for Learning Mathematics Scale determined by TIMSS guidelines and the Students Like Learning Mathematics Scale determined by ANN?

2.2 Method

2.2.1 Research model

This is a descriptive study because it aims to show how to determine the cut-off score to be used to interpret the total scores obtained from an achievement test or scale with the Artificial Neural Network method and to examine the validity of the determined cut-off scores.

2.2.2 Study group

The research was performed with two different study groups. For the purpose of determining the cut-off score for the achievement test in the study, the data of 441 students in the TIMSS 2015 Turkey sample who took the Booklet-11 subtest of the 8th Grade Mathematics Test were used. Of these students, 50.6% (N=223) were female and 49.4% (N=218) were male. In the study, the data of 5,741 students in the TIMSS 2015 Turkey sample who answered the “Students Like Learning Mathematics Scale” at the 8th grade level were used to determine the cut-off score for the scale. Of these students, 49% (N=2,812) were female and 51% (2929) were male.

2.2.3 Data description

TIMSS, conducted every four years by the International Association for the Evaluation of Educational Achievement (IEA), also creates an international database that determines the trends in students’ achievement in mathematics and science. The study data were obtained from the TIMSS 2015 international database (<https://timssandpirls.bc.edu/timss2015/international-database/>).

The 8th grade Booklet-11 mathematics subtest used in the study included 16 multiple-choice items with four options. In the Students Like Learning Mathematics Scale included in the TIMSS 2015 8th grade Mathematics Student Questionnaire, student scores are rated between 1-4 as 1=Disagree a lot, 2=Disagree a little, 3=Agree a little, and 4=Agree a lot and consists of a total of 9 items (Mullis et al., 2020).

2.2.4 Data analysis

The study basically serves two purposes. The first is to find the most appropriate cut-off scores for the mathematics achievement test and the Students Like Learning Mathematics Scale with ANN, and the second is to examine the validity of the cut-off scores.

After the data sets were obtained from the international database, the students’ raw scores were obtained by giving 1 point for a correct answer and 0 points for an incorrect answer from the student responses in Booklet 11. The raw scores were then converted into a 100-point system, i.e., the maximum score was 100. After this process, the cut-off score was determined by using the SOM learning algorithm with the ANN analysis method. Similarly, for the Students Like

Learning Mathematics Scale, the students’ responses were scored between 1-4, and the cut-off score was determined by the ANN analysis.

In the second stage, in order to provide evidence for the validity of the cut-off scores, the consistency between the classifications of students according to TIMSS 2015 international proficiency levels and the classifications made according to the cut-off score determined for the mathematics subtest was examined. TIMSS 2015 8th grade mathematics international proficiency levels are presented in Table 1 (Mullis et al., 2016).

Table 1. TIMSS 2015 international benchmarks of mathematics achievement

Score	Benchmarks
625	Advanced
550	High
475	Intermediate
400	Low
Below 400	Below Low

*: The level of students who do not even reach the lowest level in TIMSS

In addition, the agreement between the pass/fail classification based on the lowest TIMSS International Benchmarks of 400 points and the pass/fail classification based on the cut-off score determined for the Booklet-11 mathematics subtest was examined.

The scores used in the evaluation of the scores from the Students Like Learning Mathematics Scale (SLLMS) are defined as follows (Mullis et al., 2020): “*Students Who Do Not Like Learning Mathematics had a score at or below the cut score corresponding to “disagreeing a little” with five of the nine statements and “agreeing a little” with the other four, on average. All other students Somewhat Like Learning Mathematics.*” Based on this definition, the criterion set for the original scale was based on 22 points (five items disagreeing a little, $5 \times 2 = 10$; four items agreeing a little, $4 \times 3 = 12$ Total=22). Students scoring 22 points and below were classified as not like learning mathematics, while those scoring above 22 points were classified as like learning mathematics. Then, the agreement between this classification and the classification based on the score determined by the ANN method was examined.

Sensitivity (true positive rate), Specificity (true positive rate), and Accuracy values were presented as agreement values. Data analysis was performed using the SPSS package program and MATLAB R2017b software.

2.3 Results

Within the scope of the study, firstly, the question “What is the most appropriate cut-off score to be used for the evaluation of the total scores obtained from the TIMSS 2015 8th Grade Booklet-11 Mathematics subtest by ANN analysis method?” was sought to be answered. Figure 1 shows the cut-off score determined by the ANN method for the pass/fail decision to be made according to the total score of the students in 16 multiple-choice mathematics subtests.

