The Albanian Adaptation of Physics Attitude Test: Validation with 10th Grade Students

Ahmed Fatih Ersoy

Epoka University, Department of Computer Engineering

afersoy@epoka.edu.al

Ylljet Aliçka

European University of Tirana, Faculty of Social Sciences and Education

ylljet.alicka@uet.edu.al

Abstract

Attitude is an important factor in learning. The purpose of the study is to adopt a Turkish attitude test in Albanian language, to examine the secondary school students' attitude towards Newton's Laws of Motion, and to report the validity and reliability of the study. The sample was 387 secondary school students from five high schools in Albania. The original questionnaire measures five attitude components, which are enjoyment, self-efficacy, importance of physics, achievement-motivation, and interest related behavior. The data collected from five high schools was analyzed and similar factor structures were found as in the original questionnaire. Based on the principal component analysis five dimensions for learning physics were found. The Cronbach's alpha reliability was found to be .75. Physics Attitude Test, is a tool to assess secondary school students' attitude towards Newton's Laws of Motion. Keywords: Physics, Secondary School Science, Newton's Laws of Motion, Attitude, Education, Science, Assessment, Albanian, Fizika, Lëndet shkencore në shkollat e mesme, Ligjet e Njutonit, Qëndrim, Edukimi, Shkencë, Vlerësim, Shqip.

Introduction and Literature Review

Physics, as a science, a tool for grasping better understanding of nature. The developments in physics during the last centuries not only effected the science and technology but also affected our lives. Educational sciences are also had their share. One of the major goals of researchers is to find an effective method in physics learning as researches indicate that physics achievement is less than other disciplines (Gök & Silay, Dieck, Rivard & Straw, Mattern & Schau, as cited in Kaya & Boyuk, 2011). Abak (2003) stated that %50 of the variance in learning outcomes can be explained by cognitive characteristics where %50 is undefined led researchers to focus on affective characteristics which may affect learning. The result of researches on these characteristics, the key affective components can be grouped under attitude and motivation (Güngör, Eryılmaz, & Fakioğlu, 2007).

Although there are many definitions of attitude, according to Ajzen and Fishbein (1977) "a person's attitude represents his evaluation of the entity in question". Attitude is summation of someone's "inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears, threats, and convictions about any specified topic" (L. L. Thurstone, 1928). As cited in Tanrıverdi and Demirbaş (2012) attitude as the most important affective factor which influences learning, it has positive as well as negative effect on individuals learning (Yaşar & Anagün, 2008). Attitude is formed by organization of experiences and knowledge (Tavşancıl, 2002), and according to Ekici (2002) one of the best descriptors of behavior with cognitive, affective and psychomotor dimensions (as cited in Tanrıverdi & Demirbaş, 2012).

Gagne (1985) described attitude as interaction of cognitive, affective, and behavioral domains as a mental state where learners' behaviors effected while they make their choices (as cited in Olagunju & Zongo, 2011). According to Koballa and

Glynn (2007) attitude effects motivation and motivation effects learning. Attitude can also be defined as “tendency to respond positively or negatively to things, people, places, events or ideas” (Simpson, Koballa, Oliver and Crawley as cited in Tokgöz, 2007).

It is important to measure a construct like attitude as well to define it. It had been always assumed to be a complex process. L. L. Thurstone (1928) described this process as:

In devising a method of measuring attitude I have tried to get along with the fewest possible restrictions because sometimes one is tempted to disregard so many factors that the original problem disappears. I trust that I shall not be accused of throwing out the baby with its bath.

As stated by Kaya and Boyuk (2011) there are many scales developed to measure attitude. L. Thurstone and Chave (1929) developed an attitude scale. Later on Likert, Roslow, and Murphy (1934) utilized a simple and reliable method to score Thurstone Attitude Scales which is well-known and widely used even after 80 years.

One of the most challenging lessons for students from secondary school to university even for adults in graduate studies is physics (Erdemir, 2009). As cited in Erdemir (2009) learning environment and attitude towards it is also important factor though it should be also measured while measuring students' attitudes towards physics should take into account their attitudes towards the learning environment (Crawley & Black, 1992).

Basic objective of science learning should be increasing students' attitude towards physics as their attitude (feel) towards science influences their performance while research in the field showed that increase in students' science achievement can be possible with positive attitudes toward science (Cannon & Simpson, 1985; Simpson & Oliver, 1985; 1990, as cited in Tokgöz, 2007).

Researchers conducted abundant studies in order to find out the factors effecting the attitude towards science/physics based on the fact that the students do not like physics lessons as well as their physics teaches unless they have positive attitude towards physics (Erdemir, 2009).

The purpose of the study is to adopt a Turkish attitude test in Albanian language, to examine the secondary school students' attitude towards Newton's Laws of Motion, and to report the validity and reliability of the study.

The research question of the study as follows:

Is Physics Attitude Test (PATT) reliable to use into Albanian culture to measure 10th grade students' attitude towards Newton's Laws of Motion?

Rationale

It is not only important to sustain a classroom environment that increases students' attitudes towards physics to promote their learning, but also it requires full use of abilities and resources. As previous studies implied the effect of positive attitude increasing students' achievement, learning environments should be developed in order to escalate students' attitude towards physics. To achieve this goal attitude and its factors should be able to be investigated. Consequently, measuring students' attitude towards physics while adapting Physics Attitude Test into Albanian culture and classifying the factors are the main purpose of this study. The Physics Attitude Test aims to measure university students' 10th grade students' attitude towards Newton's Laws of Motion.

Method

The methods section consists of four parts where instrument, translation, sample, and data analysis will be explained briefly.

Instrument

The original test to measure the level of students' attitude towards Newton's Laws of Motion content was developed by Taşlıdere (2002) in Turkish, Küçüker (2004) modified by reversing five items to its negative form and changing two items to their new forms which are 23rd and 24th items (as cited in Serin, 2009). Both of the original tests were to measure students' attitude towards "simple electric circuits", which were replaced by "pressure" in order to be applied for pressure unit (Serin, 2009). Further versions of the attitude test applied to other topics like force and motion unit (Gökalp, 2011; Temizkan, 2003), growth in living things (Koksall & Berberoglu, 2014), Newton's Laws of Motion unit (Eryilmaz, 2004), etc.

PATT adopted from revised versions (Serin, 2009) into Albanian. As it is measuring students' attitude towards pressure content, "pressure" term in the test replaced with "Newton's Laws of Motion" terms. PATT measures 10th grade students' attitudes toward Newton's Laws of Motion. Newton's Laws of Motion covers the following content:

- Newton's First Law of Motion
- Newton's Second Law of Motion
- Velocity change with the effect of constant force
- Relation of acceleration with the magnitude of force
- Newton's Third Law of Motion

There are 24 questions (see appendix) rated on 5-point Likert scale. Responses are rated from strongly disagree to strongly agree and coded among one to five respectively. Hence, the score of students from this test may range from 24 to 120. Lower scores indicate negative, higher scores indicate positive attitude towards Newton's Laws of Motion content. PATT has five components that are enjoyment, self-efficacy, importance of physics, achievement-motivation, and interest related behavior. The items and the corresponding components of the attitude test (AT) in Taşlıdere's study (as cited in Serin, 2009) are given in Table 1. The Cronbach's alpha reliability coefficient of the test reported by Taşlıdere, Küçüker (as cited in Serin, 2009) and Serin (2009) where it was reported as 0.94, 0.83, and 0.91 respectively. The Cronbach's alpha reliability coefficient of PATT is 0.75, which means that at least 75% of the total score variance is due to true score variance.

Translation

In terms of validity, three independent bilingual researchers made Albanian translation individually then the inconsistencies were compared. Later on, back translation into English was made by other two researchers to check consistency. Before the final revision was administered to 387 high school students, the translated version is reviewed to check the face and content validity while administering to 17 high school students.

Sample

The sample of this study was 387 high school students from five different high schools in Albania. The test was administered during physics courses to 198 female students, 189 male students, and it has taken around fifteen minutes.

Data Analysis

The data collected from high school students analyzed via SPSS 21.0 for Windows. Students' response were coded according to their response strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5). The score range from minimum 24 to maximum 120. The reliability of the PATT was analyzed by internal consistency which is measured by Cronbach's alpha. For educational studies, the suggested alpha value should be at least .70 or preferably higher (Fraenkel & Wallen, 2003, p. 168). Kaya and Boyuk (2011) compared 20 research studies on students' attitudes towards science content and reported that the Cronbach-Alfa reliability coefficient was in range of 0.65 - 0.98.

Analysis and Results

The PATT items were subjected to principal component analysis (PCA) the Kaiser-Meyer-Olkin value was .879, expressing the suitability of data for factor analysis, exceed the recommended value of 0.6 (Field, 2000, as cited in Çetin-Dindar &

Geban, 2010). Additionally, Barlett's Test of Sphericity reach statistical significance supporting the factorability of the correlation matrix ($\lambda = 2499.184$, $df = 276$, 000). The factor analysis of pretest data yielded eight components where the eigen-values were greater than 1.000. Then, the analysis repeated by restricting the number of components to five. The eigen-values of five components are 4.579, 4.273, 2.996, 2.343, and 1.742 respectively. Eigenvalues and explained variance for the components of PATT are given in Table 2.

The reliability coefficient for the test estimated by Cronbach's alpha was 0.75, indicating satisfactory internal consistency. Guttman split-half coefficient is 0.66 which is also acceptable. The five components explained a total of 66.388% of the variance, with component interest related behavior explaining 19.081%, component self-efficacy explaining 17.803%, component achievement-motivation explaining 12.482%, component importance of physics explaining 9.764%, and component enjoyment explaining 7.258% (see Table 2).

Self-efficacy, interest related behavior and achievement motivation are almost identical, only item 24 was loaded to achievement motivation. Other components are also has similar loaded items. One item from enjoyment component was loaded to self-efficacy component, one item from enjoyment component was loaded to importance of physics component, one item from interest related behavior was loaded to achievement-motivation component and two components from importance of physics component were loaded to interest related behavior component. Factor analysis results of the PATT are given in **Error! Reference source not found.** and component loadings of items to the components are given in Table 4.

Conclusions and Implications

Attitude is not a variable which can be observed and measured directly because of that it had been accepted as a latent variable. Latent variables as they are not easy to measure and interpret they were rarely being included in research studies (Cetin-Dindar & Geban, 2010). Based on the findings of the study which aimed to measure students' attitudes towards Newton's Laws of Motion content showed that the adopted version of AT is a valid and reliable tool in Albanian context including the components of interest related behavior, self-efficacy, achievement-motivation, importance of physics, and enjoyment.

As the literature on similar studies mentioned that it is important to measure students' attitudes in order to sustain effective learning. The study will contribute to the literature for the researchers and teachers in order to measure student's attitudes towards a specific content as well as Newton's Laws of Motion content. The researchers and teachers who wants to use PATT for different contents may use it while changing "Newton's Laws of Motion" terms with the respective terms that they want to measure attitude towards that content. As a result it can be also recommended that researchers, instructors, etc. can use AT to evaluate students' attitude towards specific content in secondary school courses.

The results of the study is encouraging to translate the AT to other language settings as it is also valid and reliable in Albanian culture, it might be translated and used in other languages after proper validity and reliability measures taken into account. Additionally, the similar versions of this test could be adapted to the other disciplines like chemistry, mathematics or biology. The test also can be used in other environmental settings such as essays, interviews, case studies, and other qualitative methods to obtain new data.

Further studies may include gender differences, learning environments where technology and/or hands on activities involved, learning in native language, teacher specifications, socioeconomic status, teaching methods and other variables which may affect student's attitude.

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Tables

Table 1 - Items and the respective components of the AT given in Taşlıdere's study

Components	Item numbers
Enjoyment	1, 2, 16, 17, 23
Self-efficacy	9, 10, 11, 18, 21
Importance of	3, 4, 5, 13, 14
Achievement-	6, 7, 8, 12
Interest related	15, 19, 20, 22, 24

Table 2 - Eigenvalues and explained variance for the components

Components	Eigen Values	% Variance explained
1 interest related behavior	4. 579	19. 081
2 self-efficacy	4. 273	17. 803
3 achievement-motivation	2. 996	12. 482
4 importance of physics	2. 343	9. 764
5 enjoyment	1. 742	7. 258
Total variance		66. 388
Cronbach's alpha		. 75

Table 3 - Factor analysis of the PATT

Components	Item numbers
5 Enjoyment	16*, 17, 23*
2 Self-efficacy	9, 10, 11, 18, 21, 1
4 Importance of physics	3, 4, 14*,2
3 Achievement-motivation	6, 7, 8, 12, 24
1 Interest related behavior	15*, 19, 20, 22, 5, 13

Bold items are same as AT in Taşlıdere's study (as cited in Serin, 2009). Stared items are also loaded to other components.

Table 4 - Loading of items to the components

Items	Components				
	1	2	3	4	5
	Interest related behavior	Self-efficacy	Achievement-motivation	Importance of physics	Enjoyment
PATT20	. 828				
PATT19	. 780				
PATT22	. 697				

PATT13	. 680		
PATT14	. 633*	. 410*	
PATT23	. 614*		. 422*
PATT05	. 577		
PATT16	. 410*		. 314*
PATT10	. 855		
PATT11	. 785		
PATT18	. 761		
PATT09	. 705		
PATT21	. 687		
PATT01	. 476		
PATT06		. 762	
PATT07		. 716	
PATT08		. 653	
PATT12		. 629	
PATT24		. 557	
PATT04		. 793	
PATT02		. 626	
PATT03		. 617	
PATT17			. 762
PATT15	. 518*		. 532*

Bold items are same as AT in Taşlıdere's study (as cited in Serin, 2009). Stared items are also loaded to other components.

Appendix

ATTENTION! The "Newton's Laws of Motion" (NLoM) chapter covers:

- Newton's First Law of Motion
- Newton's Second Law of Motion
- Velocity change with the effect of constant force
- Relation of acceleration with the magnitude of force
- Newton's Third Law of Motion sections.

KUJDES! Ligjet e Njtonit (LN) perfshijne temat:

- Ligji i pare i levizjes i Njtonit
- Ligji i dyte i levizjes i Njtonit
- Ndryshimet e shpejtesise nen ndikimin e nje force konstante
- Ndryshimi i nxitimit ne varesi te magnitudes se forces
- Ligji i trete i Njtonit

1 I like the "Newton's Laws of Motion" chapter.
Mua më pëlqejnë temat e kapitullit Ligjet e Njtonit.

2 I have positive feelings about the NLoM chapter.
Unë kam mendim pozitiv për temat e kapitullit LN.

3 I believe that what I've learned from the NLoM chapter will make my life easier.
Unë besoj se përvetësimi i temave të kapitullit LN do të më lehtësojë jetën e përditshme.

- 4 I don't believe that the NLoM chapter will gain more importance in the future.
Unë nuk besoj se rëndësia e temave LN do të vijë duke u rritur në të ardhmen.
- 5 I believe that the NLoM chapter will be beneficial for my further studies.
Unë besoj se studimi i temave të kapitullit LN do të më shërbejë në studimet e mia të ardhshme.
- 6 I will do my best to be successful at the NLoM chapter.
Unë bëj çfarë është e mundur për të qenë i suksesshëm në kapitullin LN
- 7 I will try my best for the NLoM chapter.
Unë mundohem të bëj më të mirën e mundshme për të qenë i suksesshëm në kapitullin LN.
- 8 I will not try harder if I do not succeed in the NLoM chapter.
Unë nuk do të bëj përpjekje të tjera nëse nuk arrij rezultate të kënaqshme në kapitullin LN.
- 9 I am sure that I can learn the NLoM chapter.
Unë jam i/e sigurt se do të arrij t'i përvetësoj temat e kapitullit LN.
- 10 I am sure that I can succeed in the NLoM chapter.
Unë jam i/e sigurt se do të jem i suksesshëm në përvetësimin e temave të kapitullit LN.
- 11 I am sure that I can solve the hard problems of the NLoM chapter.
Unë jam i/e sigurt se do të jem i suksesshëm në zgjidhjen e problemave dhe ushtrimeve të vështira të kapitullit LN.
- 12 I will try my best to solve the problems related to the NLoM chapter no matter how difficult they are.
Unë do të bëj më mirën e mundshme për të zgjidhur të gjithë problemat dhe ushtrimet e kapitullit LN.
- 13 I don't think that the NLoM chapter will have any importance in my prospective vocational life.
Unë nuk mendoj se temat e kapitullit LN do të më shërbejnë në jetën time profesionale.
- 14 I believe that what I've learned in the NLoM chapter will be useful in my daily life.
Temat e kapitullit Ligjet e levizjes se Njtonit do të më ndihmojnë mua në veprimtaritë e jetës së përditshme.
- 15 I like reading books about the NLoM chapter and its applications in technology.
Mua më pëlqen të lexoj libra që tregojnë dhe shpjegojnë zbatimet e temave të kapitullit LN në teknologji.
- 16 The NLoM chapter is entertaining for me.
Temat e kapitullit LN janë zbavitëse.
- 17 I don't like studying on the NLoM chapter at school.
Mua nuk më pëlqen të mësoj temat e kapitullit LN në shkollë.
- 18 I believe I can cope with harder problems of the NLoM chapter.
Unë jam i sigurt se mund të zgjidh problema shumë të vështira nga kapitulli LN.
- 19 Talking with my friends about the NLoM after school is enjoyable.
Mua më pëlqen të flas me shokët pas mësimit për tema që kanë lidhje me kapitullin LN.
- 20 I would like to be given books and tools related with the NLoM chapter as gifts.
Mua më pëlqen të më bëjnë dhuratë libra apo materiale të tjera që lidhen me temat e kapitullit LN.

21 I believe I can solve the hardest problems of NLoM chapter if I have enough time.

Unë jam i/e sigurt se do të mund të zgjidh problemat e vështira të kapitullit LN në se do të kem kohë të mjaftueshme.

22 I like talking about the NLoM chapter or its applications in technology.

Mua më pëlqen të flas me shokët për temat e kapitullit LN dhe aplikimet e tyre në teknologji.

23 The NLoM chapter is effective in improving my manual skills.

Temat e kapitullit LN ndikojnë në zhvillimin e aftësive të mia praktike.

24 I don't want to have more lesson hours for the NLoM chapter.

Unë nuk do të doja që kapitulli i LN të zhvillohej në më shumë orë mësimore se sa tani.