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YENİ BİR ÖRGÜTSEL DEĞİŞİM PERSPEKTİFİ: ÖRGÜTLERE OTOPOYİYETİK YAKLAŞIM VE OKULLARA YÖNELİK OTOPOYİYEZ ÖLÇEĞİNİN GELİŞTİRİLMESİ

A NEW ORGANIZATIONAL CHANGE PERSPECTIVE: AN AUTOPOIETIC APPROACH TO ORGANIZATIONS AND DEVELOPMENT OF AUTOPOIESIS SCALE FOR SCHOOL

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ÖZ: Bu çalışmanın amacı; özgün kimliğini koruyarak ve kendini yeniden üreterek var etme anlayışına dayalı örgütsel değişim anlayışını vurgulayan otopoyiyetik yaklaşıma ilişkin kavramsal bir çözümleme yapmak ve eğitim örgütlerinde otopoyiyez değişime ilişkin bir ölçme aracı geliştirmektir. Araştırma ilkokul, ortaokul ve liselerde görev yapan toplam 250 öğretmenden oluşan bir örneklem grubu üzerinde yapılmıştır. Araştırmada geliştirilen Otopoyiyez Ölçeği iki alt ölçekten oluşmaktadır. Birinci alt ölçek "Otopoyiyez Anlayışı Benimseme Ölçeği", ikinci alt ölçek "Okullarda Otopoyiyez Yaklaşım Ölçeği"dir. İki alt ölçeğin kapsam ve yapı geçerliliği için ayrı ayrı açımlayıcı faktör analizi yapılmış, sonuçlar doğrulayıcı faktör analiziyle sınanmıştır. Analizler sonucunda iki alt ölçekten oluşan Otopoyiyez ölçeğin, okullarda otopoyiyetik yaklaşımı öğretmenlerin ne düzeyde benimsediğini ve okullarda mevcut otopoyiyetik değişim düzeyini ölçebilecek geçerli ve güvenilir bir ölçme aracı olduğu belirlenmiştir.

Anahtar sözcükler: Değişim, Örgütsel değişim, Otopoyiyez, Otopoyiyetik yaklaşım

ABSTRACT: This study is aimed at making a conceptual analysis of the autopoietic approach, which emphasizes organizational change based on the understanding of creating itself by preserving its original identity and by reproducing itself, and to develop a measurement tool for autopoietic change in educational organizations. The research has been conducted on a study group consisting of 250 teachers working in primary, secondary and high schools. The Autopoiesis Scale developed in the research consists of two subscales. The first subscale is "Adopting Autopoiesis Understanding Approach Scale", the second subscale is "Autopoiesis Approach Scale in Schools". Exploratory factor analysis has been conducted separately for the content and construct validity of the two subscales, and then the results have been subjected to confirmatory factor analysis. As a result of the analyses, it has been determined that the Autopoietic Scale, which consists of two sub-scales, is a valid and reliable measurement instrument that can measure the level of teachers' adoption of the autopoietic approach in schools and the current level of autopoietic change in schools.

Keywords: Change, Organizational change, Autopoiesis, Autopoietic approach

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GENİŞ ÖZET

Giriş

Örgütler, dinamik yapılar olarak; değişen toplumsal ilişkilere, ortaya çıkan yeni ihtiyaçlara ve teknolojik yeniliklere paralel olarak sürekli yapısal değişime uğrar ve yeni formlara evrilirler. Yerel ya da evrensel karakterdeki küçük ya da büyük ölçekteki değişimler, bu değişimlere uyum gösterme eğilimindeki örgütler açısından kimi avantajlar sağlasa da, bu değişimlerin ölçeği ve özellikle sürekliliği, bunlara uyum gösterme çabası gösteren örgütler için pek hesaba katılmayan bazı sorunlar yaratma riskini de barındırır. Sürekli değişim karşısında savrulurcasına bu değişimlere ayak uydurma çabası, örgütlerin kendi özgün kimliklerini korumalarını, kendileri olarak var olmalarını ve kendi geleneksel karakteristikleriyle varlıklarını sürdürmelerini zorlaştırabilmektedir. Dışarıdan esen yönü belirsiz ve bitmez rüzgarlara kapılarak savrulan yaprak misali girilen sürekli değişim, örgütü kendisi olmaktan çıkararak yeni bir örgüte evrilme durumunda bırakabilir. Bu yüzden birçok örgüt, kendisini diğer örgütlerden ayıran özelliklerini kaybederek geleneksiz ve köksüz bir görüntüye bürünmektedir. Bu anlamda örgütler, yeni ve özgün bir alternatif değişim anlayışını yansıtan otopoyiyetik yaklaşıma uygun bir değişim iradesi benimseyebilirler. Yeni bir örgütsel kavram olarak otopoyiyez, örgütün kendi özgün kimliğini koruyarak varlığını sürdürebilmesi için, kendi iç dinamikleriyle kendini yeniden üreterek var etme anlayışına dayalı bir örgütsel değişimi vurgular. Bu çalışmanın amacı; yeni bir örgütsel değişim anlayışını vurgulayan otopoyiyetik yaklaşıma ilişkin kavramsal bir çözümleme yapmak ve eğitim örgütlerinde otopoyiyez değişime ilişkin bir ölçme aracı geliştirmektir.