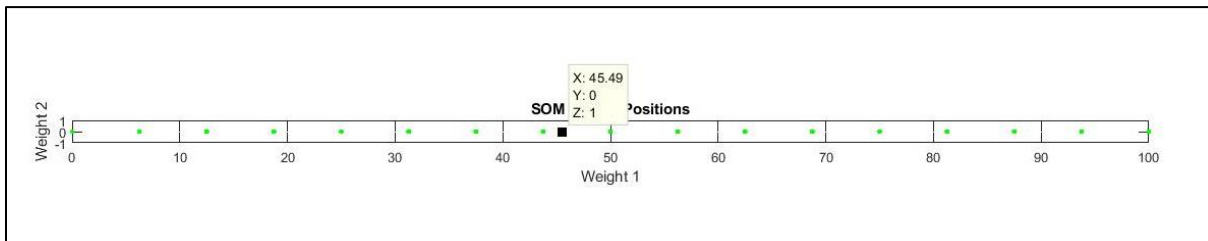


Figure 1. The cut-off score determined for the total score of the mathematics subtest (Booklet-11)

Figure 1 demonstrates that the most appropriate cut-off score to be used to evaluate the total scores obtained from the TIMSS 2015 8th grade level Booklet-11 Mathematics subtest by ANN analysis method was 45.49 out of 0-100 points. According to the cut-off score determined, the achievement status of 411 students in the study group in the mathematics test is shown in Figure 2.

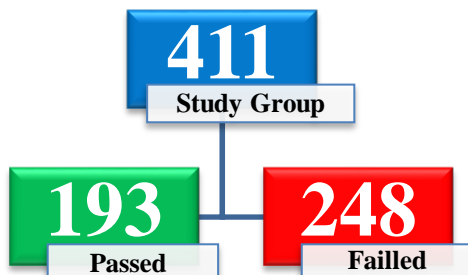


Figure 2. Mathematics subtest achievement status of the students in the study group

As given in Figure 2, according to the cut-off score determined, 193 students (47%) out of 411 students in the study were successful in the mathematics test, while 248 students (53%) were unsuccessful.

Within the scope of the study's second aim, the question “How is the distribution of the achievement status of the students according to the cut-off score determined by ANN for TIMSS international proficiency levels and Mathematics subtest?” was sought to be answered. Figure 3 shows the distribution of successful students according to TIMSS international proficiency levels and Figure 4 shows the distribution of unsuccessful students according to TIMSS international proficiency levels.

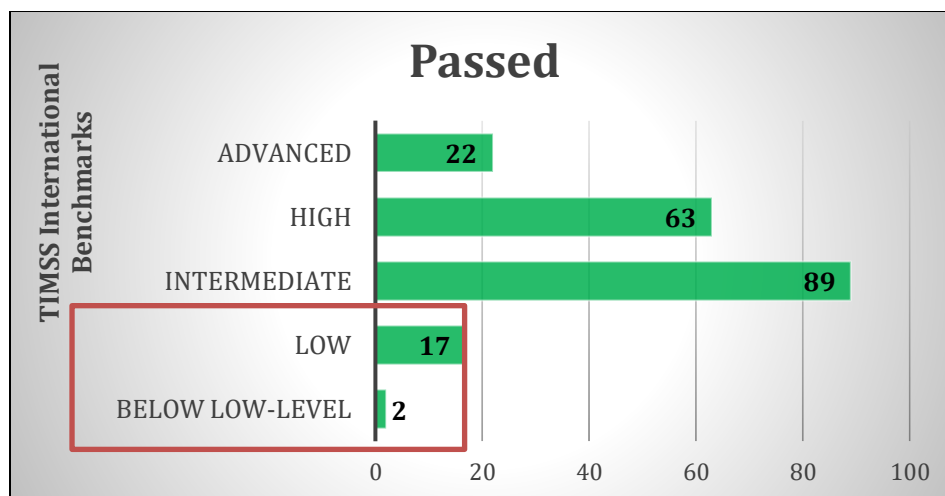


Figure 3. Distribution of the successful group according to TIMSS international benchmarks

When Figure 3 is analyzed, it is seen that 1.0% (N=2) of the 193 students in the successful group were below the Low Level, 8.8% (N=17) were at the Low Level, 46.1% (N=89) were at the Intermediate Level, 32.6% (N=63) were at the Upper Level and 11.4% (N=22) were at the Advanced TIMSS international proficiency level.

