

# Seeing wholes: The concept of systems thinking and its implementation in school leadership

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**Abstract** Systems thinking (ST) is an approach advocating thinking about any given issue as a whole, emphasising the interrelationships between its components rather than the components themselves. This article aims to link ST and school leadership, claiming that ST may enable school principals to develop highly performing schools that can cope successfully with current challenges, which are more complex than ever before in today's era of accountability and high expectations. The article presents the concept of ST – its definition, components, history and applications. Thereafter, its connection to education and its contribution to school management are described. The article concludes by discussing practical processes including screening for ST-skilled principal candidates and developing ST skills among prospective and currently performing school principals, pinpointing three opportunities for skills acquisition: during preparatory programmes; during their first years on the job, supported by veteran school principals as mentors; and throughout their entire career. Such opportunities may not only provide school principals with ST skills but also improve their functioning throughout the aforementioned stages of professional development.

**Keywords** Systems thinking · School leadership · School management

**Résumé** Voir des ensembles : le concept de la pensée systémique et son application à la gestion scolaire – La pensée systémique est une approche qui préconise la réflexion sur toute question donnée en tant qu'ensemble, et qui valorise les corrélations entre ses composantes au lieu des composantes elles-mêmes. Cet article

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visé à mettre en rapport la pensée systémique et la gestion scolaire, partant du principe que la première peut permettre aux directeurs de développer des écoles hautement performantes et capables de relever avec succès les défis actuels, plus complexes que jamais dans notre époque marquée par l'imputabilité et des attentes élevées. Les auteurs présentent le concept de la pensée systémique – définition, composantes, historique et applications. Ils décrivent ensuite son rapport avec l'éducation et sa contribution à la gestion scolaire. Ils concluent par une analyse des applications pratiques, par exemple la sélection des candidats aux postes de direction qualifiés en pensée systémique, et le perfectionnement de ce type de pensée chez les directeurs actuels et futurs. Ils signalent enfin trois opportunités pour la transmission de cette compétence : dans le cadre des programmes préparatoires, au cours des premières années d'exercice avec le soutien de collègues expérimentés servant de mentors, enfin tout au long de la carrière. Ces opportunités peuvent transmettre cette compétence aux directeurs d'école, mais aussi améliorer leur action à chaque étape mentionnée de leur évolution professionnelle.

## Introduction

School leadership has never been easy; however, practitioners and researchers alike agree that current-day school principals face particularly complex challenges. Allan Walker and Haiyan Qian (2006) figuratively wrote, 'The dominant modern myth portrays the school principal as an underpaid workhorse tangling with the conflicting demands of instructional leadership, bureaucracy, official mandates and adverse interest groups' (p. 298). Eller (2010) added that the public expects schools and their leaders to be able to work through this chaos and operate in a focused and effective manner. In this regard, the contents, rigour and relevance of educational leadership programmes are currently undergoing reevaluation by a professorate which is external to the educational leadership (e.g. Hess and Kelly 2007) as well as by educational leadership staff (e.g. Murphy et al. 2008). The widespread criticism of leadership training programmes focuses mainly on the inadequate preparation for the exigent demands of principalship (Copland 2001; Hale and Moorman 2003; Levine 2005) and on their failure to provide prospective principals with the capacities to generate change in their schools (Grogan and Andrews 2002).

Challenges faced by contemporary school principals, such as high expectations, accountability requirements and conditions of uncertainty, require systems thinking (ST), which advocates viewing the issue at hand as a whole, while emphasising the interrelationships among its components rather than the components themselves (e.g. Bonn 2005; Checkland and Poulter 2006; Pisapia 2009; Senge 2006; Sterman 2000). The goal of this article is to link ST and school leadership, claiming that ST enables the development of highly performing schools. According to this claim, ST skills acquisition and mastery are essential for current-day school principals as a way to cope with contemporary complex challenges and to meet high expectations. This article therefore maps out the current complexity of school management and then describes ST, both as a concept and as a pragmatic approach. Its connection to education in general and to school management in particular is then discussed. The

article concludes by suggesting practical processes for developing ST skills among currently in-service and prospective school principals.

### Current complexity of school management

Although school leadership has always been challenging, school leaders nowadays face many additional difficulties such as budget cuts (Lytton 2012), community involvement (He et al. 2011), transient student populations, and ethnic and cultural diversity (Kiefer 2004). Importantly, the challenges faced by educational leaders depend on specific characteristics of their particular contexts and local needs (Schechter 2011; Bush and Glover 2004; Bush and Jackson 2002). For example, Tony Bush and George Oduro (2006) found that beginning principals in developing countries, such as Kenya, face problems that differ dramatically from problems faced by their counterparts in developed countries, such as the USA, the UK and Australia. In any case, school leadership today is not easy anywhere.

The present era, referred to as ‘the era of accountability’ by various researchers (e.g. Carter 2012; Comber and Nixon 2011; Jennings 2010), is characterised by high expectations from school leaders alongside frequent changes in educational systems. Accountability is ‘a social relationship in which an actor feels an obligation to explain and to justify his or her conduct to some significant other’ (Bovens 2005, p. 184). Accountability in education is defined as ‘demonstrating the worth and use of public resources’ (Lewis et al. 2008, p. 74) or as ‘responsibility for the decisions and capability to explain to others or the public all undertaken activities to carry out what was obliged to do [*sic*]; to ensure reaching or making progress towards planned objectives or targets’ (Wojtczak 2002, p. 216). The dominance of accountability in the last decade is largely a result of the United States’ Act of Congress *No Child Left Behind*, which requires schools to pass yearly standardised tests aiming to measure students’ improvement. These tests are the primary means for determining whether schools are meeting the standards they are required to attain. If the required improvements are not achieved, the schools may face decreased funding and other penalties (Hayes 2008; Hess and Petrilli 2006). However, the increasing demands for accountability are common not only in the USA but also throughout the world (Levinson 2011; West et al. 2011).

The outcome-based accountability approach holds schools responsible for improving students’ performance. Each school’s staff is currently accountable for ameliorating its students’ academic progress and outcomes, and, more than anyone else, school principals are expected to demonstrate positive results in terms of their students’ achievements (Hess and Kelly 2007). Principals must drive school improvements to meet the challenges of standards-based reforms (Grogan and Andrews 2002) and to align all aspects of schooling to support the goal of improving instruction so that all students are successful (Darling-Hammond et al. 2007).

To accommodate this era of results-based accountability, school leadership needs the capacity to develop high levels of learning for all students (Browne-Ferrigno 2007). Some researchers (Schechter 2005, 2011; Huber et al. 2007; Leithwood et al.

2004; Matthews et al. 2007) have explored desirable leadership capacities for contemporary principals, including the following: (1) Constructing an understanding of how to support teachers in doing their work effectively by *providing models of practice*, i.e. leaders must provide instructional leadership empowering teachers to promote student learning; (2) *Developing shared goals, identity, meaning and purpose*. This means that leaders should encourage effective communication within a culture of shared knowledge, leadership and responsibility for school events and processes; (3) *Fostering collaborative processes* that cultivate better teaching and learning; (4) *Recognising individual and school accomplishments*, thus furthering individual and collective efficacy; (5) *Situating teachers' learning* in the unique educational context at hand; (6) Facilitating collective learning by *establishing collective organisational structures, processes and practices*. Thus, leaders should take the role of facilitators and co-learners who guide collective learning; and (7) *Modelling learning as a shift in perception*, thereby promoting learning in which teachers can construct, refine and negotiate meanings. Altogether, current school principals are expected to focus on the influence of leadership on teaching and learning issues (Orr 2006) through generating learning opportunities for all staff members and students (Schechter 2011; Donaldson 2006; Fullan 2003; Murphy 2006; Young 2008).

In light of growing expectations from school leaders in today's high-stakes accountability environment, leaders need strategies and tools to enable them to succeed. ST may be a useful conceptual framework that makes it possible for school leaders to better overcome the challenges they face. The following sections will present the concept of ST – its definition, history and applications.

## Definitions of ST

What exactly is ST? So far, it has no single accepted definition (Cabrera 2006; Davidz 2006). Here is just a sample of its definitions to date: In Peter Senge's *The Fifth Discipline: The Art and Practice of the Learning Organisation* (2006), one of the fundamental books on ST, the term in question was defined as follows: 'Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots." It is a set of general principles ... it is also a set of specific tools and techniques' (p. 68). Barry Richmond (1994, p. 141) posited, 'Systems thinking is the art and science of making reliable inferences about behaviour by developing an increasingly deep understanding of underlying structure'. Jamshid Gharajedhagi (1999, p. 16) explained, 'Systems thinking puts the system in the context of the larger environment of which it is a part and studies the role it plays in the larger whole'. He added, 'Systems thinking is the art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice. We see the world as increasingly more complex and chaotic because we use inadequate concepts to explain it. When we understand something, we no longer see it as chaotic or complex' (ibid., p. 283). John Sterman (2000, p. 4) wrote that ST is 'the ability to see the world as a complex system, in which we understand that

“everything is connected to everything else.” Peter Checkland (1999, p. 318) claimed that ST is ‘an epistemology which, when applied to human activity, is based upon the four basic ideas: emergence, hierarchy, communication and control as characteristics of systems. When applied to natural or designed systems, the crucial characteristic is the emergent properties of the whole’. The Engineering Systems Division of the Massachusetts Institute of Technology (2007, p. 6) stated the following definition: ‘System thinking – includes holism, an ability to think about the system as a whole; focus, an ability to address the important system level issues; emergence, recognition that there are latent properties in systems; and trade-offs, judgment and balance, which enable one to juggle all the various considerations and make a proper choice’.

Not only is there no agreed definition of ST but there is also no continuous debate about formulating one either (Cabrera 2006; Davidz 2006). The reason for this essential lacuna lies in the nature of the entire ST literature, as evaluated by Heidi Davidz (2006): ‘One key limitation of the ST literature is that there is not a central, ongoing discussion. The ST literature is found in disparate fields and journals, from systems dynamics to systems engineering to general philosophy’ (p. 40). Davidz went on to claim that the ST literature has a substantial disadvantage because the writing on this topic lacks analytic rigour and supporting data or models. For this reason, some of the definitions of ST, dispersed in the broad literature on this topic, do not meet scientific criteria. Davidz also attempted to reconcile the divergent definitions for ST. Synthesising various definitions, she defined ST as ‘utilizing modal elements to consider the componential, relational, contextual, and dynamic elements of the system of interest’ (p. 119). Despite the absence of a common definition for ST, it is quite clear that ST is a holistic framework that views all the component parts of a system in the context of and in relation to the other parts, emphasising the influence of the system’s parts on one another and on the entire system.

## ST components and characteristics

What characterises those who are skilled in ST? What exactly distinguishes them from others? According to the definitions of ST mentioned above, skilled systems thinkers consider any system as a whole rather than as a mere collection of details, understand the system beyond its subsystems and parts, and recognise how each subsystem and each component function as part of the entire system. They understand systems without dwelling on details, develop an increasingly deep understanding of underlying structures and acknowledge the mutual influences at play among the system’s parts.

Researchers have compiled various lists outlining the components of ST. Richmond (2000) named the skills necessary to become a true systems thinker, such as ‘dynamic thinking’ – framing a problem in terms of a pattern of behaviour over time; ‘system-as-cause thinking’ – placing responsibility for a behaviour on internal actors who manage the policies of the system; and ‘forest thinking’ – believing that to know something requires understanding the context of its interrelationships. He also mapped these skills onto a 4-step process that underlies the ST method, to

clarify when it would be best to employ each skill. Senge (2006) presented ‘laws’ of ST, which he distilled from the works of many writers in the systems field, such as ‘today’s problems come from yesterday’s solutions’ and ‘the easy way out usually leads back in’. These formulations are very important for understanding what ST’s components are, but still lack scientific validation.

In order to generalise the characteristics of successful systems professionals, Moti Frank (2010) based his assertions on those of earlier researchers. His list was composed of four sub-lists: (a) cognitive characteristics, such as ‘understanding the whole system and seeing the large picture’, ‘understanding interconnections’ and ‘thinking creatively’; (b) capabilities, such as ‘analyzing the need’, ‘analyzing and/or developing the concept of operations’ and ‘requirements analysis’; (c) individual traits, such as ‘management skills’, ‘building and controlling the work plan’ and ‘good human relations’; and (d) background and knowledge, such as ‘interdisciplinary knowledge’, ‘broad experience’ and ‘education’. Frank posited that successful systems professionals may be considered as such even if they demonstrate only some of the characteristics on the list, as any one person is unlikely to possess them all. However, this list of characteristics does not clearly indicate to what extent each characteristic is vital, or to what extent a professional who is lacking one characteristic or more can compensate with one or more of the other characteristics. Different combinations of characteristics may be appropriate for different types of projects, client environments, team compositions, workplace infrastructures and prevailing organisational cultures.

## History of ST

Further understanding of ST may be gained by briefly reviewing its history. ST began as a scientific approach that stood in contrast to the ‘scientific reductionism’ of René Descartes, who lived in 17th-century Europe and is considered one of the most important and influential thinkers in Western history. The term ