



**SCALE DEVELOPMENT AND INITIAL TESTS OF THE  
MULTIDIMENSIONAL COMPLEX ADAPTIVE  
LEADERSHIP SCALE FOR SCHOOL PRINCIPALS:  
AN EXPLORATORY MIXED METHOD STUDY<sup>i</sup>**

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**Abstract:**

This study was designed to develop the scale of the Complex Adaptive Leadership for School Principals (CAL-SP) and examine its psychometric properties. This was an exploratory mixed method research design (ES-MMD). Both qualitative and quantitative methods were used to develop and assess psychometric properties of the questionnaire. This study introduced the construct of CAL-SP, which comprised three dimensions: enabling leadership (EL), managerial leadership (ML) and adaptive leadership (AL). The scale showed internal consistency, reliability, construct validity and nomological validity explaining that the instrument had a good structure and reliability. Directions for future research and managerial implications of the new construct are discussed.

**Keywords:** school principal, complexity theory, complex adaptive leadership, complex adaptive systems, education

**1. Introduction**

It is a platitude that we live in a time of change (Handy, 1994) at schools; moreover, it might be said that organizational reality of school is characterized by the dynamics such

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as volatility, complexity, change and nonlinearity which are driven by powerful sets of technological, social, political and economic forces (Sinha, 1981). A failure to recognize and examine these new dynamics may have some implications for school and its partners (Blandin, 2008). As Peter Drucker (2012) had written, a time of change may be a dangerous time if the leaders feel a temptation to deny reality.

Educational leaders guessed long ago that the main responsibility of education was to narrate knowledge to students. It was like that in the past but it is not now (Schlechty, 2001). The explosion of knowledge about the nature of learning, combined with the growing power of technology, create the potential to transform even the most fundamental unit of education; the interaction of the teacher and the learner. Moreover, huge social changes, such as growing diversity and population mobility, present educators with new and constantly changing circumstances (OECD 2003; OECD, 2008).

Traditional organizational theorists describe schools in terms of their loosely-coupled structures (Weick, 1969), dealing with the tendency in schools for teachers to operate fair independently within their four classroom walls. This independence can be beneficial in some cases because it minimizes the degree to which disruptions in one classroom might cascade through the system. But this same loose coupling also minimizes the degree to which great ideas and innovations propagate throughout the organization (Yamashiro, 2006). In addition, often by necessity, organizational researchers tend to look at an organization by breaking it down into parts like the studies that focus primarily on the qualities of the leadership style of the school principals. This way of examining systems may risk missing the relationships between the parts (Reckase, 2004). What might be insignificant to traditional organizational theorists may be crucial elements in the system's interactive network and its relationship with the surrounding environment in a collective behavior of the partners. However, new approaches such as chaos and complexity owe much to systems thinking. System thinking is opposite to analytical thinking. Whilst analytical thinking seeks to get an understanding of the whole by breaking it up and analysing the parts, systems thinking does the opposite. It looks at the whole and from that, one can gain an understanding of the parts (Obolensky, 2010).

This study is designed to empirically and conceptually explore the ways with which we research leadership quality and the degree to which complexity theory (CT) might change the way we look at leadership administering complex adaptive leadership for school principals (CAL-SP). The themes from complex adaptive leadership theory push us to study the leadership not by decomposing the system into parts and studying those parts in isolation, but by exploring and analyzing how the parts interact, recombine, and learn from each other (O'Day, 2002; Yamashiro, 2006;

Obolensky, 2010). Exploration began with an examination of complex adaptive leadership (CAL) tenets, then application of CT to Turkish school system to develop a leadership scale within the framework of qualitative methodology, and finally surveys were handled to assure the validity and reliability of CAL-SP scale.

## **2. The Very Tenets of School Principals as Complex Adaptive Leaders**

A school leader must adapt to changing the environment by understanding how changing context can affect the performance of students. That is why; schools are able to survive if they satisfy the need of families and children by keeping up with the change enhancing their skills and performances (Fin, 1991; Webb, Bondy & Rose, 1994). If a school leader intends to reconstruct the schools to attune to the changing educational approaches, strong leadership at all levels, and new lenses that focus on the complex interactions are needed (Snyder, 2013). The reason why school leaders require new lenses is that from politics to policymakers have approached the school so far opposing to the platitude mentioned above. The attractions of CAL-SP, management and organizational behavior are several. For example, CAL suggests that school leaders may enable and generate conditions for the self-organized emergence and change rather than mandating specific behaviors suggesting that emergent, self-organized order may supersede command and control in many situations (Carley & Hill, 2001). Moreover, CAL suggests that leadership emerges through interactions, networking, connectivity, and relationships, as these enhance operational effectiveness (Schreiber & Carley, 2006). Lastly, CAL provides a lens for examining, managing and leading change and schools touching particularly the view of change that is facilitated in open, non-linear, far-from-stable environments (Falconer, 2007). That is why it is important to seek for the tenets of CAL to establish links with school principals.

The CT as a first facet posits that the richest interactions usually occur locally within the network of the school. Because schools are a function of the people in them, and people have the ability to learn from past interactions, mistakes, and new information, they are constantly evolving organizations. In addition, schools are embedded in a larger context. The environment around a school can impact the very core of its practices, whether through pressures from the district office, riots in the neighborhood, or a local student's winning of a regional spelling bee. CT would suggest that we focus our attention on the dynamic, interactive, and even chaotic aspects of schools (Yamashiro, 2006) because CT does not attempt to reduce the complex nature of them emphasizing on people and goal focused behaviours or strategies (Obolensky, 2010). Thus, we should accept schools as a complex structure, not a simple one. The

difference between complexity and simplicity of school lies behind a function of our distance from the system. If you look at a school outside as a decoration, it is quite simple, but as a system, it is a mere complex one seen from close by (Cilliers, 1998) because influences can be far-reaching, and remote connections may be important due to non-linearity of every action (Cilliers, 1998; Stacey, 2001; Hammer, Edwards & Tapinos, 2012).

The second facet requires that there are unpredictable cause and effect relationship at school. Small actions can have big effects, big actions can have minimal effects, and the scale of effects cannot be predicted. In some contexts, this phenomenon is known as the 'butterfly effect' (Cilliers, 1998; Stacey, 2001; Hammer, Edwards & Tapinos, 2012) with the non-linear events in educational context. CT is concerned with non-linearity and sensitivity to initial starting points, which leads to the unpredictability of events and outcomes. For example, two schools with seemingly similar inputs perform wildly differently on test scores or daily school routines. If you reduce school to a large system of linear elements with non-interactive people, it usually can be collapsed into an equivalent system that is very ineffective and a grinding place, which means that school, is one size that fits all (Goyal, 2012).

The third complex characteristic of school is that there are loops in the school interactions. The activity of any person at school can back onto itself, sometimes directly, sometimes after a number of intervening processes (Cilliers, 1998). These are positive and negative feedbacks that can exist within the school, being developmental (positive feedbacks) and restraining (negative feedbacks) (Hammer, Edwards & Tapinos, 2012). Complexity is a rich interaction in a school context that it emerges as a result of the patterns of interactions (Cilliers, 1998). Complex adaptive schools co-evolve its partners' interactions producing ongoing variety of traditions, customs, and organizational culture. In order to attain patterns of interactions bearing mostly positive feedbacks, each group members of a school must balance with collective goals, acquire resources for his/her own work, and share those resources to support the work of others, navigate the tensions between autonomy and collaboration. Thus, school principal must try to control these tensions by using facilitators to shape and mold the group energy-yielding the good behaviors bear the best ones (O'Day, 2002).

The fourth facet is that school has a pivotal character that there is an endless, continuous and repeating dynamical interaction among students at the school. Each partner conversely in a reductionist school environment neglects the behavior of the whole system, they respond merely to information that is available locally (Blandin, 2008). The reality mentioned is so important that if each person knew what was happening to the school system as a whole, all of the complexity would have to be

embedded in those interacting people. Shortly, school is a connected open system, and it can be passive or active in their interactions with other complex environments, which can be at various levels of integration within and external to the organization (Cilliers, 1998; Hammer, Edwards & Tapinos, 2012). CT also recognizes the evolving nature of schools and how hundreds of complex interactions between individuals can actually result in a few simple rules of engagement at the organizational level. For example, would an accepted truth be that when schools are full of struggling students from low-income and fragile backgrounds, performance tends to be poor (Benedict, 2013)? If the school system and school leadership are accepted as linear and not evolving, yes, there is an immoral congruence between school principals and teachers. Thus, in this system, principals do not force teachers to success and teachers do not demand principals to supply materials and conditions to form an open climate for success (Ozen, 2015).