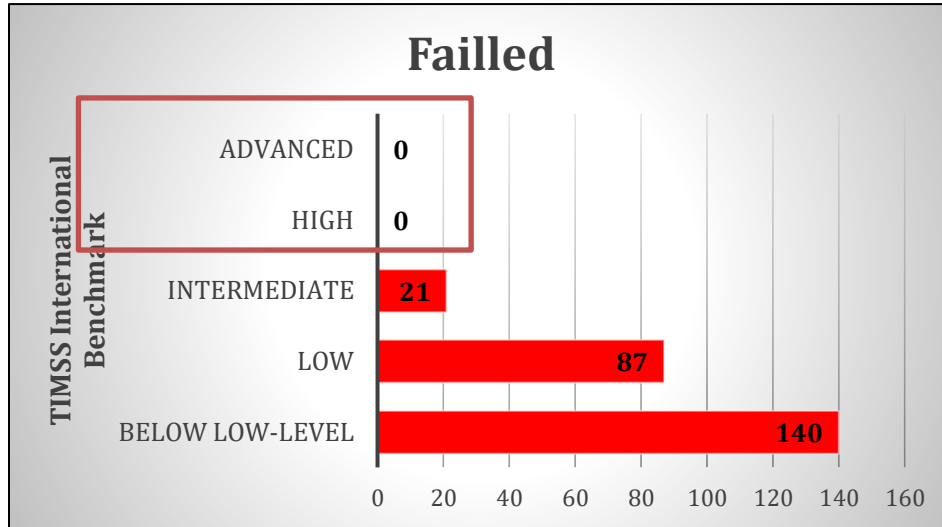


Figure 4. Distribution of the unsuccessful group according to TIMSS international benchmarks

Figure 4 shows that 56.5% (N=140) of the 248 students in the unsuccessful group were below the Low Level, 35.1% (N=87) were at the Low Level, and 8.5% (N=21) were at the Intermediate TIMSS international proficiency level, and there were no students at the Upper and Advanced Levels.

The contingency table from a pass/fail classification of students based on the low level of TIMSS international proficiency levels (400) and a pass/fail classification based on the cut-off score (45.49) determined by ANN for the Booklet-11 mathematics subtest is given in Table 2.

Table 2. Mathematics subtest (Booklet-11) contingency table

		TIMSS International Benchmark (400)		
		Passed	Failed	Total
Math. Test (45.49)	Passed	191	2	193
	Failed	108	140	248
Total		299	142	411

As presented in Table 2, according to the pass/fail classification using the lowest TIMSS 400 International Benchmark criterion and the criterion of 45.49 for the Mathematics subtest, the number of people who passed the mathematics test in both criteria was 191 and the number of people who failed was 140. Using the value in Table 2, Sensitivity (true positive rate), Specificity (true positive rate), and Accuracy values can be obtained as the agreement values of the two criteria. These values are presented in Table 3.

Table 3. Math subtest (Booklet-11) fit values

Agreement for the passed	Sensitivity = $191/299 = 0.64$
Agreement for the failed	Specificity = $140/142 = 0.99$
Overall agreement	Accuracy = $(140 + 191)/411 = 331/411 = 0.81$

The agreement for the success case was 64% according to both criteria, while the agreement for the failure case was 99%. The overall agreement level of the pass/fail classification using both criteria was 81%.

Then, within the scope of the study, the answer to the question “What is the most appropriate cut-off score to be used for the evaluation of the scores obtained from the SLLMS in the TIMSS 2015 8th grade student questionnaire by ANN analysis method?” was sought. Figure 5 shows the cut-off score determined by the ANN analysis method for the decision of likes/dislikes learning mathematics to be made according to the total score of the students from the SLLMS, which consists of 9 items and is graded between 1-4.

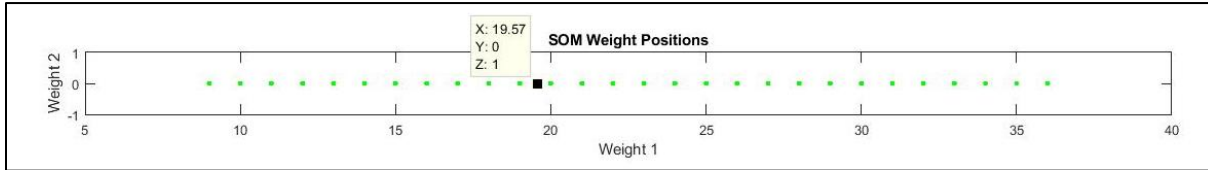


Figure 5. Cut-off score determined for SLLMS scale total score

Figure 5 indicates that the most appropriate cut-off score to be used for the evaluation of the total scores obtained from the SLLMS in the TIMSS 2015 8th grade level student questionnaire with the ANN analysis method was 19.57 over 9-36 points. According to the determined cut-off score, the SLLMS status of 5,741 students in the study group is shown in Figure 6.