Yöntem

Otopoyiyez ölçeğini geliştirme süreci üç aşamadan oluşmaktadır. İlk aşamada, otopoyiyetik yaklaşım ile ilgili alan yazın incelenmiştir. İkinci aşamada, madde havuzu oluşturulmuştur. Bu aşamada kuramsal temel dikkate alınarak iki alt ölçek (otopoyiyez anlayışını benimseme, okullarda otopoyiyez yaklaşım) olarak tasarlanan ölçek için 93 maddelik taslak hazırlanmıştır. İki alt ölçek içerecek şekilde tasarlanan ölçeğin, otopoyiyetik yaklaşıma bakışı ve okullardaki durumu birbiri ile ilişkili bir bütünlük içinde ortaya koyabileceği değerlendirilmiştir. Üçüncü aşamada, maddelerin uygunluğu, anlaşılırlığı ve gramer yapısı için uzman görüşüne başvurulmuştur. Bunun için hazırlanan uzman değerlendirme formunda her bir maddenin yapı ve içerik açısından uygunluğuna ilişkin değerlendirmelerin yapıldığı bir değerlendirme ölçeği ve görüş kısmı yer almıştır. Uzmanların değerlendirmeleri sonucu gerekli düzenlemelerin yapılmasıyla ölçek 71 maddeye indirgenerek uygulamaya hazır hale getirilmiştir. Bu maddelerin 40'ı *otopoyiyez anlayışını benimseme* alt ölçeği, 31'i *okullarda otopoyiyez yaklaşım* alt ölçeği ile ilgilidir. Ölçme aracı, gerekli izinler alınarak 2018 yılı güz döneminde Van ili Erciş İlçesinde ilkokul, ortaokul ve liselerde görev yapan toplam 250 öğretmenden oluşan bir örnekleme uygulanmıştır.

Sonuç

Açımlayıcı ve doğrulayıcı faktör analizleri sonucunda, eğitim örgütlerine yönelik özgün bir değişim anlayışını vurgulayan otopoyiyez yaklaşıma ilişkin geliştirilen Otopoyiyez Ölçeği iki alt ölçekten oluşmuştur. Birinci alt ölçek Otopoyiyez Anlayışı Benimseme Ölçeği, ikinci alt ölçek Okullarda Otopoyiyez Yaklaşım Ölçeğidir. Ölçek, beş dereceli Likert tipinde bir katılım ölçeğidir. Ölçeğin birinci alt ölçeği olan otopoyiyez anlayışı benimseme ölçeği, beş faktörlü ve 25 maddeden oluşmaktadır. Bu ölçekten alınabilecek puanlar 25-125 arasındadır. Puanın yüksekliği katılımcıların otopoyiyez anlayışı yüksek seviyede benimsediklerini gösterir. İkinci alt ölçek olan okullarda otopoyiyez yaklaşım ölçeği, üç faktörlü ve madde sayısı 16'dır. Bu alt ölçekten alınabilecek puanlar 16-80 arasındadır. Puanın yüksekliği, okullarda otopoyiyetik değişim anlayışına dayalı karar ve uygulamaların hakim olduğunu gösterir. Sonuç olarak ayrı ayrı yapılan AFA ve DFA analizleri sonucunda iki alt ölçekten oluşan Otopoyiyez Ölçeğinin, okullarda otopoyiyetik yaklaşımı öğretmenlerin ne düzeyde benimsediğini ve okullarda mevcut otopoyiyetik değişim düzeyini ölçebilecek geçerli ve güvenilir bir ölçme aracı olduğu belirlenmiştir.

INTRODUCTION

Organizations, as dynamic structures; in parallel with changing social relations, emerging new needs and technological innovations, undergo constant structural change and evolve into new forms. Although small or large-scale changes of local or universal character provide some advantages for organizations that tend to adapt to these changes, the scale and especially the continuity of these changes also have a risk of creating some problems that are not taken into account for organizations that try to adapt to them. The effort to keep up with these changes, as if tossing in the face of constant change, can make it difficult for organizations to preserve their original identities, exist as themselves and maintain their existence with their own traditional characteristics. Constant change, like a leaf blown away by the uncertain direction and endless winds blowing from the outside, can leave the organization out of itself and leave it to continue as a new organization. For this reason, many organizations lose the characteristics that distinguish them from other organizations and take on an untraditional and rootless image. One of the ways to exist by preserving its original identity in the face of this brutal and continuous change is to adopt a will for change in accordance with the autopoietic approach, which reflects the understanding of reproducing and creating itself through the organization's self-dynamics.

One of the most important reasons for some failure and corruption in organizations is that the organization receives every input open to all environmental impacts. This situation causes the culture, image and many other values of organizations to change or erode rapidly. It is considered important that organizations need to protect their own identity, culture and values in the face of dizzying developments in their environment. In this sense, autopoiesis, which was used in biology and later adapted to social sciences, reflects an understanding of change that reveals that organizations need to open the thick curtain between themselves and their environment in order to have the chance to renew themselves by changing and acquire a systemic identity (Çobanoğlu, 2008). It is considered that the understanding of autopoiesis can play an important role in the development and preservation of the concepts of identity and culture of organizations (Toytok, 2016).