The fifth facet which is not static but dynamic and constantly evolving, patterns and attractors. Those in nature are visible regularities of form found in the natural world. These patterns by attractors recur in a different context (Lorenz, 1963; Ruelle, 1991). The school context is a complex adaptive system so the system itself can create attractors causing patterns, cope, adapt, and survive in chaos which is known as far-from-equilibrium. Stability is not a requirement for progress and could lead to atrophy (Cilliers, 1998; Hammer, Edwards & Tapinos, 2012). Thus, CAL-SP is about evolution and learning because schools are constantly evolving organizations. In addition, schools are embedded in a larger context. In the school context, CAL-SP is responsible to form the attractors to initialize the patterns of success for students and teachers.

The last facet of CAL to develop leadership is polyarchic complex adaptive point of view including content which is what curricular needs to be included in a leadership development, and process which is how can leadership development best be delivered. More important than the knowledge of school leadership development is the process of delivery. Successful school leadership encapsulates three areas (Obolensky, 2010). The first area of school principal is about knowing what to do. The second area is about believing why to do, the last one is about understanding how to do.

Emergent forms of leadership such as CAL-SP require awareness to change, unpredictability, and the big effect of small actions, networking, and connectivity. The tenets mentioned opens the way of team development, incentives and motivation, an acute knowledge of human relations, emotional intelligence, and servant leadership to provide organizational learning for schools by accessing the creative and interpersonal side of the teachers who lead (Morrison, 2002). The CAL-SP is composed of frameworks and blueprints for a specific future. It is much more about fostering and nurturing the emergence of self-organization in an unpredictable and turbulent world. With the

support of those tenets about schools, a new leadership for school principals might be needed. For that reason, complex adaptive leadership (CAL) within the light of CT can be an approach which can deal with emotional and psychological roles, adaptive skills, and delegation of his authority to a follower whose power of interaction and power of expertise are unique. Using CT to understand the management as a metaphorical device might give a rise to reshape organizations, schools (Uhl-Bien, Marion & McKelvey, 2007; Marion & Uhl-Bien, 2003; Marion & Uhl-Bien, 2007).

### **3. Complex Adaptive Leadership (CAL)**

CAL is a framework for leadership that enables the learning, creative and adaptive capacity of followers in organizations. This framework aims to foster complex dynamics while enabling control structures for coordinating formal organizations and producing outcomes suitable to the vision and mission of the system at the same time. It intends to integrate complexity dynamics and bureaucracy, centralism and decentralism, enabling and coordinating, exploration and exploitation, CAS and hierarchy, and informal emergence and top-down control (Uhl-Bien, Marion & McKelvey, 2007). CAL suggests the role of administrators not be limited to attenuate worker skills and abilities to perform with centralized organizational aims. Rather, managers who are under conditions of knowledge production especially should act to enable informal emergence and to coordinate the contexts (Uhl-Bien, Marion & McKelvey, 2007). CAL-SP focused on three leadership behavior which is expected to adapt complex adaptive interaction in hectic organizational structures. The first focus was set on fayolist comprehensive statement on principles of management. These are; planning, organizing, leading, controlling, and coordinating. The second focus was set on adaptive leadership skills which enable leader to establish communication networks and interactive context. Also, benefiting from dynamics, communication devices which result in interaction are expected to cause school to develop and use adaptive behaviors such as self-reflexivity, change, adaptation, and innovation. The third focus was set on enabling leadership. Enabling leadership behavior gives a rise to learning, creativity, and show multi-level leadership skills which provides an infra-structure to occur context which starts complex adaptive systems dynamics.

#### **3.1 Administrative leadership (AL)**

Management is defined and undefined activities to plan, coordinate, organize, evaluate, and achieve objectives using principles, concepts, theories, and models related with managerial functions of a leader in organizations (Gullick, 1937). CAL-SP points out

managerial functions which put priority on development and legitimacy of organization. CAL-SP is distinctive from other leadership behaviors because leader influence does not stem from the post leader; rather, post is the cause of influence. CAL-SP has five skills to show his administrative ability.

### **3.1.1. Resource Management (RM)**

Resource creation and management mostly are understood as fiscal neglecting human resource, visibility and transparency and accountability in organization (Yang, 2008).

One of the basic skills of administrative leader is to find and manage scarce resources from broad perspective. If a leader has an ability to forecast proactively and track specific and generic resource placeholders with an in-depth visibility, he is to enhance productivity, profitability and reduce wasteful downtime as well. It can be said that survival of organizations strictly depends upon their skills of resources management.

We are living in the world that resources are scarce and demands are limitless, which causes unmanageableness in organizations and schools. Strict demands for education and public schools quality, fast evolving environment, growing shortages in school resources and funds, irresistible complexities and challenges of school organization push education, school partners into vicious circle. Turkish educational system has some deficiencies for RM and been striving hard for finding and managing especially monetary resources. Turkish Schools have been under heavy financial burden because school is lack of enough funding which has detrimental effects on every step of education according to academic researches (Alpaydın, 2008); hence, we embedded RM in CAL-SP.

### **3.1.2. Risk Taking (RT)**

School system can be accepted as complex systems. If a school aims to develop continuously and adapt to changing environment, school principal should take risks which is an indicator of interiorized innovative culture and the soul of entrepreneurship (Adair, 2009). Researches purport that if leaders are liable to take a risk, they value leadership, have cogency and finally they are respected in their organization by their follower. Also, successful principals are those who carve out the space for school partners to take risks. Even in a less than ideal risk-taking environment of high-stakes testing and evaluations, these principals are buffers according to teachers' perceptions and allow teachers to express creative latitude in their curriculum while keeping an eye on school progress towards benchmarks (McKibben, 2015). The skill of taking risk is to make huge contribution to schools' development in complex school systems.

### **3.1.3. Making Decision (MD)**

MD is a continuous task of embodying followers in specific instructions and serving as the leader of the organization (Gullick, 1937). Schools can be successful upon making right decision on right time. Decision causes important results; that is why, they should not be clashed in management process. Another contributing cause of success of school principal is to establish a well-running mutual consultation mechanism. Manager who is not responsible for knowing everything should both delegate his authority and consult the followers in organizations.

### **3.1.4. Planning**

Planning is called as an estimation of human and material resources in an organization to keep the organizational aims in both economical and efficient way. Leaders collect data from every source to apply the plan according to expected level by clearing communication means in organization. Schools are exposed to changes and needs to be managed not by top-down bureaucratic procedures and centralized structures because top-down management of a school does practically all the topside thinking and planning, and issues orders to those under him. In the extreme form it is a management in which boss-edicts are seldom questioned; no ideas or suggestions are actually sought; the current of initiative flows down from the top. So, effective plans cannot make real the participation of followers causing them developing negative attitude in school. School principals easily can make them a part in decision making process because plans are needed to facilitate the continuity of services and organizational change (Gullick, 1937).

### **3.1.5. Control**

Education is an important factor to raise human whose needs are to be provided with knowledge in information age. School responsibility is to equip students with urgent needs, which must be aimed by every organization in society. The main objective of schools which is to improve quality of students must be controlled effectively. Due to an effective control plan, assessments are held to according to plans, deficiencies are found, and remedial actions are applied in schools. School principals can control from perspectives of program, educational activities, teaching activities and teacher activities for effective learning (Beach & Reinhartz, 2000).

## **3.2. Adaptive Leadership (AL)**

AL was conceptualized by Heifetz (1994) and is neither a leadership style which will be used in every situation and nor is a panacea. It distinguishes difference between

technical and adaptive problems which needs urgent solutions. Technical problem is the one whose solution is known and figured out with a work checklist. Some problems are fuzzy which cannot be defined clearly, so their solutions are adaptive which needs change (Akbaba-Altun, 2001). Adaptive skill outflanks an effort spent by one person with the performance of the group; hence, CAL-SP describes school conditions in which adaptive dynamics emerge and produce adaptive and creative knowledge that shows sufficient importance and impact to create a change. Adaptive leadership behavior is not an act of an individual. It is rather a dynamic which establishes interdependent agents to form healthy inter-connected communication means. Adaptive leadership must be embedded in appropriately structured, neural-like network complex social systems to exhibit significance and impact, (Uhl-Bien, Marion & McKelvey, 2007) with its sub dimensions. There are some sub-dimensions of adaptive leadership

### **3.2.1. Dynamics**

Dynamics in an organization refer to the contexts and mechanisms that enable adaptive leadership. As for context, *it is* an interactive ethos at school within which complex dynamics occur. Mechanisms are the dynamic behavior patterns that produce complex outcomes. In interactive and interdependent school, adaptive ideas emerge and interact by interactions among agents. School as a contexts shape those ideas including networks of interaction, conflicting ideas, direct and indirect feedback loops and rapidly changing environmental demands. The mechanism at school correlated action, catalytic behaviors, information flow and pattern formation (Uhl-Bien, Marion & McKelvey, 2007).