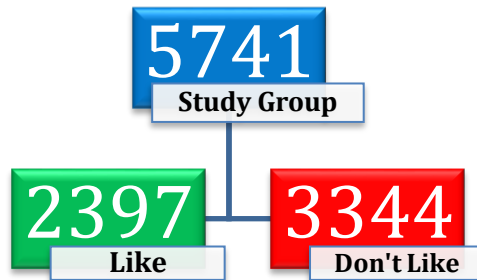


Figure 6. The status of the students in the study group for liking learning mathematics according to the SLLMS

According to the cut-off score determined, 2,397 students (42%) out of 5,741 students in the study liked learning mathematics, while 3,344 students (58%) did not like learning mathematics.

Within the scope of the study’s second aim, the answer to the question “How is the agreement between the SLLMS cut-off score determined by TIMSS guidelines and the SLLMS cut-off score determined by ANN analysis method?” was sought. Table 4 shows the contingency table for the classification of liking/disliking learning mathematics according to the 22-point criteria determined based on the statement given in the original description of the SLLMS scale and the 19.57-point criteria determined by the ANN analysis method.

Table 4. SLLMS contingency table

		TIMSS Description Cut Score (22)		
		Like	Don't Like	Total
SLLMS ANN (19.57)	Like	1440	957	2397
	Don't Like	0	3344	3344
Total		1440	4301	5741

Table 4 reveals that the number of people who liked learning mathematics in both criteria was 1,440, and the number of people who did not like learning mathematics was 3,344 according to the classification of liking/disliking learning mathematics using the 22 score criteria based on the TIMSS description and the 19.57 criterion obtained from ANN analysis. Table 5 shows the agreement values calculated with the values in the contingency table.

Table 5. SLLMS agreement values

Agreement for liking to learn mathematics	Sensitivity = $1440/1440 = 1.00$
Agreement for not liking learning mathematics	Specificity = $3344/4301 = 0.78$
Overall agreement	Accuracy = $(1440 + 3344)/5741 = 4784/5741 = 0.83$

When Table 5 is examined, it is seen that the level of agreement in the case of liking to learn mathematics according to both criteria was 100%, while the level of agreement in the case of disliking to learn mathematics was 78%. The overall level of agreement for the classification of liking/disliking learning mathematics using both criteria was 83%.

According to all the findings obtained, it can be said that the validity of the cut-off scores determined by ANN analysis for the Mathematics subtest Booklet-11 and for the SLLMS scale was high.

3. Discussion, conclusion, and recommendations

The current study basically aimed to show how to determine the cut-off score to be used in the interpretation of the total scores obtained from an achievement test or scale with the Artificial Neural Network method. In addition, the validity of the cut-off scores determined within the scope of the study was also examined.

As a result of the study, the most appropriate cut-off score to be used for the evaluation of the total scores obtained from the TIMSS 2015 8th grade level Booklet-11 Mathematics subtest was determined as 45.49 out of 0-100 points with the Artificial Neural Network analysis method. According to the cut-off score, it was concluded that 193 (47%) of the 411 students in the study were successful, and 248 (53%) were unsuccessful. According to the lowest TIMSS International Benchmark (TIMSS International Benchmark) of 400 points and the 45.49 criterion determined by ANN for the Booklet-11 mathematics subtest, it was concluded that the agreement was 64% in the case of success and 99% in the case of failure. The overall agreement level of the pass/fail classification using both criteria was 81%.

With the artificial neural network analysis method, the most appropriate cut-off score to be used for the evaluation of the scores obtained from the SLLMS in the TIMSS 2015 8th grade student survey was determined as 19.57 over 9-36 points. According to the cut-off score, 41.8% (N=2,397) of the students liked learning mathematics, while 58.2% (N=3,344) did not like learning mathematics. According to the 22-point criteria determined on the basis of the expression given in the original description of the SLLMS and the 19.57-point criteria determined by the ANN analysis method, it was concluded that the agreement was 100% for the case of liking to learn mathematics and 78% for the case of disliking to learn mathematics. The overall level of agreement for the classification of liking/disliking learning mathematics using both criteria was found to be 83%. Birican et al. (2010) state that SOM-type networks are ideal for cluster analysis; however, it may be necessary to consult expert opinion on the subject to check the accuracy of the results

obtained. The study not only determined the cut-off score, but also examined the validity of the cut-off score, which eliminated the need to apply for expert opinion on the results obtained.

The study results suggested that the validity of the standard-setting studies conducted with the Artificial Neural Networks method was high. Therefore, researchers are recommended to use the Artificial Neural Networks method in determining the cut-off score to be used in interpreting the total scores obtained from the achievement test or the total scale scores obtained from the scales. Because traditional standard-setting methods involve expert opinion, subjectivity may be in question. However, there is no subjectivity since the ANN method does not require expert opinion. In the study, a cut-off score was determined using the ANN method. In future studies, cut-off scores can be determined using different standard-setting methods, and the cut-off scores' validity can be examined.

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