Autopoiesis, which is Latin origin and means self-production, was first put forward by Chilean biologist Humberto Maturana and his student Francisco Varela in 1972. As a biological concept, autopoiesis has been used to describe living systems. The birth of this concept was a matter of curiosity, and two biologists were asked questions about the concept.Maturana (1991, xvii) stated that the circular organization definition was insufficient to describe living systems as unity, and they sought a term that would convey autonomy, which is the most basic feature of living systems, on its own. One day, while talking to his friend about an article about Don Quixote, he stated that he realized the power of the word and understood that the word he was looking for was "autopoiesis".

When the literature is examined, it is seen that the concept of autopoiesis is defined in three different ways: the biological meaning acquired by Maturana, the sociological meaning adapted by Niklas Luhmann, and the meaning in the organization theory. Although these definitions are similar to each other, they basically offer different perspectives (Toytok, 2016).

Biologically, autopoiesis was first developed by Maturana and Varela to indicate that cognition is a living phenomenon and to offer a new perspective (Whitaker, 1995). Autopoietic systems, which are living systems, are systems that produce themselves from their own cells. The eukaryotic cell, which is the embodiment of the autopoietic system, consists of various biochemical components such as nucleic acids and proteins. The cell nucleus is organized into limited structures such as various cell organelles, cell membrane, and cytoskeleton. Varela defined autopoyesis as a machine that constantly renews itself. It is a machine that can produce its own parts with its own system and has a circular structure fed by itself (Schatten, 2008, 76).

Autopoiesis, a sociological concept, was first introduced to sociology by the German sociologist Niklas Luhmann. Luhmann conceptualized social systems as systems that reproduce on the basis of their own elements. Luhmann treated autopoietic systems as both open and closed systems. Being in interaction with their environment is open system feature; The fact that the environment cannot affect the structure and process of the system also shows the feature of a closed system. Autopoietic systems have both open and closed systems; unlike open systems, there is no input and no output; The difference from the closed system is that the operations are repeated (Luhmann, 1986).

Ertong (2011) mentioned five features of social autopoietic systems. These are; 1) it produces the elements that form the basis of the system, 2) regulates itself, 3) determines its own limits, 4) separates the system from the environment, and 5) regulates its internal structures. Looking at these features, we see that autopoietic systems have the feature of separating the system and the environment by drawing their boundaries, as well as producing and regulating themselves. In this system, which exists in interconnected, coordinated and language-based social networks, it is possible for all elements of the system to produce itself and for many elements to form a structure by determining the limit to cover the whole system (Balyer, 2014). Luhmann divided the autopoietic systems into three (Figure 1).

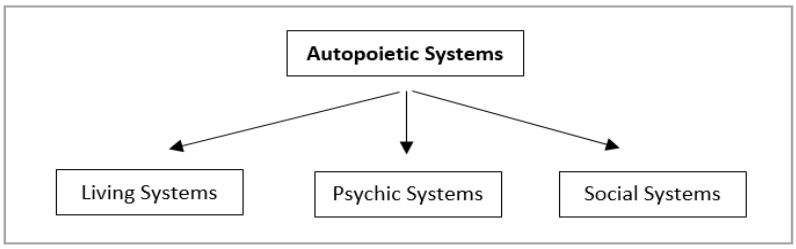

Figure 1. Types of Autopoietic Systems (Luhmann, 1986)

Luhmann stated that autopoietic systems consist of psychic systems, living systems with self-renewal features such as cells, brains and organisms, and social systems consisting of society, organization and interactions.

The survival and success of organizations is possible by following the changes in the environment and adapting to these changes. However, it is also important for organizations to realize the change in accordance with their own structures. It is necessary to distinguish between the controlled change that takes place with the participation and support of the members of the organization and the unplanned and uncontrolled sudden change (Özdemir, 2000, 55). Considering the meaning of autopoiesis in organization theory; The autopoiesis approach offers a new perspective on changes in the environment that are seen as problems for organizations and how to deal with them. According to the autopoiesis, all living systems are autonomous interaction systems that refer only to themselves and show closed organization characteristics. The main requirement for the definition of autonomous systems in autopoiesis is not a set of inputs and outputs, but an internal consistency resulting from the interdependence of a system's inputs and outputs. In this context, organizational closure requires a kind of self-expression, whether material, linguistic or social, rather than a specific production process (Varela, 1984, Mingers, 2001, 111; cited in Magalhaes & Sanchez, 2009). This feature of closure that Maturana and Varela mentioned is the system's self-referencing to maintain stable relationship patterns. This self-referencing feature is seen as what distinguishes systems from other systems.

The autopoietic system is likened to the homeostatic system in the human body. Just as the body tries to maintain its normal balance against harmful substances coming from outside in homeostasis, it will be beneficial for organizations to protect their own internal structure against unnecessary inputs from outside (Maturana, 1975). From this, we can say that the autopoiesis protects its inner environment by acting selectively against the inputs from the environment. In other words, instead of including the inputs directly into the system, it adapts it to the structure of the system and rearranges it in its own internal structure. To explore this system, it is necessary to interact and follow the circular interaction pattern. However, since this interaction ring is closed, the system has no beginning and no end. E.g; In the way honeybees are organized, we encounter self-referential systems within self-referential systems. As an organism, the bee lives in a community of bees, which has a unique circular organization, considers itself a source of reference, forms a chain based on physiological processes, and has cyclical relationships. At the same time, the relationships between the bee community and the general ecology are circular. When we eliminate the bees, the whole ecology will change. Because the bee system is connected with the botanical system, and the botanical system is connected with the insect, animal, agriculture, human and social systems. All of these systems are self-referential and return to each other. A change in any of the elements can transform all of the other elements (Morgan, 1998, 282-283).

Goldspink and Kay (2009) discussed autopoiesis and social systems in their study and talked about the biological appearance and working methods of social system change. Their analysis showed how the management processes are associated with a new form of organization and how they are affected

by technical and social fabrics, and how conventional methods can be used. It also helps answer a longstanding controversial question among users of autopoietic theory (are social systems autopoietic?). In the study, which investigates the way social systems work by using various models, Wikipedia, which is defined as a self-organizing online community, is likened to autopoietic systems as a working method. In addition, in the study, in order to distinguish autopoietic systems from other systems, by specifying the criteria of Maturana and Varela, it is stated that the borders in social systems are defined by the observers, and the places where we draw the borders are important. They explained that the Wikipedia review provides an example of the type of data that can be used for this purpose, and the implications of plotting it in different places. A similar study was done by Pamkowska. Pamkowska (2008) gave Wikipedia as an example for autopoietic organizations in her study titled "Autopoiesis in virtual organizations". Defined as the free encyclopedia that anyone can contribute to, Wikipedia is collaboratively written and edited by volunteers from around the world with internet access. All authors must abide by the mandatory rules. Volunteers form a virtual organization. Stating that Wikipedia has a structure that constantly updates, produces and organizes itself with the contributions of its users, Pawkowska explains that this closed production network, which determines its extension by creating its own borders, exhibits autopoiesis.

Like other organizations, the resistance of educational organizations to change as well as their constant, disproportionate and unplanned changes creates an obstacle to development. Godin (2007) expresses the traditional aspect of schools in his work “Purple Cow” with these words: “We operate our schools like factories. We arrange the children on a straight line and divide them into clusters; we call it class and we work hard so that no defective parts remain” (p. 54). Schools show social and open system features with their existing structural features. With this structure, it is affected by external factors and has a permeable structure. This situation makes it difficult for schools to create their own identity (Toytok, 2016) and to preserve their original identity in the process of change (Çobanoğlu, 2008).
Schools that start the change by planning based on needs, update their programs with strategic plans and continuous evaluations, and renew themselves by including people in the process, manage the change well. Because success in change is related to employees' belief in the necessity of change. Seeing the positive results of change is possible by seeing change as a natural, continuous and need-based process (Ostrom, Martin, Zacharakis, 2008).

It is considered unacceptable that schools, which are organized structures, should be managed centrally and stagnantly, as in classical theories, and it has been predicted that a new and different management approach will affect people and organizations more. In this context, some new management approaches have been developed as an alternative to traditional management approaches. Autopoyesis, which emphasizes self-generating and regenerative systems, is one of the new approaches. The autopoietic approach offers an important alternative perspective of change in order to preserve values and organizational identity in our age of rapid change as educational organizations. One aim of this study is to make a conceptual analysis of autopoietic change as a new perspective of organizational change, and another aim is to develop a measurement instrument for the autopoietic approach, which emphasizes a unique understanding of change for educational organizations. Since no scale developed for autopoiesis has been found in the field of education or in other fields in Turkey, it is thought that the developed scale will fill a crucial gap in the field.

METHOD

Development of The Scale

The process of developing the autopoiesis scale, which will be used to determine the teachers' adoption of the autopoiesis approach and the autopoiesis of the schools, consists of three stages. In the first stage, the literature on the autopoiesis approach was examined. In the second stage, an item pool has been formed. At this stage, a 93-item draft has been prepared for the scale, which has been designed as two subscales (adopting the understanding of autopoiesis, approach to autopoiesis in schools) considering the theoretical basis. It has been evaluated that the scale, which has been designed to include two subscales, could reveal the view of the autopoietic approach and the situation in schools in an interrelated integrity. In the third stage, a total of 11 academicians have been sought for the relevance, clarity and grammatical structure of the items, two of them linguistics, two of them research and

statistics, and seven of them were experts in educational administration. The expert evaluation form prepared for this purpose included an evaluation scale and an opinion section, where evaluations have been made regarding the suitability of each item in terms of structure and content. As a result of the evaluations of the experts, the scale has been reduced to 71 items and made ready for application after the necessary adjustments have been made. 40 of these items are related to the subscale of adopting the understanding of autopoiesis, and 31 of them are related to the subscale of approach to autopoiesis in schools. The scale has been formed in a Likert type with five options ranging from "strongly disagree" to "strongly agree".

Sample

The measurement instrument has been conducted to a study group consisting of 250 teachers working in primary, secondary and high schools in Erciş District of Van province in the fall semester of 2018, after obtaining the necessary permissions. 84 (33.6%) of the teachers in the study group of the research, determined by simple random sampling technique, work in primary school, 55 (22.0%) in secondary school and 111 (44.4%) in high school. 161 (64.4%) of them have 1-5 years, 53 (21.2%) 6-10 years, 36 (14.4%) have 11 years or more professional seniority. The vast majority of teachers are novice in which they are at the first five years of their profession; This can be explained by the circulation of teachers and the fact that most of the first assignments to the teaching profession are made to the region. Of the teachers, 61 (24.4) were primary school teachers, 24 (9.6%) were English, 23 (9.2%) were mathematics, 19 (7.6%) were information technologies, 17 (9.6%) 6.8% literature, 15 (6.0%) preschool, 13 (5.2%) religious culture and ethics, 11 (4.4) Turkish, 9 (3%) 6) school psychologist, 6 (2.4%) physical education, 6 (2.4%) geography, 6 (2.4%) science and technology, 6 (2.4%) social studies 6 (2.4%) history, 5 (2.0%) child development, 4 (1.6%) special education, 4 (1.6%) chemistry, 4 Physics (1.6%), 4 (1.6%) visual arts, 4 (1.6%) biology and 3 (1.2%) music.

Analysis of Data

The data have been subjected to exploratory factor analysis (EFA) for the construct validity of the scale and confirmatory factor analysis (CFA) to test the accuracy of the construct. This process has been carried out separately for two subscales designed considering the theoretical basis, and the resulting factor structure for each subscale was determined.

Rennie (1997) explains factor analysis (FA) as an analytical technique with a computational logic that aims to arrive at a small number of explanatory factors (concepts) that explain the maximum variance and is based on the relationships between observed variables. FA is divided into two as exploratory and confirmatory. While EFA tries to explore the construct validity of the measurement tool by investigating the relationship structure between the items, CFA aims to test the model put forward by EFA and to test the suitability of the model (Büyüköztürk, Akgün, Özkahveci, & Demirel, 2004; Memduhoğlu and Tanhan, 2013; Tabachnink & Fidell, 2001). In EFA, all transactions are carried out over the R-matrix. The R-matrix reached before the operations turns into a new R-matrix after the operations. The rigidity of the result of the analysis depends on the lowest level of difference between these two matrices (Tabachnick & Fidell, 2001).

In order for an item to be included in a factor defined in the scale in EFA, its load value (its relationship with the factor) must be high (Coombs & Schroeder, 1988; Dunteman, 1989; Gorsuch, 1983). When deciding whether to include an item in the scale, it is taken into account that there is no overlapping item (at least 0.10 difference between the load values in the two factors) and that the factor load value is not below a certain level (usually 0.45). For some substances, this limit value can be reduced to 0.30. In this study, these criteria were taken into account and Principal Component Analysis (PCA) was used for factorization (Hutcheson & Sofroniou, 1999; Büyüköztürk et al. 2004).

Factor analyses of the Autopoiesis Scale has been performed separately for the subscales of "Adopting the Understanding of Autopoiesis" and "Approach to Autopoiesis in Schools".

FINDINGS

Explanatory and Confirmatory Factor Analysis of the Adoption of Autopoiesis Subscale

For sub-scales, it has been checked whether there were different sub-factors by using the Varimax Vertical Rotation Method from Principal Component Analysis. In order to test the sample suitability of the obtained data, Kaiser-Meyer-Olkin (KMO) and Barlett test values were examined. The KMO value is .775 in the dimension of Adopting the Understanding of Autopoiesis. Bartlett test result was found as 1771.597 ($p<0.0001$). KMO and Bartlett values show that the data are suitable for analysis.

EFA started with forty items for "adopting the understanding of autopoiesis" sub-scale. In the analysis performed again by removing an item (m9) that showed overlapping items in two factors, the items that did not meet the criteria of overlap and at least .30 load value have been removed from the scale one by one and the analysis was repeated. Thus, respectively; fifteen items in total m6, m5, m14, m39, m38, m4, m25, m19, m11, m35, m40, m34, m13, m36 were excluded from the scale, as they did not meet the specified criteria. As a result of the analysis, a five-factor structure with an eigenvalue greater than 1 emerged, which overlaps with the scree plot graph. The result was named as renewal, corporate culture, organizational identity, adaptation, originality in accordance with the items of the factors, taking into account the factors in the item distribution and the theoretical basis. The eigenvalues of the sub-factors consisting of 25 items and the amount of variance they explained are given in Table1.

Table 1.

Adoption of autopoiesis subscale factor analysis results of total variance explanation percentages

Factor	Initial Values			Total Disclosure Values			Rotation Description Values		
	Total	Variance Percentage	Additive Variance Percentage	Total	Variance Percentage	Additive Variance	Total	Variance Percentage	Additive Variance Percentage
1	4,405	17,620	17,620	4,405	17,620	17,620	3,418	13,672	13,672
2	2,781	11,125	28,745	2,781	11,125	28,745	2,879	11,514	25,186
3	2,745	10,980	39,726	2,745	10,980	39,726	2,624	10,495	35,681
4	1,610	6,441	46,167	1,610	6,441	46,167	2,403	9,612	45,293
5	1,479	5,914	52,081	1,479	5,914	52,081	1,697	6,788	52,081
6	1,122	4,487	56,568						
7	,955	3,818	60,387						
8	,855	3,419	63,806						

As seen in Table 1, the eigenvalues of the factors are 4.40 for the first (Renewal) factor, 2.78 for the second (Corporate Culture) factor, 2.74 for the third (Organizational Identity) factor, 1.61 for the fourth (Adaptation) factor, and 1.47 for the fifth (Originality) factor, respectively. The first of the factors determined as important explains 13.67% of the total variance, the second factor 11.51%, the third factor 10.49%, the fourth factor 9.61% and the fifth factor 6.78%. The total variance explained by the five factors is 52.08%. This ratio is mostly expected to be above 50% for multi-factor scales. In the literature, variance rates between 40% and 60% are considered sufficient for social sciences (Büyüköztürk, 2015). The EFA values of items in the scale as a result of the analysis are given in Table 2.

Table 2.

Item analysis results of the subscale of adopting the understanding of autopoiesis

Faktor	Items		Factor Load Values After Rotation	Item Total Correlation
	Sequence Number on Draft Form	New Sequence Number in Scale		
Renewal	1	1	,526	,767
	2	2	,611	,660
	3	3	,558	,653
	7	4	,380	,605
	10	5	,481	,468

	24	6	,384	,428
Corporate Culture	15	7	,349	,825
	16	8	,594	,691
	17	9	,686	,430
Organizational Identity	18	10	,428	,829
	20	11	,432	,812
	21	12	,704	,729
	22	13	,680	,616
	23	14	,576	,509
Adaptation	26	15	,535	,710
	27	16	,494	,655
	28	17	,466	,626
	29	18	,570	,603
	12	19	,400	,582
	8	20	,399	,581
	37	21	,440	,566
Originality	30	22	,507	,785
	31	23	,648	,758
	32	24	,536	,660
	33	25	,644	,630

As seen in the Table 2, the items in the scale were collected in 5 factors. The factor loading values of the items vary between 0.380 and 0.704. The item-total correlations of the items in the factors varied between 0.428 and 0.767 in the first factor, 0.430 and 0.825 in the second factor, 0.509 and 0.829 in the third factor, 0.566 and 0.710 in the fourth factor, and 0.630 and 0.785 in the fifth factor.

The high score obtained in the "Adopting the Autopoietic Understanding" sub-scale indicates that the autopoietic understanding is adopted at a high level in organizational change. Scores on this scale ranged between from 25 to 125. The alpha coefficient calculated for the dimensions is 0.657 in the first dimension, 0.547 in the second dimension, 0.771 in the third dimension, 0.758 in the fourth dimension, and 0.766 in the fifth dimension, respectively. The total alpha coefficient for the subscale of adopting the understanding of autopoiesis is 0.742.

CFA processes have been performed to test the accuracy of the structure. CFA aims to test the model proposed by EFA based on some criteria and to test whether the model is suitable (model fit). From the fit indices used in CFA; Chi-square (Chi-square test), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Spuare Error of Approximation (RMSEA), Root Mean Square Residual (RMR) Normed-fit index (NFI) values were checked. (Tabachnick and Fidell, 2001). The CFA results regarding the 5-factor model fit statistics of the first subscale are given in Table 3.

Table 3.
The results of confirmatory factor analysis of the subscale of adopting the understanding of autopoiesis

x^2/sd	RMSEA	RMR	GFI	CFI	NFI
1,98	.06	.08	.85	.83	.71

When the fit indices of the model tested by CFA are examined, it is seen that the Chi-Square value (x^2=525.22, N=250, sd=265, p=.000) is significant. The x^2/sd ratio calculated as 1.98 which supposed to be in good level. The fit values calculated for the fit of the model as a result of DFA, respectively, are RMSEA. 06, RMR. 08 is GFI .85, CFI .83 and NFI .71.

In the literature, GFI, NFI and CFI values are generally considered to show good model fit when they are 0.90 or above. It has also been stated that this value increases as the number of parameters increases (MacCallum & Hong, 1997) and has an upward deviation with larger samples (Bollen, 1990; Miles & Shevlin, 1998, cited in Hooper, Coughlan & Mullen, 2008). According to Memduhoğlu and Tanhan (2013), RMSEA and RMR values are good when they are 0.05 and lower; When 0.08 and lower, it shows an acceptable fit (Moosbrugger & Müller, 2003). When the values of fit indices in the table are examined, it is seen that the result of chi-square test, RMSEA and RMR values have acceptable goodness of fit, and other fit indices (GFI, CFI, NFI) are close to acceptable goodness of fit. Considering all the

criteria, it can be argued that a five-factor structure obtained as a result of CFA has a good model. By creating a first level CFA model, the latent factors in the structure of the subscale of adopting the understanding of autopoiesis, which is the first main dimension of the autopoiesis scale, and the interdependent effects between these factors have been tested with the AMOS program. The diagram regarding the construct validity and model fit of the subscale of Adopting the Autopoiesis Approach is given in Figure 2.

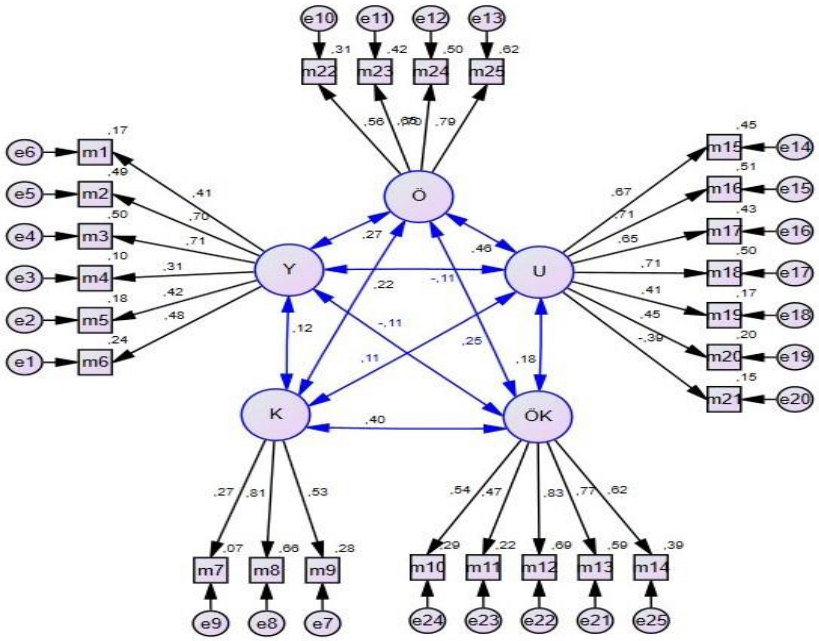

Figure 2. CFA diagram of autopoiesis scale's sub-scale of adopting autopoiesis
(Ö: Originality, U: Adaptation, Y: Renewal, ÖK: Organizational Identity, K: Culture)

All relationships among the variables in the model are considered to be linear, and there may be two types of linear relationships. One-way arrows represent causal directional relationship. It expresses the effect of one variable on the other variable. Two-way arrows correspond to non-causal non-directional relationship and correlations between latent variables. In the structural equation model, such a non-causal relationship between the independent variables is assumed (Cokluk, Şekercioğlu, & Büyüköztürk, 2012).

When Figure 2 is examined, it is aimed to adopt the understanding of autopoiesis; The five factors appearing in the scale are related to each other and are shown with double-sided arrows. The 25 observed variables representing the factors are represented by 25 rectangles. According to the findings obtained from the diagram according to CFA, the factor loads for each sub-dimension, respectively; Between .31 and .71 in the Renewal sub-dimension, between .27 and .81 in the Corporate Culture sub-dimension, between .47 and .83 in the Organizational Identity sub-dimension, between .39 and .71 in the Adaptation sub-dimension, between .56 and .79 in the Originality sub-dimension. appears to be in between. According to the literature, if the factor loading value is .71, it is perfect; If it is .32, it is recommended to be evaluated as weak (Tabanichnick & Fidell, 2007). Each observed variable is loaded with a single factor. The observed variables and measurement errors are uncorrelated.

Exploratory and Confirmatory Factor Analysis of Autopoiesis Approach Subscale in Schools

For the second sub-scale, the operations on the first sub-scale were performed. KMO value was found as .840, Barlett test 2858.325 ($p<0.0001$). As a result of the EFA analysis, which started with 31 items, the item with a low load value (m62) was removed from the scale and repetitive items (m41, m43, m51, m45, m50, m71, m59, m61, m65, m60, m42, m65, m56, m57) were extracted sequentially. The three-factor structure that emerged with the remaining 16 items was named as *balanced change and innovation*, *need for change and originality*, *openness and environmental impact*, taking into account the content and theoretical basis. Values related to the three-factor structure are given in Table 4.

Table 4.
The results of the factor analysis of the autopoiesis approach subscale in schools total variance explanation percentages

Factor	Initial Values			Total Disclosure Values			Rotation Description Values		
	Total	Variance Percentage	Additive Variance Percentage	Total	Variance Percentage	Additive Variance Percentage	Total	Variance Percentage	Additive Variance Percentage
1	4,732	29,573	29,573	4,732	29,573	29,573	3,614	22,588	22,588
2	2,489	15,554	45,126	2,489	15,554	45,126	2,977	18,607	41,195
3	1,656	10,351	55,477	1,656	10,351	55,477	2,285	14,282	55,477
4	,918	5,737	61,214						
5	,813	5,084	66,298						
6	,797	4,984	71,282						

As seen in Table 4, the eigenvalues of the factors are 4.73 for the first (Balanced Change and Innovation) factor, 2.48 for the second (Need for Change and Originality) factor and 1.65 for the third (Openness and Environmental Impact) factor, respectively. The first of the factors determined as important explains 22.58% of the total variance, the second factor 18.60% and the third factor 14.28%. The total variance explained by the three factors is 55.47%. It is considered important that the total variance explained in the literature is above 50%. EFA results were given in Table 5.

As can be seen in the table, the items in the scale were collected in 3 independent factors. The factor loading values of the items ranged from 0.357 to 0.716. The item-total correlations of the items in the factors ranged from 0.550 to 0.790 in the first factor, between 0.458 and 0.816 in the second factor, and between 0.790 and 0.842 in the third factor.

The high score obtained from the subscale of Autopoietic Approach in Schools indicates that decisions and practices based on the understanding of autopoietic change are dominant in schools. . Scores in this dimension range from 16 to 80. It is seen that the alpha coefficient is 0.820 in the first dimension, 0.792 in the second dimension, and 0.779 in the third dimension, respectively. The total alpha coefficient for the autopoiesis approach subscale in schools is 0.813.

Table 5.
Item analysis results of the autopoiesis approach subscale in schools

Factor	Items		Factor Load Values After Rotation	Item Total Correlation
	Sequence Number on Draft Form	New Sequence Number in Scale		
Balanced Change and Innovation	46	26	,562	,722
	47	27	,414	,569
	48	28	,536	,636
	52	29	,627	,775
	53	30	,377	,550
	54	31	,639	,790
	55	32	,478	,664
Need for Change and Originality	64	33	,427	,638
	68	34	,688	,816
	69	35	,676	,806
	63	36	,602	,741
	49	37	,478	,458
	44	38	,357	,478
Openness and Environmental Impact	66	39	,671	,812
	67	40	,629	,790
	70	41	,716	,842

The diagram for the CFA analysis of the autopoiesis approach subscale and the fit test of the 3-factor structure in schools is given in Figure 2 and the values for model fit were given in Table 6.

In the diagram in Figure 3, the items of the autopoiesis approach subscale in schools are the observed variables, balanced change and innovation, need for change and originality, openness and environmental impact as latent variables. The three factors in the subscale are interrelated. Factor loads for each sub-dimension, respectively; It is seen that it is between .46 and .76 in the balanced change and innovation sub-dimension, between .45 and .81 in the need for change and originality sub-dimension, and between .67 and .82 in the openness and environmental impact sub-dimension.

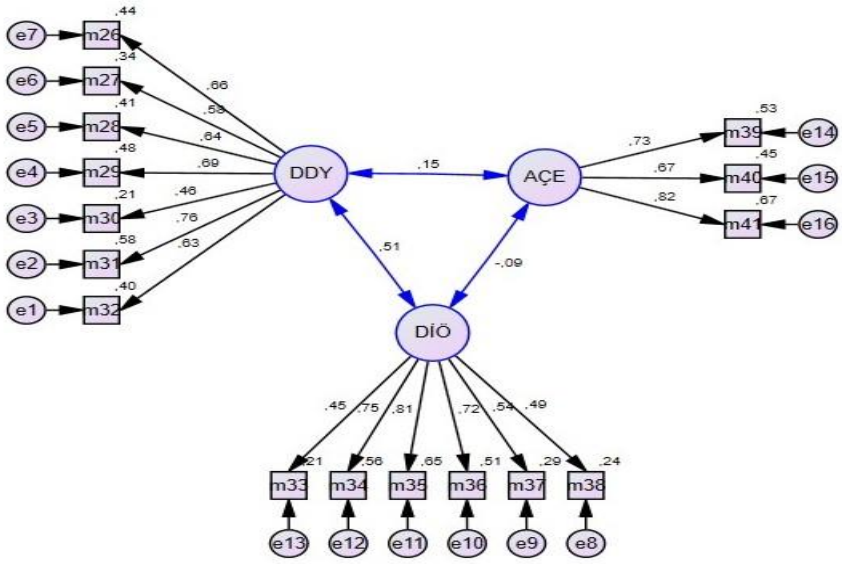

Figure 3. DFA diagram of the autopoiesis approach subscale in schools
(DDY: Balanced change and innovation, DİÖ: Need for change and originality, AÇE: Openness and environmental impact)

Table 6.
Confirmatory factor analysis results of the autopoyesis approach subscale in schools

x^2/sd	RMSEA	RMR	GFI	CFI	NFI
3,17	.09	.08	.86	.84	.78

According to the fit indices in Table 6, the Chi-Square value (x^2?=320.50, N=250, sd=101, p=.000) seems significant. The x^2?/sd ratio calculated by analysis is 3.17. The fit values calculated regarding the fit of the model as a result of DFA are RMSEA .09, RMR .08, GFI .86, CFI .84 and NFI .78, respectively. When the values of fit indices in the table are examined, it is seen that the result of chi-square test, RMSEA and RMR values have acceptable goodness of fit, and other fit indices (GFI, CFI, NFI) are close to acceptable goodness of fit. Considering all the criteria, it can be argued that the three-factor structure obtained as a result of CFA is a good model.

Finally, since these research data were collected before 2020, ethics committee permission was not obtained, and utmost care was taken to comply with ethical principles at all stages.

CONCLUSION

The Autopoiesis Scale developed for the autopoiesis approach, which emphasizes a unique understanding of change for educational organizations, consists of two subscales. The first sub-scale is the Autopoiesis Approach Scale, the second sub-scale is the Autopoiesis Approach Scale in Schools. The scale is a five-point Likert type participation scale. The first subscale of the scale, the autopoiesis understanding adoption scale, consists of five factors and 25 items. The scores that can be obtained from this scale are between 25-125. The high score indicates that the participants adopted a high level of understanding of autopoiesis. The second subscale, the autopoiesis approach scale in schools, has three factors and the number of items is 16. The scores that can be obtained from this subscale are between 16-80. As a result of separate EFA and CFA analyses, it was determined that the Autopoiesis Scale, which consists of two subscales, is a valid and reliable measurement tool that can measure the level of

teachers' adoption of the autopoietic approach in schools and the current level of autopoietic change in schools. Since no scale developed for autopoiesis has been found in the field of education or in other fields in Turkey, comparison and discussion regarding the findings could not be made. In this respect, it is thought that the developed scale will fill a crucial gap in the field.

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