### **3.2.2. Emergence**

Emergence is a process whereby larger entities, patterns, and regularities arise through interactions among smaller or simpler entities that themselves do not exhibit such properties in philosophy, systems theory, science, and art. Complex change processes between spaces and struggles over diverse ideas. First of all, emergence involves the reformulation of existing atmosphere at school to produce outcomes that are qualitatively different from the original climate, which is tedious, oppressive, and inefficacious; next self-organization of self-excited emergent behaviors which turn the school to a blissful, liberal, and exuberant. Reformulation competes with theories of natural selection or human intelligence as a source of unique change (Uhl-Bien, Marion & McKelvey, 2007).

### **3.2.3. Crisis Management (CM)**

From the etymological perspective, the crisis may be taken as a factor inducing disability of making a right decision on a right time, in the meantime, the *raison d'être* of the organization being either questioned or compromised. Within the dynamics context of our contemporary schools, risk represents one of the engines of progress and it can be utilized for dysfunctions elimination. Not taking the risks preserves the possibility of crises to appear, whereas taking risks does not equal the disappearance of uncertainty; on the contrary, it leads to its amplification. Crisis management is based on risk management, namely, on activities performed toward preventing and evaluating of events of various origins, without initiating prevention steps, but trying to diminish the chances of risk development, or by initiating protective steps, trying to reduce the risk effects (Wyatt, 2002).

School principal that has the adaptive skill is expected to foresee the possibility of upcoming crisis, if at all not possible, he might reduce the ill effect of it. Schools are complex organizations and open to all crises, so in-school reasons, families, school surrounding pressure, groups, central management, and natural disasters can be accepted as the reason of crisis. For school principals, the most important difference between traditional school principal and CAL-SP is to embrace the uncertainties and ability to develop new and creative approaches for social turbulences (Whiffen, 2011; Torres & Reeves, 2011; Ritchie, 2004).

### **3.2.4. Enabling Leadership (EL)**

EL is a modern leadership theory which was conceptualized by Ian Falk and Bill Mulford. It concentrates on enabling skills, context, practices, and holistic behaviors to make strategic changes real. The role of enabling leadership in the CAL framework is to directly maneuver school context that *catalyze* adaptive leadership and allow skillful followers to emerge when necessary. School as a complex structure has a school principal whose position was a middle manager. Middle managers are often in a position to engage in enabling behavior grid (Uhl-Bien, Marion & McKelvey, 2007) because schools are the last production level of educational system. The enabling ability of a school principal together with administrative shoes can perform to enable effective complex adaptive dynamics to emerge in school context. The emergence is completely up to school physical and psychological well-being, which helps emerging adaptive skills of teachers, vice school principals, families, school partners and even students as a new leader by disseminating innovative dynamics for adaptive functions that is supplied by innovation-to-organization interface (Uhl-Bien, Marion & McKelvey, 2007).

### **3.3.1. Communication as a dynamic**

Communication is one of the most important elements in social life having good or ill effect in human life. Daily behaviors shape human life that continues repetitiously. Communication starts first in human mind through awareness of objects and human around. The awareness makes sense of human behaviors which was called as first impression that.

### **3.3.2. Interaction as a dynamic**

One of the most important proposals of CAL-SP is not that leaders have effect on their followers. Beyond this, leader has a power to stimulate the dynamics in context to provide interaction through networks in an organization. Effective network conditions are catalyzed first by interaction. Interaction produces the network of linkages across which information flows and connects (Uhl-Bien, Marion & McKelvey, 2007). Dynamics interact naturally in context, but leaders stir and change the direction of interaction. So we can say that network analysis stirs interaction and leadership interaction. There are three levels of interaction. The first level complexity is micro level complexity in which interactions are observed transiently. Another level of interaction is mezzo level interaction which is encountered among people and can be analyzed by social network analysis. The last level is macro level interaction. Historically analysis is developed and simulation models are used to understand the power and direction of interactions. Communication has been brought forefront so far neglecting the effect of interaction. We should understand that interactive context define the quality of communication.

### **3.3.3. Interdependency and tension**

Interaction alone is not enough for CAL-SP functions; the agents of a system must be interdependent also (Johnson, 2013). While interaction lets the movement and dynamic interplay of information, interdependency creates pressure to act on information. The potency of interdependency comes from naturally emergent networks of conflicting constraints among the agents. Conflicting constraints reveals when the wellbeing of one agent is inversely dependent on the well-being of another, or when the information broadcasted by one agent is incompatible with that broadcasted by another agent. Such constraints put a pressure on agents to design their actions and to define and explain their information (Uhl-Bien, Marion & McKelvey, 2007).

Interdependency was flashed as solidarity in Turkish school context because Turkish social system is collectivist. Due to the fact that human is a social creature and not possible to live alone, solidarity is the most important thing to develop quality of life and social and psychological well-being. Solidarity among personalities causes

peace and produces common values which enable respect, reliability, moral values, between person-organization, society-organization and society-society so that common values can turn into enthusiasm. Solidarity and enthusiasm nonbeing in Turkish school context paralyze the interaction among group as such the concept of nonbeing is not comprehended and effort is not spent to replace the context which solidarity and enthusiasm does not exist. People accept the situation. Finally, everybody feels that they are perfect at school and factionalize others who try to change and adapt at school.

### **3.3.4. Multi-level leadership**

Multi-level adaptive leadership occurs in all hierarchical levels of an organization. The emergent outcomes and the significance and impact of adaptive behaviors differ from level to level (Uhl-Bien, Marion & McKelvey, 2007). A presumption of bureaucracy in the traditional organizations is that the higher the organizational level of an actor, the more information the individual possesses and the better informed she or he is with respect to goal setting and decision making. In the new forms, hierarchical organization is accepted as to allow operating horizontally- to reducing to a minimum core activities retained within one unit and assigning other tasks to semi-independent unit (Johnson, 2013). The objective here is to push decisions to where relevant knowledge and information reside. Broadly discussed, the adaptive function of upper level hierarchy is Ministry of National Education (MoNE) the task of which is to produce emergent planning, resource acquisition and allocation. Adaptive function of middle hierarchical like Provincial Directorate for National Education (PDfNE) level is to allocate the allocated sources and to direct and control the focused planning. The lower level of hierarchical level is schools. School principals develop the core products; produce knowledge for innovation and adaptation.

## **4. Methods**

### **4.1. Research Design**

An exploratory sequential mixed-method design (ES-MMD) in which qualitative data collection and analysis were followed by a quantitative phase was used in this study. Generally, the purpose of an exploratory design is to use the qualitative data exploring a particular phenomenon to develop a quantitative instrument. If the main purpose is to test out an instrument, there may be a greater emphasis on the quantitative part of the study; for that reason, dominant quantitative status was employed to study the factors, processes and impediments for CAL (Creswell, 2012, McMillan and Schumacher, 2006).

Data about the CAL and CT were gathered mainly from the study of Uhl-Bien, Marion & Mc Kelvey (2007), and literature review.

The design began with a descriptive phase named deductive study including literature review. After, follow-up interviews were handled with first sampling group, second sampling group. These groups consisted of some individuals who were instrumental in initiating and guiding the change processes faced transformations from private educational institutions to colleges. Structuring the scale phase is another process that included expert opinions. Lastly, evaluation of the scale step was commenced. Evaluation of the factor structure, validity measures, and reliability measures were applied. The purpose of the qualitative phase of the study was to gain an understanding of the CAL dynamics in both private and state schools.

#### **4.2. Ethical Approval**

The study was approved by the Ethics Committee of the University of Osmangazi University of Education Science Institute and Ministry of National Education of Turkey. Every participant were demanded to take part in interview for qualitative phase of the study. Oral consent was obtained from principals for quantitative phase. Every teacher was invited for quantitative research at teacher lounges. Principals and vice-principals were not allowed to be in teachers' lounge so as not to influence teacher's perception. One school principal refused to leave, and then data collection was cancelled.

#### **4.3. Phase I: Qualitative Study**

Firstly, qualitative (deductive) phase of the research was intended to explore the dimensions of CAL-SP as described by literature of CT, complex adaptive leadership (CAL), administrative leadership (AL), enabling leadership (EL), and adaptive leadership (AL). Next, some people were reviewed to explore the grounded dimensions of CT, CAL, AL, and EL as described by private courses, private schools, and state schools' partners. To this end, a phenomenological approach to qualitative exploration was undertaken. Phenomenology requires the exploration of a phenomenon by narrative explanation of individuals according to their experience related with event phenomenon under study (Moustakas, 1994; Sokolowski, 2000). Thus, semi-structured interviews were carried out with a sample from the population to understand completely dimensions of CAL, CT, AL and EL based upon the own experiences of the interviewees.

### 4.3.1. Sample

Selecting sampling design and size is a pivotal process for S-MMD. Given the option of concurrent and sequential design in ES-MMD, we must make clear which design we are using: (i) choosing the samples for the two phases of the study at the same time, or (ii) choosing one sample first, and only when that study is complete choosing the sample for the next phase of the ES-MMD study (Collins, Onwuegbuzie & Jiao, 2006). Another important point for the relationship between quantitative and qualitative samples in a ES-MMD study can be 'identical', 'parallel', 'nested' or 'multilevel'. When samples in the two phases of the study are exactly the same, the sampling procedure is identical. When the two samples are not exactly the same, but are selected from the same population (e.g. university students) the sampling is parallel. In nested sampling, the qualitative sample is usually a sub-sample of the quantitative sample; finally, multilevel sampling requires the recruiting of different groups of participants for each phase of the research. So, nested sampling was selected depending upon appropriate and contextually relevant criteria (Onwuegbuzie & Collins, 2007).

Three groups of participants were used in this study. The first group used for lucidity testing of semi-structured interview form consisted of four people. Three of them were school principals who were male and one of them was a teacher who was female. On average, the participants were 42, 25 years old (range = 32-49, SD = 7.27).

After literature review on complex adaptive leadership, some state run school principals, private school owners, managers, and teachers were invited in study; because it was needed, some condense analyses to find out some themes embedded in Turkish school context. Criterion sampling method was used in the process for interviews. The second group of participants used for semi-structured interview technique consisted of 13 people. Seven of the participants were female and six of them were male. On average, the participants were 41.26 years old (range = 29-56, SD = 8.85).

### 4.3.2. Procedures

We used semi-structured interviews. All the interviews took place at an office which was designated for the interviews by school principals. When researcher met interviewees at the location designated beforehand, interviewees were introduced to the research topic, and aim. After the permission of interview was granted, all the interviews were tape-recorded and the interviewees were guaranteed that their identity would be kept confidential would not be shared with anyone. During the interviews, all the interviewees were given the same information about the research and were asked almost the same questions. Finally, they were insured that after verbatim transcribed,

form would be given them to be controlled so that any part they do not want would be removed.

### **4.3.3. Data Analysis**

All the interviews were recorded then transcribed verbatim. These transcriptions were analyzed pursuing the phenomenological data analysis by Moustakas (1994). Researcher scrutinized all the transcriptions carefully several times. These ideas and experiences gathered from transcription were grouped into meaning units by thematic clustering (Creswell, 2012). Finally, the description text of the interviewees' was produced. Later, a structural description was constructed through the interviewees' narrative descriptions on CAL, CT, EL, and AL (Miles & Huberman, 1994). As a result of the phenomenological analysis of the qualitative data, some sub and sub-sub dimensions were generated.

### **4.3.4. Thru phase: Development of Scale**

The thru phase of the study was accomplished to the development of the CAL-SP scale. This step of the study was to build the findings from qualitative stage to design and develop the CAL-SP. For that reason, it was the interim phase that the qualitative study was connected to the quantitative study. Research study started with reviewing the literature. As such, both national and international literature related with complex adaptive leadership, CT was reviewed. Moreover, the theoretical foundation concerning with CAL and CT thesis, data collection tools, conceptual articles were examined.

Another session was the semi-structured interview process which had some open ended questions and is one of the most effective ways for collecting data for qualitative (inductive) methods. This session was accomplished in two phases. The first phase adapted interview questions which sought to identify competencies of school principals from the perspectives of CAL and CT that were tested by four participants who were: 1 private college owner, 1 private college coordinator, 1 educational institution owner. Second, thirteen participants who were: 2 Private college owners, 3 private college coordinators, 4 private educational institution managers, 2 state run school principals, 2 state run school teachers were selected. Interviews between researcher and participants discussing some aspects of CAL and CT helped finding some hidden dynamics in Turkish school context. They were asked some questions like what was the meaning of resources for school principals. How did you find and manage resources? What was interaction and how should it be? What was multi-level leadership and functions of it? Was a school principal able to adapt upcoming changes? The opinions of participants were evaluated and experiences of them about

transformation. The sessions were recorded using software called Audio recording applications for Android. The length of each interview varied between 45 to 60 minutes depending on the degree of detail in each interviewee's answers. Researcher was very careful about asking responsive questions, collecting specific data from every participant differently. Researcher focused on interaction, budgeting and resources, multi-level leadership and adaptive climate of schools. All interviews were recorded and transcribed. After descriptive analysis, findings were changed to expressions. Expressions were combined with statements gathered from literature review (Meriam, 2009) constituting a draft form of complex adaptive leadership scale which contained 94 items. Those 94 items were decided adequate in case of possible item reduction onwards.

#### **4.4. Phase II: Quantitative Study**

The purpose of the quantitative phase of the study was to measure the psychometric properties of CAL-SP scale and investigate the validity and reliability scores that scale generated. For this purpose, the CAL-SP was administered to in service secondary school teachers in Turkey.

##### **4.4.1. Sample**

A stratified random sampling method was selected for the main study to improve the representativeness of the results. In this procedure, the population of Odunpazari districts schools' teachers were divided into three strata according to their students' TEOG exam results held in nationwide for the 8 grade students of secondary schools. Once the population was divided, (ii) sample were drawn proportionally instead of random way (McMillan & Schumacher, 2006). The proportionate stratification was calculated on the basis of teachers who took part in the research. This confirmed that the number of teachers chosen as a sample from each stratum was on an equal basis to the number of teachers for representing each school in an equal ratio.

The total sample size of 424 teachers was chosen among 1203 population. The sample in the study consisted of 133 (31.4%) male teachers and 291 (68.6 %) female teachers. The age of sample was divided into four groups. The first group which was below 30 consisted of 87 teachers (20,9%), the second group which was between 31-40 consisted of 190 teachers (45.7), the third group between 41-50 consisted of 110 teachers (26.5%) and they last group which was over 50 consisted of 30 teachers (7.2%). The first cluster consisted of 152 (female=125, male=27) teachers, the second cluster consisted of 164 (female=111, male= 53) teachers and the last cluster consisted of 108 (female=56, male= 52) teachers.

#### **4.4.2. Data Collection**

Permissions were granted by school principals up on a telephone call for reservation. A date was arranged and researcher demanded a private room for data collection through filling questionnaire. It was reached a consensus together with school principal that no principal or vice-principal would be allowed to be in during questionnaire filling process. A school principal violated the agreement then the researcher stopped the survey and left the school. Teachers were invited to take part in the study voluntarily then the purpose of study and data collection procedures explained by researcher.

#### **4.4.3. Instruments**

Complex adaptive leadership for school principals (CAL- SP) was designed in three sections. The questionnaire was composed of two main sections: demographics and CAL-SP questionnaire. The Demographics section which was designed for teachers included sex, employment duration in service, age, alma mater, branch, and union membership. The complex adaptive leadership for school principals' questionnaire section included the 45 items developed through qualitative study. All 45 items in CAL-SP are rated using a 5-point Likert scale, with 1 being "Strongly Disagree" and 5 being "Strongly Agree". Total scores are calculated by summing up responses for each item. The scores that refer to the CAL skills of school principals range from 45 which was low level CAL skill to 225 with higher scores corresponding to best level of CAL-SP skill.

We employed a school climate scale (SCS) to ensure the validity of CAL-SP. School climate scale (Calik & Kurt, 2010) we used revealed that the scale was composed of three factors. These were (1) supportive teacher behaviors, (2) achievement-orientation and (3) safe learning environment and positive peer interaction. Factor load value of each item was found to vary in 0.45-0.85 range in this 3-factor structure. Total number of the variances defined by SCS was found to be 44.78. Using Lisrel 8.71 program, Confirmatory Factor Analysis (CFA) was made to test the validity of the 3-factor structure. Examination of the other goodness-of-fit values showed that 3-factor model had sufficient goodness-of-fit values. Reliability level of the scores obtained from SCS was evaluated on the basis of the Cronbach Alfa inter-item correlation coefficients calculated according to item analysis. These coefficients were .79 for the first factor, .77 for the second factor, .85 for the third factor and .81 for the whole scale.

The transformational leadership (TL) scale was used (Edwards, Knight, Broome & Flynn, 2010). It was evaluated in two stages: first-order analysis consisted of factor structure and second order factor loadings were estimated based on composite scores corresponding to each of the first-order factors. The principal component analysis

(PCA) found five factors that were (i) idealized influence, (ii) intellectual stimulation, (iii) inspirational motivation, (iv) individualized consideration, and (v) empowerment.

Another scale was motivational language scale for school principals (ML-SP). The ML-SP revealed that item-total correlation coefficients were between .56 and .83. The Kaiser Meyer Olkin value was .946. The Bartlett Sphericity test was significant ( $\chi^2=4859.252$ ,  $p<.01$ ). Exploratory factor analysis was held and indicated that 3 factors existed that were greater than Eigen value 1, explaining 69% of the total variance. Factor loads were changed from .54 and .84. The Pearson-Moment correlation coefficients between factors ranged from .67 to .78. Cronbach's Alpha values for factors ranged from .88 to .94. Researcher labeled three factors as such: (i) perlocutionary language, (ii) illocutionary language, (iii) locutionary language.

#### **4.4.4. Data Screening and Analysis**

The SPSS (Statistic Package for Social Science) software and the LISREL (Linear Structural Relations) program and AMOS program were used for the statistical analysis.

##### **4.4.4.1. Reliability Assessment and Dimensionality**

Exploratory Factor Analysis (EFA) statistical analyses were conducted by employing IBM Statistical Package for the Social Sciences (SPSS 20). Exploratory factor analysis (EFA) was performed to explore the factor structure of the CAL-SP scale. Firstly, the KMO (Kaiser-Meyer-Olkin) test for sample adequacy was performed to research the adequacy of the data. Moreover, Bartlett's test was employed to decide the level of factorability by scale. Later, the principal components of factor analysis were made regarding the scale items. Factor analysis is a widely used multivariable statistics technique that aims to find independent variables. According to if a factor load value is .45, it is a good criterion for selection. This number can be reduced to .30 for scales with a small number of items (Tabachnick & Fidell, 2013). In addition, if the value in the KMO test is over .80 is very good, and .90 is perfect. In the factor analysis, the inclusion of factors with the Eigen value of 1 and higher is widely used, and these factors are taken as important. In factor analysis measurements, a total variance between 40% and 60%, are considered as sufficient. Researchers frequently choose the techniques of varimax or quartimax for vertical rotation, and oblimin or promax for inclined rotation. A selection may be considered as better when there is a general (single) factor that meets the majority of the variance, and varimax is a multi-factor structure. On that basis, .40 was taken as the lower limit for the factor load values and factor common variance (commonalities), and the item total correlation lower limit was taken as .30 in

the factor analysis measurement, as with various existing studies (Kurtuldu & Bulut, 2017). The coefficient Cronbach's Alpha was employed for the reliability. The Alpha test was performed on the subtitles to determine the internal coherence coefficients of the scale by split-half method. In the half-split validity, the total sample was randomly divided into two groups to represent all of the groups.

#### **4.4.4.2. Convergent and Discriminant Validity**

Confirmatory Factor Analysis (CFA) was executed using Lisrel 8.51. Specifically, the model hypothesized a priori those teacher perceptions responses to the CAL-SP could be explained by the three factors called: (i) enabling leadership, (ii) administrative leadership, (iii) adaptive leadership. Several criteria were used in determining the goodness of fit for the hypothesized structure, including the ratio of  $\chi^2$  to its degree of freedom ( $\chi^2/df$ ), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and goodness of fit index (GFI). Because the  $\chi^2$  test has been found to be too sensitive to sample size, the ratio of  $\chi^2$  to its degree of freedom ( $\chi^2/df$ ), with a range of less than 3.0 being indicative of an acceptable model fit, has been used in practice (Hoe, 2008; Carmines and McIver, 1981). CFI values near 1.0 are optimal, with values greater than .90 indicating acceptable model fit (Kline, 2005). A value of .90 or greater was initially suggested as evidence of adequate fit. Yet, it was later suggested a value of .95 as a criterion for adequate fit (Kline, 2005). Recently, the cut-off value of .95 is viewed as too restrictive. Byrne (1998) proposes that CFI values in the range of .92 through .94 may be considered as reasonable indicators of good model fit, whereas Hair, Anderson, Tatham & Black (2010) recommend value of equal to or more than .90 to indicate an acceptable level of model fit. The RMSEA values less than .05 indicate good fit, with values as high as .08 representing reasonable errors of approximation in the population (Browne & Cudeck, 1993; Byrne, 1998). The GFI values like multiple r-squared, theoretically ranges from 0 (poor fit) to 1 (perfect fit), considered satisfactory when  $> .90$  (Hu & Bentler, 1999). Internal consistency reliability was studied to decide how homogeneous the items in the CAL-SP. Cronbach's Alpha, Spearman-Brown and Guttman coefficients were used as the internal consistency reliability coefficient.

#### **4.4.4.3. Nomological validity**

It is a means of evaluating construct validity for a measure comes from determining the extent to which the measure fits into a network of relationships. That is, one aspect of construct validity involves the extent to which a measure operates within a set of theoretical constructs and their respective measures. Nomological validity based on investigation of constructs in terms of formal hypotheses derived from theory. As such,

nomological validation is primarily external and involves investigating both the theoretical relationship between measures of those constructs. Thus, measures must demonstrate nomological validity to be accepted as construct valid. Structural equation modeling (SEM) can be used to corroborate evidence of validity (Iacobucci, Ostrom, & Grayson, 1995). In assessing the nomological validity of CAL-SP, we used SEM and investigated two antecedents of CAL leadership behaviors, and one consequence. For the operating antecedents, we used transformational leadership scale (TL), and motivational language for school principals (ML). Lastly, school climate scale (SC) was used for researching the consequence.

#### **4.4.4.4. Content validity analysis**

Content validity study is defined as the ability of an instrument to measure the properties of the construct under study. It is also known as the ability of the selected items to reflect the variables of the construct in the measure. This type of validity addresses the degree to which items of an instrument sufficiently represent the content domain (Nunnally, 1994). We used Lawshe content validity ratio to assess the validity. In the quantitative content validity method, confidence is maintained in selecting the most important and correct content in an instrument, which is quantified by content validity ratio (CVR). In this way, the experts are requested to specify whether an item is necessary for operating a construct in a set of items or not (Lawshe, 1975). To this end, they are requested to score each item from 1 to 10 with a degree range of “*not necessary to essential*” respectively. Content validity ratio varies between 1 and -1. The higher score indicates further agreement of members of panel on the necessity of an item in an instrument. The formula of content validity ratio is  $CVR = (N_e - N/2) / (N/2)$ , in which the  $N_e$  is the number of panelists indicating "essential" and  $N$  is the total number of panelists. In our study, if CVR is bigger than 0.59, the item in the instrument with an acceptable level of significance will be accepted.

## **5. Findings and Results**

### **5.1. Findings of Deductive Study**

There were three dimensions of CAL which was conceptualized by Uhl-Bien, Marrion, & McKelvey (2007). In order to find some other dimensions qualitative research was used. As such, some themes emerged from the interviews as the sub-dimensions or complementary information about CAL-SP. These dimensions or complementary information emerging from interviews were: (i) resources at school, (ii) sustainable

interaction at school, (iii) functions of multi-level adaptive leadership (Uhl-Bien, Marrion, & McKelvey, 2007), (iv) adaptive functions of school principal.

The theme about resources at school emerged as a complementary information refers to very problematic situation of school principals. The topic of resources was generally understood as money which was main problem of schools and school principals. Other resources were uttered as time, environment, intellectual background, knowledge, commitment, and technology. In this regard, one school participant whose nickname was K4 said that:

*“We are desperately in need of money to take care and manage school. I cannot keep on thinking about what other things can be resources unless I figured out monetary problem. The amount that state allocates is not enough even for main need have school”.*

Managing the resources was another sub-dimension or complementary information about CAL-SP. These items were: (i) state monetary support, (ii) centralized administrative system, (iii) parent-teacher-student association. The items mentioned under this theme were related to the ideas of creating and managing resources for school. Participants described how this idea was an indispensable part of their schools. K3, a state school principal, stated that:

*“What a pity that problems are quite a lot. Figuring out them is our responsibility. We have to change our traditional way of thinking. We must go from door door. Decisions are taken centrally. I do not think that those decision makers are caring about us”.*

The second dimension was labeled as sustainable interaction at school. The items under this theme reflected a reverential tongue by school principals, accepting otherness and consulting teachers. Participants’ portrayal about interaction at school of what was interaction and how it must be discovered some problems at school such as principals’ not using a respectful language, not respecting discrepancies, and a self-ordained principal behavior. The vital importance of respectful language from school principals to established a healthy school climate. Since communication devices were effective parts of school climate, supported by interaction, teachers reported communication deficiencies during the interviews. K2 who was a teacher at a school said that:

*“We aim to raise students who own their ideals for their country and humanity. If we want to reach the aim, school climate must be positive. I can express that school climate is*

*not satisfying and the only responsible person is always school principals. For that reason, school principals must use respectful language and shows respectful behaviors”.*

The third dimension was the multi-level adaptive leadership behavior. There were ethical leadership, charismatic leadership, and emergence ability of ethical and charismatic skills as items under this dimension. The items grouped under this theme are related to the need of teachers because ethic and charisma were found to be a desired personality trait of school principals. Participant K6 touched upon the item about ethical leadership as such:

*“I demand that school principal can gain confidence. School ambiance in which we live is not deterministic and we serve for human. When something is made accidentally, nobody should be blamed. [] School principal should be trustable and act within moral and ethics codes”.*

K9 pointed out about the emergence ability of a leader in school settings:

*“Everything changes in a minute so school principals do not have to know everything. If there somebody in a problematic settings, school principal let him handle the situation delegating his authority. Decisions mechanisms are not up to date and quite hectic, so it is not possible for a school principal to delegate his power. The system must undergo a radical change”.*

The last dimension was adaptive function of school principal. There were two sub-dimensions emerging during the interviews: (i) school manager ability to adapt change, (ii) obstacles for adaptations to change. The items grouped under the first sub-dimension were ability to see the change beforehand, free structure which will let changes emerge and the will to bring about change. Participant K1 talked about the item of obstacles for adaptations to change.

*“[...] If you convince the families, it is easy to get help. Turkey is located in earthquake zone. After the big one lived in Istanbul, parents offered me to put our school structure under resistance control. I supported them. I found some amount of money, I found the company which renounced some money and families donated sum we need. After control, our school structure was earthquake resistant. That common action got us together. Everybody was happy then. I understood that my being open to change, foresee the anxiety of parents ruined the obstacles between me and parents”.*

## 5.2. Findings Inductive Study

Multiple data analysis was implemented for the purpose of accumulating different types of CAL-SP validity, as described below.

### 5.2.1. Reliability Assessment and Dimensionality

The most important aspects of construct validity are to measure the convergent validity (Hinkin, 1995). Convergent validity points out the agreement reached by multiple measurements of the same concept (Bagozzi & Phillips, 1991). Dimensionality of the construct was tested using exploratory factor analysis (EFA). Our research groups were divided into three teachers' samples according to the schools whose TEOG results were low, middle and high. The first group was consisted of 152, the second group 164 and the third group 108 teachers. All 47 items were subjected to an exploratory factor analysis (EFA). The KMO measure of sampling adequacy for cluster 1= .967, cluster 2= .924, cluster 3= .952 and Bartlett's test of sphericity for cluster 1= 16773.606, ( $p < .001$ ), cluster 2= 16821.599, ( $p < .001$ ), cluster 3= 15998.302, ( $p < .001$ ) indicated that the 47 items were suitable for factor analysis. In the EFA in total, Factor 1 contained 1 insufficient item to be considered stable. Factor 2 contained 1 assimilation items the reason of which was thought to be a reverse item. After conducting one more EFA extracting the unwanted 2 items, we had three factors with 45 items. We labeled these factors as "managerial leadership (ML)", "adaptive leadership (AL)", and "enabling leadership (EL)". Enabling leadership factor had 21 items and factor loads were changing from 0.448 to 0.766. Managerial leadership factor had 14 items and factor loads were changing from 0.464 to 0.714 and adaptive leadership factor had 10 items and factor loads were changing from 0,516 to 0,765. Table 1 shows a complete listing of all items retained for the final version of the scale as well as their EFA results.

Factors were also largely independent in total ( $r \geq .69$ ), accounted for 61% of the variance, and had factor loadings. CAL-SP scale had three sub-factors and their Eigen values were greater than 1. Table shows the CAL-SP scale variance percentage and Eigen values.

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**Table 1: Variances of Sub-scales of CAL-SP**

Sub-scales	Cluster1 (N=152)			Cluster2 (N=164)			Cluster3 (N=108)			Total (N=424)		
	EL	ML	AL	EL	ML	AL	EL	ML	AL	EL	ML	AL
<b>Items *</b>												
1. Uses decent communicative language with teachers.	.71	-	-	.70	-	-	.70	-	-	.76	-	-
2. Is reliable.	.67	-	-	.66	-	-	.66	-	-	.72	-	-
3. Is modest.	.64	-	-	.63	-	-	.61	-	-	.71	-	-
4. Is respected.	.63	-	-	.62	-	-	.61	-	-	.67	-	-
5. Respects opinions of opponents at school.	.61	-	-	.61	-	-	.60	-	-	.64	-	-
6. Shows effort to establish interactional school ethos to share common values (knowledge, culture, values etc.)	.60	-	-	.59	-	-	.59	-	-	.63	-	-
7. Has an integrative personality at school.	.60	-	-	.59	-	-	.58	-	-	.61	-	-
8. Accepts otherness as spiritual richness.	.59	-	-	.59	-	-	.58	-	-	.61	-	-
9. Is a mediator during conflicts at school?	.58	-	-	.57	-	-	.56	-	-	.61	-	-
10. Causes me to undergo burnout syndrome.	.58	-	-	.57	-	-	.56	-	-	.61	-	-
11. Encourages teachers to show strong solidarity on their “rainy days”.	.57	-	-	.57	-	-	.56	-	-	.60	-	-
12. Does not pull strings using his post.	.56	-	-	.55	-	-	.54	-	-	.59	-	-
13. Shows effort to comprehend teachers better by using his emphatic skill.	.54	-	-	.54	-	-	.53	-	-	.57	-	-
14. Pursues fairly of gains and losses of teachers when managing conflicts at school.	.53	-	-	.52	-	-	.52	-	-	.56	-	-
15. Gives chance to people who are able to solve problem more efficiently occurred in school context.	.50	-	-	.49	-	-	.48	-	-	.52	-	-
16. Efforts to recognize every teacher at school.	.47	-	-	.47	-	-	.46	-	-	.52	-	-
17. Takes fast and precise decision.	.46	-	-	.45	-	-	.45	-	-	.49	-	-
18. Looks for negative sides of teachers (such as mistake, fault, wrongdoings)	.45	-	-	.45	-	-	.45	-	-	.47	-	-
19. Consults before taking decisions.	.43	-	-	.44	-	-	.42	-	-	.45	-	-
20. Sees the change and innovation proposals in vain	.43	-	-	.42	-	-	.41	-	-	.45	-	-
21. Plans course loads fairly.	.43	-	-	.41	-	-	.40	-	-	.44	-	-
22. Uses social networks (Facebook, twitter etc.) efficiently for educational purposes.	-	.69	-	-	.71	-	-	.68	-	-	.71	-
23. Has an intuition to define the emerging problems beforehand during the change and innovation process.	-	.67	-	-	.70	-	-	.67	-	-	.70	-
24. Has the capability for change and innovation at school.	-	.67	-	-	.63	-	-	.65	-	-	.63	-
25. Informs parents regularly about children’s academics/social conditions via social media.	-	.65	-	-	.62	-	-	.63	-	-	.62	-

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26. Efforts to furnish teachers with high-tech educational aids.	-	.65	-	-	.62	-	-	.62	-	-	.62	-
27. Show efforts to improve teachers' professional competence.	-	.64	-	-	.62	-	-	.61	-	-	.62	-
28. Shows effort to enhance teachers' self-confidence.	-	.64	-	-	.61	-	-	.60	-	-	.61	-
29. Encourages teachers for using new instructional methods and techniques.	-	.63	-	-	.58	-	-	.59	-	-	.58	-
30. Adapts himself developments related with his profession.	-	.62	-	-	.54	-	-	.53	-	-	.54	-
31. Creates school environment giving "a will to work".	-	.57	-	-	.53	-	-	.51	-	-	.53	-
32. Show efforts to keep school environment safe.	-	.56	-	-	.53	-	-	.50	-	-	.53	-
33. Provides strong solidarity with teachers to improve academics standing of school.	-	.54	-	-	.52	-	-	.49	-	-	.52	-
34. Overworks altruistically at off-hours for school.	-	.49	-	-	.53	-	-	.47	-	-	.49	-
35. Provides cooperation among school-family-teacher.	-	.47	-	-	.52	-	-	.44	-	-	.46	-
36. Controls instructional activities if performed according to aim.	-	-	.73	-	-	.72	-	-	.71	-	-	.76
37. Evaluates scientifically of school's academic standings (collecting digital data, using statistics)	-	-	.72	-	-	.70	-	-	.69	-	-	.74
<b>38.</b> Evaluates students' academic standings collaborating with teachers.	-	-	.69	-	-	.65	-	-	.65	-	-	.71
39. Follows students' development level.	-	-	.64	-	-	.64	-	-	.64	-	-	.66
40. Works hard for enhancing students' academic standings.	-	-	.63	-	-	.63	-	-	.61	-	-	.66
41. Demands me to follow children are social networking sites for keeping them from abuses (sexual, mental etc.)	-	-	.61	-	-	.61	-	-	.59	-	-	.58
42. Organizes drills at school. (Fire, earthquake etc.).	-	-	.59	-	-	.59	-	-	.54	-	-	.57
43. Shows effort to organize extracurricular activities.	-	-	.58	-	-	.58	-	-	.53	-	-	.56
44. Has a skill to plan school tasks according to degree of urgency.	-	-	.56	-	-	.57	-	-	.52	-	-	.52
45. Communicates positively with other instutions around school environment.	-	-	.54	-	-	.51	-	-	.49	-	-	.51
					<b>Cluster 1</b>	<b>Cluster 2</b>	<b>Cluster 3</b>	<b>Total</b>				
KMO					967	.924	.952	946				
Bartlett's					16773.606	16821.599	15998.302	4859				
$\chi^2/df$					2.44	2.16	2.04	2,26				
RMSEA					0.05	0.07	0.06	0,07				
GFI /CFI					0.91/0.94	0.89/0,90	0.80/0,83	0.91/0.94				

**Table 2:** CAL-SP Scale Variance, Percentage, and Eigenvalues

Sub-factors	N	Eigen values	Explained Variance
Enabling leadership	424	5.131	22.309
Administrative leadership	424	3.538	20.506
Adaptive leadership	424	2.354	18.730
Total	424	11.023	61.545

### 5.2.2. Convergent and Discriminant Validity

Confirmatory factor analysis (CFA) with maximum likelihood estimation was performed to test the constructs' stability in the 45-item CAL-SP. The 3-factor model fit were; cluster 1  $\chi^2/df = 2.44$ , cluster 2  $\chi^2/df = 2.16$ , cluster 3  $\chi^2/df = 2.04$ , total  $\chi^2/df = 2.04$ . Cluster 1 CFI = 0.94, Cluster 2 CFI = 0.90, Cluster 3 CFI = 0.83, total CFI = 0.94, Cluster 1 GFI = 0.91, Cluster 2 GFI = 0.89, Cluster 3 GFI = 0.83, total GFI = 0.91. Cluster 1 RMSEA= 0.05, Cluster 2 RMSEA= 0.07, Cluster 3 RMSEA= 0.06 and total RMSEA= 0.07. Additionally, all factor loadings were significant at the  $p < .001$  level, ranging from .39 to 1.07 (standardized). Small to moderate levels of intercorrelation support discriminant validity of 3 constructs; thus, this model confirmed the exploratory factor analysis. Table 1 shows a complete listing of all items retained for the final version of the scale as well as their EFA and CFA results.

Discriminant validity was also employed. For each construct average variance extracted (AVE) exceeded the 0.5 level (Hair, Anderson, Tatham & Black, 1998). Besides, the AVE for each construct i.e., item was almost higher than the squared correlation between transformational leadership (TL), motivational language (ML) and school climate (SC) indicating discriminant validity (Fornel & Larcker, 1981). Table 3 illustrates the discriminant validity test for CAL-SP scale.

**Table 3:** Discriminant validity test

Construct	AVE	Squared correlations		
		1	2	3
EL	0.75			
ML	0.69	0.57		
AL	0.71	0.65	0.52	
TL	0.69	0.51	0.46	0.44
ML-SP	0.61	0.42	0.43	0.55
SC	0.45	0.16	0.43	0.39

### 5.2.3. Nomological validity

Evidence of nomological validity is provided by a construct's possession of distinct previous and consequences, investigating theoretical relationships between different

constructs derived from the literature. To assess the nomological validity of the CAL-SP scale relying on structural equation modeling, the nomological validity investigates one antecedent's transformational leadership and one consequence. For the operationalization of the antecedents, the well-structured scale of TL (Edwards, Knight, Broome & Flynn, 2010) and ML (Ozen, 2013) were used while SC scale (Turker & Calik, 2005) was used for the operationalization of the consequence. The TL was evaluated in two stages: first-order analysis consisted of factor structure and second order factor loadings were estimated based on composite scores corresponding to each of the first-order factors. The principal component analysis (PCA) identified idealized influence, intellectual stimulation, inspirational motivation, individualized consideration, and empowerment. Reliability for all TL factors met or exceeded) recommendation of .70 for newly developed scales. The alpha coefficient scores ranged from .78 to .97 (Inspirational Motivation). The high coefficients support the conclusion that the TL reliably measures the first-order transformational leadership practices (Nunnally, 1978). As for motivational language for school principals (ML), which is a Likert scale, Item-total correlation coefficients were between .56 and .83. The Kaiser Meyer Olkin value was .946. The Bartlett Sphericity test was significant ( $X^2=4859.252$ ,  $p < .01$ ). Exploratory factor analysis was held and indicated that 3 factors existed that were greater than Eigen value 1, explaining 69% of the total variance. Factor loads were changed from .54 and .84. The Pearson-Moment correlation coefficients between factors ranged from .67 to .78. Cronbach's Alpha values for factors ranged from .88 to .94. The translated Turkish form of the Motivational Language Scale (MLS) in this study has a high validity and reliability. School climate scale (SC) was developed by Calik & Kurt (2010), and analysis revealed that the scale is composed of three factors. Factor load value of each item was found to vary in 0.45-0.85 range in this 3-factor structure. Total number of the variances defined by SC, which is composed of three sub-dimensions, was found to be 44.78. Confirmatory Factor Analysis (CFA) was made to test the validity of the 3-factor structure revealed by exploratory factor analysis. Examination of the other goodness-of-fit values showed that 3-factor model has sufficient goodness-of-fit values. Reliability level of the scores obtained from SCS was evaluated on the basis of the Cronbach Alfa inter-item correlation coefficients calculated according to item analysis. These coefficients were calculated to be .79 for the first factor, .77 for the second factor, .85 for the third factor and .81 for the whole scale.

A structural model was estimated with AMOS and provided good fit to the data ( $\chi^2 = 320$ ;  $df = 131$ ;  $p < 0.001$ ;  $CFI = 0.94$ ;  $RMSEA = 0.05$ ;  $GFI = 0.94$ ). Table 4 illustrates in detail the nomological validity from the model fit statistics that purports that CAL-SP has a good structure.

**Table 4:** Model fit statistics of the scales used in the nomological validity test

Measure	$\chi^2$	df	RMSEA	GFI	CFI
TL	339	140	0.08	0.78	0.88
ML	753	200	0.10	0.98	0.97
SC	178	50	0.10	0.96	0.98
CAL-SP	320	131	0.05	0.91	0.94

Table 5 shows the statistics for the paths of the nomological validity. Given that TL is a leadership skill for schools (Leithwood, 1992), the nomological validity test examines the role of TL as an antecedent, which seems to drive CALSP ( $\beta = 1.031$ ,  $p < 0.01$ ). However, the effects of ML on CAL-SP are significant ( $\beta = -0.047$ ,  $p = 0.39$ ). ML predicts negatively CAL-SP. Considering that the ML items related to school leadership objectives, this finding could be explained by the social and hierarchical impotency of school principals not having power in their hands. The nomological validity test confirms that SC might not be a driver of CAL-SP ( $\beta = -0.145$ ,  $p < 0.001$ ) which means that a school principal should have power stemming from his post to undertake strategic initiatives and take important decision such as teacher employment to improve school capabilities. The education system in Turkey conveys strong central management characteristics. Our model shows that CAL-SP ( $\beta = -0.15$ ,  $p < 0.05$ ) has a negative effect on SC not corroborating the aforementioned studies. It is important to acknowledge that since SC is measured subjectively in our study, it can only be confirmed as a positive link in the context of a nomological validity test and not a causal relationship.

**Table 5:** Statistics for the paths of nomological validity test

Path	$\beta$ (Estimate)	S.E.	t-Value
TL → CAL-SP	1.031	0.177	3.18
ML → CAL-SP	-0.047	0.140	0.56
SC → CAL-SP	-0.145	0.077	3.60
TL ↔ ML	0.510	0.051	2.71

Table 6 illustrates the data for each construct average variance extracted (AVE) exceeded the .5 level that is recommended (Hair, Anderson, Tatham and Black, 1998).

**Table 6:** Correlations among and AVE's of nomological constructs validity test

Construct	1	2	3	4
CAL-SP				
TL	0.63	0.62		
ML	0.57	0.52	0.79	
SC	0.65	0.10	0.54	0.30

A Pearson moment correlation coefficient was conducted to assess the relationship between the scores of the sub-factors of CAL-SP scale. The correlations coefficients of the sub-factors changed between 0.69 and 0.81. The strong correlation between the two scores provided evidence of similarity among sub-factors. Thus, it was ensured that construct validity of CAL-SP was provided. Table 7 shows the correlation values among dimensions.

**Table 7:** Correlation Values among Dimensions

Sub-factors	1	2	3	4	5	6
EL	-					
ML	0.79	-				
AL	0.70	-.69	-			
TL	0.68	0.66	.81			
ML-SP	0.63	0.58	.76	0.66		
SC	0.54	0.63	0.67	0.72	0.70	
AVE	0.75	0.69	0.71	0.69	0.61	0.45

\* p<.01

#### 5.2.4. Reliability Analysis

As can be seen from Table 8, Cronbach's alpha reliability coefficient for internal consistency of the questionnaire is .970. It indicates that the questionnaire's internal consistency is good (Nunnally, 1978). Cronbach's alpha was computed separately for each factor to evaluate the internal consistency of the items in factors. The alpha coefficients of Enabling Leadership Skill (21 items), administrative leadership skill factor (14 items), adaptive leadership skill (10 items) were .960, .940, .827, and .910, respectively (see Table 4). They were all beyond the accepted minimum value of .7 which means good internal consistency (Nunnally, 1978).

**Table 8:** CAL-SP Reliability Coefficients

Sub-factors	N	Items	Alpha	Spearman-Brown	Guttman
Enabling Leadership	424	21	.96	0.96	0.95
Administrative Leadership	424	14	.94	0.93	0.94
Adaptive Leadership	424	10	.91	0.86	0.90
CAL-SP	424	45	.97	0.97	0.94

### 5.2.2. Content validity analysis

Content validity was held in 3 steps and started with 94 questions. The first step was held through expert opinions. The first step included three experts who had research about CT, and they expressed their opinions. They were given an assessment card saying; (i) item must be excluded from scale, (ii) item must be re-organized, (iii) item must be in scale. Upon the experts' opinions, 24 items were excluded from scale. It was reached 10 academics for the second step of analysis. Academics had at least PhD. On educational science, and they were given the same assessment card that was given to first group of participants. 25 items were excluded from the scale after the assessment. The third step of content validity was performed with 11 local teachers who worked at Odunpazari secondary schools. They were distributed a graduated dial scale which showed numbers from zero (0) to eleven (11). Zero (0) meant that item did not measure the skill. Ten (10) meant that item perfectly measures the skill. A quantitative result was converted to Lawshe Content Validity ratio. Seventeen items were excluded from scale. Table 9 illustrates the Lawshe content validity ratio.

**Table 9:** CAL-SP Scale Lawshe Content Validity Ratio

Items	Valid	Re-organize/Invalid	X	L-CVR
64	9,07	1.92	8.43	+0,83

L-CVR= Lawshe Content Validity Ratio N=11 N/2: 5, 5 Min.≥ 0.59

## 6. Discussion, Conclusion, and Recommendations

This study examined and confirmed the validity and reliability of the CAL-SP. First, the construct validity was good, showing the expected three-factor structure. Second, the internal consistency of the scale was also good. Overall, these outcomes illustrate that the questionnaire for CAL-SP can be brief and in item-format, with the ability to measure the skills of CAL-SP. The present instrument can therefore be suggested as a useful tool for educational research purposes. With respect to research, the questionnaire can for example be used to learn the skills of school principals for ability to enable their teachers using their administrative and adaptive skills. If the level is

found to be low level, it is high time to criticize centralist structures of educational and school system.

Given the simple and short wording of the items we expect that this questionnaire will also be a useful instrument reporting about school principals' communication, interaction, and ethical skills for being ready for upcoming changes. Although the current study shows positive reliability and constructs validity results of the MMS, it is advisable for future studies to test the cross-cultural compatibility of the results. Furthermore, future studies should also examine the contribution of CAL-SP especially in the countries whose educational and school systems are decentralized.

Considering that the survey data were collected from only one city center in Turkey, the generalizability of the results is limited. Additionally, the data in this study were collected through face to face interview. Decoding the data collected from teachers by only researcher himself might have caused subjectivity and biases in the relationships researcher and interviewee. The most important methodological limitation of this research is common method bias. The main reason for this limitation was the collection of the research data from a single source (teachers from state schools), which may have led to artificial increases in the observed correlations. Although it was not possible to fully eliminate the mentioned limitations of this research, we sought to minimize the error level especially in qualitative phase by inviting teachers, principals and school owners from several sources (i.e. teachers and principals from state schools, private schools). Therefore, the necessary measures were taken during the data collection phase. First, the validity and reliability of the scale used for the data collection phase of the study were tested. Second, during the face-to-face interviews, it was clearly expressed that the responses would kept completely confidential and would not be revealed in any way. Additionally the questionnaire was designed in a manner such that the scale items related to independent variables came before the items related to dependent variables.

### **6.1. Limitations**

The CAL-SP scale was developed in Turkey. The first potential limitation may be that the cultural validity of the scale was not performed in any country other than Turkey. Another limitation may be that school partners' perceptions except school teachers were not obtained. To further validate the scale, a sample of all school members working in different schools in different countries should be examined.

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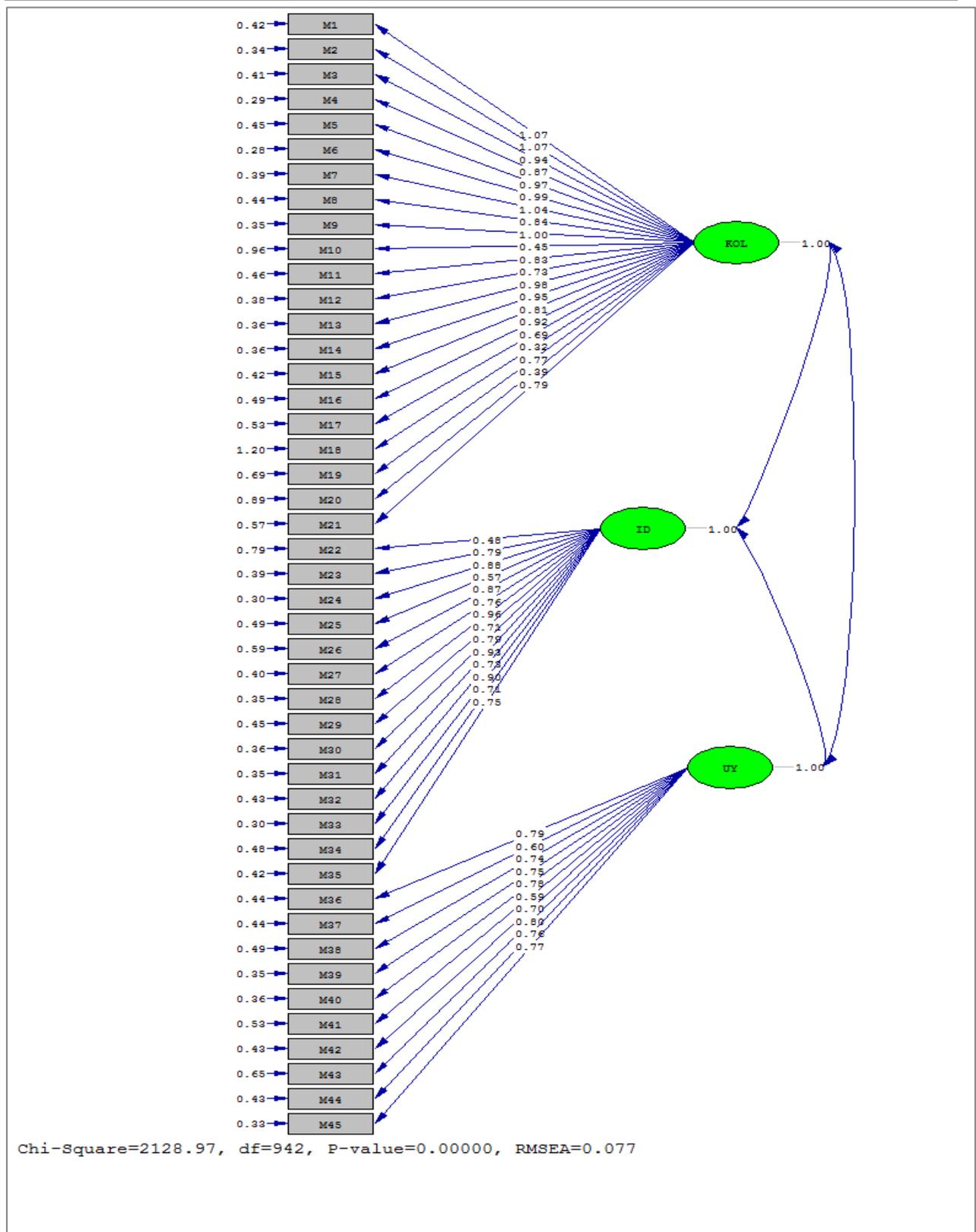


Figure 1: 3- Factor Model

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