The Development of the Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) and Validity–Reliability Study[*]

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Abstract

This study aims to perform a validity-reliability test by developing the Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) for primary education students. The study group includes 209 fifth grade students at Sabri Taskın Primary School in the Kartal District of Istanbul, Turkey during the 2010-2011 academic year. Structure validity of scale is examined with exploratory factor analysis and first factor is named as school, second factor as family and third factor as environment in accordance with Ecological Theory. Cronbach's alpha internal consistency coefficient, item total and residual item correlation in relation to scale are figured out. Then, significance of difference between top 27% and bottom 27% group item average and relation between item discrimination and two practices have been examined. Total Cronbach alpha value of this scale accounts for .86 and total item value is between .26-.56. *t*-test results are of no significance, with the difference between the top 27% and the bottom 27% of the group's item average being significant, correlation value between two practices is high and there is a significant relation at .001 level as a result. All these results put forth that Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) is valid and reliable scale for education sector.

Keywords

Ecological Theory, Functional Literacy, Literacy, Reliability, Validity.

There are many ways for one to follow pertinent events occurring in his/her area of influence and interest. Among these, television, newspaper, magazine, radio, and internet have made communication between individuals across continents more efficient. To remain informed about events and to keep up with such a quick pace requires a high level of literacy. Beyond the literacy skills of an individual, his/her ability to select essential information among superfluous information, his/her ability to make sense of information, and his/her ability to interpret this information are all required.

Moreover, development of an individual in some aspects such as sense, notion and information

require qualitative read and write activities. After a review of world history, one realizes that societies with a high opinion of science, information, and books are more developed than others. As such, it can be stated that there is a close relation between development and literacy.

In the related body of literature, there is no one clear definition for literacy although definitions related to literacy are clear. However, considering the existing definitions and explanations related to this literacy, it can be clearly stated that literacy does not consist merely of reading and writing, but is much more comprehensive.

Literacy

When looking at the history of literacy, the first international definition was made by experts in charge of normalizing education statistics at a meeting held by UNESCO in 1951. Their definition is as follows: "A person who is literate can comprehend and write simple and short sentences related to his/her daily life." From 1958 UNESCO recommended member states to use this definition. Between 1950 and 1970, studies were conducted to understand how literacy might develop cognitive skills. With the development of literacy's definition, both the terms operational and functional literacy were established. During this period, literacy was summarized as the reading and writing skills necessitated for activities in modern society (Güneş, 2000).

After the 1990s, the notion of literacy began to diversify in relation to technological developments, the change of living conditions in cities, and new necessities. Hereafter, literacy was no longer a monolithic concept, but one which had multiple facets. Literacy began to be used with various types of literacy, such as computer literacy, technology literacy, internet literacy, and media literacy (Altun, 2005). Furthermore, literacy began to be used as a life style which encompasses a person's entire life who lives in a society in which literacy kinds such as information literacy, cultural literacy and universal literacy develop. From among these different kinds of literacy, two, "computer literacy" and "media literacy," are not subjects taught to students during primary and secondary education (Aşıcı, 2009, p. 14). As is seen, the term literacy has changed and developed by undergoing a multitude of phases in accordance with the specific period of a society and the necessities that period entailed. Following these definitions and explanations, it is essential to focus

on the definition of functional literacy to see the difference, similarity or the relations with the term literacy

Functional Literacy

Just as it is the case with the term "literacy," so is it difficult to find a specific, clear definition of functional literacy. At its most basic level, functional literacy may be understood to constitute a second level of literacy after basic literacy in which literary and mathematical information and skills can be used by an individual in personal, social, economic, and cultural endeavors. The most significant point in functional literacy is to learn basic information and skills related to literacy and mathematics and then to use then in one's daily life. In other words, functional literacy level comprises both technical and functional skills. Moreover, it is seen as subsidiary for an individual to prepare and further develop social, citizenship, and economic roles (Güneş, 2000). Çapar (1998) states that a functionally literate person is a "person who is one move ahead of literacy and [who] maintains literacy activity [throughout his/her life in order both] to keep living and [to effectively] accommodate himself/herself to his/her surrounding[s]." It is furthermore stated in this definition, that literacy is an ongoing process.

In UNESCO resources, functional literacy is defined by De Castel (1971) (Gökşen, Gülgöz, & Kağıtçıbaşı, 2000, p. 4 as cited in Savaş, 2006) as follows: "If an individual is able to take part in significant activities in professional, social, political, and cultural fields for a society he/she lives with the help of literacy skills of his/her own, it is possible to define that person as functional literate."

In literature, there are many similar definitions about literacy and functional literacy. Hatch (2010:4) defines it simply by looking at the American Heritage College Dictionary (AHCD). Accordingly, he states that this definition is simple, that the expression "functional" appears in dictionary as "building capacity," and that "literacy" appears in dictionary as "reading and writing skills." Hatch also states that when these two words are combined, the following definition is constructed: "*The capability of reading and writing at a level proficient enough to conduct one's daily affairs.*" As is seen, Hatch's definition is quite clear and simple. Knoblauch and Brannon (1993, as cited in Jabusch, 2002, p. 20), on the other hand make a standard distinction between basic literacy and functional

literacy. According to Knoblauch and Brannon, "*the expression "functional" is taken to indicate performance with texts, including mathematics. Conventional literacy, therefore, is the ability to read labels and signs sufficiently to buy food and use public transportation.*"

There is a different definition for functional literacy in the Education for All Global Monitoring Report (UNESCO, 2006). According to this definition, functional literacy means the ability to make significant use of activities involving reading and writing skills which includes using information, communicating with others, and following a path of lifelong learning necessary for that individual's ability to express him/herself in daily life. UNESCO's definition also adds that functional literacy includes those skills essential for both official and unofficial participation as well as those which are necessary for national change and development that can be used to aid an individual in contributing to himself/herself's own development and that of his/her family and society. Based on these definitions, functional literacy can be defined as such: An activity which contributes to the development of an individual and society, including one's ability to use information and skills related to listening, speaking, reading, writing, and arithmetic necessary for daily life in every aspect of life (social, cultural, economic) effectively. In this study, functional literacy is discussed in accordance with this sense.

Ecological Theory

On the other hand, the theoretical framework on which this study is based and from which the scale takes its named is the "Ecological Theory." This particular theory was developed based upon the philosophical opinions made by Bronfenbrenner in 1976. The ecological model explores the external and internal influences on a child's growth and development. According to Bronfenbrenner (1976), a child is born and grows up in a social and cultural setting. Every social and cultural setting is nested in the influence of other social and cultural settings. For an example: a child is born in a family and every family has its own social norms and cultures, histories, values and disciplines; the family is connected to the school, community and other institutions. All of the connecting agents have a great impact on the child's family which in turn influences the child. Bronfenbrenner, 1976 as cited in Begum, 2007, p. 17). Cook and Kilmer (2010) also mention Ecological Theory under the

name "Ecological System Theory" in parallel with the expressions above. The systems reflect an array of nested components that have an impact on a child's growth, development, and adaptation: those directly interacting with and affecting the child (i.e., such as the family environment, teachers, and peers), and broader, more indirect forces (i.e., such as neighborhood characteristics, community, and socioeconomic status) that affect the child and family.

Furthermore, according to Bronfenbrenner's Ecological Theory, an individual's environment comprises a complex relations system consisting of interconnected systems. An individual's development is affected by these systems' mutual and internal relations as well as by his/her relationship with the society in which these relations exist (Bronfenbrenner, 1979; Lindo, 1997 as cited in Obalar, 2009).

Ecological Theory examines different subcultures to which people belong. These subcultures include the microsystem, mesosystem, ecosystem, and macrosystem. The microsystem covers the environment to which a child is connected. The microsystem includes, first and foremost, one's family, followed by his/her kindergarten and other social areas, like parks, which form the social network(s) where children communicate face-to-face (Guterman et al., 2000 as cited in Cummings, Goeke-Morey, Schermerhorn, Merrilees, & Cairns, 2009).

The second phase of subculture, as based upon Brofenbrenner's theory, is the mesosystem. The mesosystem reflects one's professional relation, including the networks within his/her microsystem as well as other social networks. These include, for instance, one's school site as well as outings with friends, both which act to support an individual's personal and social growth and development (Tissington, 2008).

The mesosystem refers to social settings that do not contain individual, but that affect his experiences in social network. For example, work experiences may affect a person's relationship with his family (Tissington, 2008).

When it comes to the macro system, it refers to consistencies .Accordingly each person belongs to different subcultures. People's own belief system and ideology lead them to become involved in different activities that occur within these subcultures. In the last stage Bronfenbenner emphasizes the ideology, norms, values, and belief system of each cultural

setting. At this stage a child interacts in different institution based on the norms,

ideologies and beliefs of the child (Bronfenbrenner, 1976 as cited in Begum, 2007, p. 19).

As is seen, the basic term of Ecological Theory is the triangle relationship between one's family, school, and environment. This triangle is essential for both the language acquisition process and the functional literacy of a child. In that case, it can be stated that the ecological environment of an individual is useful in cultivating functional literacy and in enhancing academic success.

In the present study, the development of the Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) which determines the functional literacy level of primary school children and which studies its validity reliability shall provide a new measurement device in literature, thereby helping to further develop this field. From this vantage point, the following questions shall be discussed:

-What is the level of validity of the *Functional Literacy Experience Scale based upon Ecological Theory* developed for fifth grade students in primary school?

-What is the level of reliability of the *Literacy experience scale based upon Ecological Theory* developed for fifth grade students in primary school?

Method

Model and Study Group

Since this study has set out both to develop a new scale and to study its validity and reliability, it has been designed as a screening model. The study group includes a total of 209 fifth grade students from Sabri Taskın Primary School in the Kartal district of Istanbul, Turkey during the 2010-2011 academic year. The reason why this study has been applied to fifth grade students is to observe the source of functional.

Related studies for scale development

When any scale is to be developed, there is a specific process that should be carried out in terms of research techniques. According to Karasar (2005, pp. 136-153), the basic phases for developing a scale are as follows:

a) Forming the items for the scale,

b) Seeking expert opinions,

c) The preliminary test phase, and

d) The reliability measurement phase.

In this study, the phases stated above form the base in determining the functional literacy experience of fifth grade students in primary school.

Accordingly, the most important step before developing any scale is to review the related literature. As such, both domestic (from Turkey) and international literature in relation to literacy and functional literacy required review. Moreover, the theoretical basis related with this matter, similar research projects, data collecting tools, and the literature reviews used in these studies need to be compiled. These are: Chang et al. (2011), Arke and Primack (2009), Chang (2008), Bush, Welch, and Burt (2008), Audet (2008), Donohue (2008), Hall (2008), Janes (2008), Rivas (2008), Steiner (2008), Smith (2008), Stepp (2008), Wilson (2008), Begum (2007), Bunn (2007), Caspe (2007), Cheng (2007), Garrett (2007), Kingsley (2007), Holloway (2007), Howell (2007), Molosiwa (2007), Nebrig (2007), Poppe (2007), Porter (2007), Sanago (2007), Shaw (2007), Xu (2007), Msengi (2006), Collins (2005), Stephens (2006), Johnson (2005), Constantine (2004), Nederland (2004), Scott (2004), Stevenson (2004) .

During the second phase, an interview between the researcher and branch teacher discussing the study and subject matter was held. The opinions and suggestions of teachers in relation to the subject matter were evaluated and the measurement tool(s) discussed, which resulted in specific research tools being recommended. Afterward, the independent variables were recorded.

During the third phase, the researcher gathered and organized information in relation to subject matter. In fourth phase, the researcher rearranged the expressions of some of the items, preparing a wide item pool for the scale (100 items). In the next phase, similar items were compounded after consulting eight experts which resulted in some of the items being removed and the rest being rearranged. Consequently, the scale was reduced to a total of 80 items. It was also examined by a Turkish Language and Literature expert in terms of language and expression. After such evaluation, a pilot of the scale began to be implemented. After the 40-person pilot for fifth grade students at primary school, a number of interviews were conducted

with two thesis advisors, one of whom was an expert in sociology and the other an expert in Language, Literature, and Turkish teaching as well as with five expert classroom teachers. As a result of the interviews, it was concluded necessary to make some of the items in the scale more understandable and to review the other items once again.

After reconstructing the scale with the revised items, the next phase was the validity phase. It is customary for an exploratory factor analysis to be conducted during validity studies. Furthermore during this phase, the items were examined once again by a team of eight experts, consisting of a sociologist, a psychologist, an assessment and evaluation expert, a Turkish Language and Literature expert, two field experts, and two expert teachers. Afterward, those items agreed on for correction were once again studied, resulting in the total number of items in the scale being reduced from 100 to 66 items. Also during this phase, test-retest consistency was performed 3 weeks after the original test on 95 of the original 209 students (the rest of the students did not want to participate in the application once again). Finally, the data were evaluated using Pearson's correlation analysis.

During the structure validity study of the scale, both Kaiser-Meyer-Olkin's (KMO, Sampling sufficiency statistic) and Barlett's test values were measured. A factor analysis was also carried out and the correlation between factors and the total score was measured using Pearson's product moment correlation coefficient. The structure validity test showed an accurate measurement level of the factors which is abstract concept within the context of behavior that is required to be tested. "To what degree questions measure various behaviors" is related to structure validity (Büyüköztürk, 2006, p. 168). Sub-factors were formed by performing an exploratory factor analysis. By rotating the axis 3 times, items factor loadings of which are below .35 were removed and scale items were ultimately decreased to .32.According to Büyüköztürk (2006, p. 169), the value for factor loading can drop to as low as .30.

Whether the data set that the researcher had collected via scale/survey is appropriate for factor analysis or not was decided through the sampling efficiency value. The prerequisite for factor analysis is the correlation/relation between variables proportionately. The Barlett sphericity test shows whether there exists a sufficient relation between variables. Accordingly, if the results of test are significant, a sufficient relation exists to justify conducting a factor analysis. However, if the results of test are not significant, then variables are considered inappropriate for factor analysis. Similarly, the Kaiser-Meyer-Olkin (KMO) sampling efficiency tests compatibility of the correlation among variables for factor analysis. The KMO value ranges between 0 and 1 with the lowest acceptable value being .50.

Furthermore, correlations between factors, both between themselves and with the total score, are measured with Pearson's moment correlation coefficient. After performing the appropriate analysis, the correlation between the total score and factors, as well as between individual factors, was found to range between .363 and .849.

Within the framework of the Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) validity studies, Cronbach's alpha reliability coefficient, total item, residual item score correlation, item distinctiveness and test-retest reliability values were measured. A reliability analysis is used to test whether expressions forming measurement tools produced in an attempt to collect data from units forming sample in any subject matter are consistent between one another (Ural & Kılıç, 2006, p. 286).

In case the answers given to Cronbach's alpha test items account for three and more, that is based upon measurement of alpha coefficient (Büyüköztürk, 2006, p. 171). Since a 3-point Likert scale was prepared, Cronbach's alpha coefficient was measured. Consistency between Cronbach alpha reliability coefficient and total item is measured. Possible values range between 0.00 and 1.00 with higher values (those values close to 1) indicating reliability (Şeker & Gençdoğan, 2006, p. 41). In the case that the Cronbach alpha value is .70 or above, the scale is considered to be reliable. However, when the total number of questions is little, values of .60 and above are accepted (Sipahi, Yurtkoru, & Çinko, 2006, p. 89). For the present study, the total reliability coefficient of the scale was found to be .868, with the scale's first factor being .836, its second factor being .747, and its third factor being .746. These values are significantly high.

Item total score correlation explains the relation between test items score and the total test score. Item-total correlation's being positive and high indicates that items sample similar behaviors of items and internal consistency is high (Büyüköztürk, 2006, p. 171). Since item-total correlation's being low has an impact which hampers reliability, these items have been removed from scale (Tavşancıl,

2002, p. 33). Büyüköztürk (2006, p. 171), states that statistical significance can be accepted as benchmark in evaluating item-total correlation. However, he also states that by considering the fact that slight correlation can be significant in large samples, it is necessary to be more conservative for significance level while deciding on significance and he adds that items below .20 correlation value should be removed from scale. It is observed that some limit values are benchmark in evaluating item total correlation. Overall, it can be stated that items of which item-total correlation is .30 and above distinct the individual very well and items between .20 and .30 can be tested if obligatory or it is essential to correct item. It can also be signified that items below .20 should not be tested. (Büyüköztürk, 2006, p. 171) Item-total and residual item analyses aims at reflecting relation between each test item and total test. In item-total analysis, there are also comparisons including test item to the total test. After all, when it comes to residual item technique, there are comparisons not including test item to the total test (Balcı, 2009).

Item discrimination is to test difference between item average score of sub 27% and super 27% group formed in accordance with total test score via unconnected t-test (Büyüköztürk, 2006, p. 171). In this analysis, after grading a test, test papers are put in order from the highest score to the lowest in accordance with total score. Test papers are distinguished as 27% of the highest score forming "super group" and 27% of the individual with lowest score forming "sub group" (Tavşancıl, 2002, p. 55). Significance differences observed among groups is evaluated as indicator of test internal consistency (Büyüköztürk, 2006, p. 171).

Common evaluation in relation to measurement of test-retest continuity coefficient is in the way that it is essential to observe relation level between two practices. Expected result is significant relation between two practices. Another opinion is to observe whether there is a distinction between two practices or not. Expected result is that there is not a significant result between two practices (Şimşek, 2007, p. 131). In this study, continuity coefficient from measurements related to reliability is evaluated both as relational and also as difference. Then, the scale is performed for same group including 95 people three weeks later.

Operations

A validity-reliability study of the scale was carried out independent of the main application and then main application follows this process. First, the researcher screened both domestic and international literature and consulted experts for their opinions. Then, the *Functional Literacy Experience Scale based upon Ecological Theory* which is prepared for primary school students and three-point Likert and consists of 32 items and three sub-dimensions is conferred upon 300 primary school fifth grade students for validity reliability study however 220 out of 300 are filled by students. When the scales filled by students are examined, it is observed that there are some mistakes and deficit points in forms. In the end, 209 out of 220 were evaluated.

Analysis and Resolution of Data on Functional Literacy Experience Scale based upon Ecological Theory (FLESBUET) Validity- Reliability Studies

Data were analyzed and resolved using the SPSS 18.0 package program. Accordingly, the Kaiser-Mayer-Olkin (KMO) value, Barlett's test, and exploratory factor analysis are figured out for validity analysis and Pearson moment Pearson product moment correlation coefficient is calculated for indicating factors' relation between total score and one another. When it comes to reliability analysis, internal consistency coefficient, Cronbach alpha reliability coefficient, item-total and residual item score correlation coefficient, item discrimination index is figured out and finally correlation and independent group t test are carried out for test-retest analysis.

Findings

Findings in relation to Study of Functional Literacy Experience Scale based upon Ecological Theory

The most significant aim of this study is to what degree "Functional Literacy Experience Scale based upon Ecological Theory" for fifth grade primary school students is reliable. In line with this overall aim, KMO value, factor load in exploratory factor analysis and correlation value among factors have been figured out. Accordingly, findings indicate that the scale has three factors structure and Functional Literacy Experience Scale based upon Ecological Theory finalized by three axis rotating and including 32 items has 3 sub-dimensions such as school, environment and family. 14 items are gathered in first factor, 7 items in second factor and 11 items in third factor. Items below .35 factor load are removed from the scale. According to

Büyüköztürk, factor load can be drop down to .30 (Büyüköztürk, 2006, p. 124).

Another finding is directed to the fact that factors correlation value with total score and one another changes between .363 and .849. Accordingly, correlation between total score and first factor accounts for .849, correlation between total score and second factor is .715 and correlation between total score and third factor is .747. Correlation between first and second factor accounts for .489, correlation between first and third factor is .363 and correlation between second and third factor accounts for .371.

Findings in relation to Reliability Study of Functional Literacy Experience Scale based upon Ecological Theory

Second aim of this study concerns to what degree Functional Literacy Experience Scale based upon Ecological Theory developed for fifth grade primary school students is reliable. For this general aim of the study, internal consistency coefficient, item total, residual item correlation, item discrimination value and test-retest application have been carried out. Accordingly, total internal consistency coefficient of this scale is $r = .868$. This finding indicates that total items of the scale have internal consistency. Furthermore, internal consistency of the first factor accounts for $r = .836$, internal consistency of the second factor is $r = .747$ and when it comes to internal consistency of the third factor, it accounts for $r = .746$. This finding indicates that all items of the scale have internal consistency.

Besides, item total correlation of Functional Literacy Experience Scale based upon Ecological Theory is significant at .001 level and when it comes to residual item value, it indicates that any value does not exceed .868 which is a total internal consistency coefficient. This shows that any item does not hamper internal consistency. When it comes to item discrimination, it is significant at .001 level. This is another benchmark that indicates items of the scale are consistent.

As a result of test-retest application of the scale, in both applications, total score correlation of this scale accounts for .850, correlation value of first factors is .742, correlation value of second factors is .770 and correlation value of third factors accounts for .999. Between two measurements, there is quite significant relation for all factors at .001 level. For instance; these results indicate that there is test-retest reliability.

Conclusion and Discussion

The findings of the study indicate that the Functional Literacy Experience Scale based upon Ecological Theory is an effective measurement tool. The Functional Literacy Experience Scale based upon Ecological Theory has been consulted to be examined and then evaluated by eight experts that are consisted of a sociologist, psychologist, assessment and evaluation expert, Turkish Language and Literature expert, two field experts and two expert teachers. In that context, it can be stated that the scale has a content validity. Kaiser-Meyer-Olkin (KMO) value is high and Barlett's test is significant. These results confirm that the scale has content validity. The other step taken within the scope of validity study is structure validity. For this, exploratory factor analysis is carried out. Accordingly, factor load value of Functional Literacy Experience Scale based upon Ecological Theory is higher than acceptable value. In conclusion, correlation value, last step of the validity study between factors has been figured out. As a result of analysis, it becomes evident that correlation value of factors with total score and with one another is at sufficient level. All statistical analyses demonstrate that the scale is an effective scale.

As a result of statistical analyses based upon the second aim of this study, Functional Literacy Experience Scale based upon Ecological Theory for fifth grade primary school is a reliable measurement tool. Within this context, Cronbach alpha reliability coefficient, item total, residual item score correlation, item discrimination and test-retest reliability value have been figured out. Results of all these statistical operations indicate that the scale is highly reliable.

Although there are a wide number of scales developed in relation to literacy in domestic and international literature, there is, at the time of conducting this study, no scale which measures functional literacy. In the study (2011) of which media literacy in relation to primary school students is developed and validity of which is carried out, Chang et al. (2011) performed a study on 300 students (149 out of 300 are female). A 13-item scale was prepared in the form of a 5-point Likert and confirmatory factor analysis of this scale is carried out. As a consequence of exploratory factor analysis, it is observed that items of the scale are between.513 and.763. Total Cronbach alpha coefficient of the scale accounts for 0.9. In a study performed by Arke and Primack (2009), validity reliability analysis of media literacy scale is

carried out on 34 college students and five-factor structure of the scale Cronbach alpha coefficient of which is 0.9 in total has been detected. Overall, it became evident that the scale is effective and reliable. Chang (2008) developed computer technology literacy scale for Taiwanese primary school students and 0.96 value has been detected on 1539 students. When it comes to total variant value of the scale, it accounts for 57.13% and Cronbach alpha coefficient is 0.93. In the study including literacy activities developed for 219 pre-school students by Buhs, Welch, Burt, and Knoche (2011), there is an acceptable harmony between confirmatory factor analysis and factors of the scale and it is demonstrated that the scale is effective and reliable. In a study performed by Stephens (2006), the scale measuring computer literacy of students is developed and he also compared the scale he developed with another scale developed previously. In conclusion, there is a relation between two scale at .93 level and it is evident that there is a harmony between these two scales.

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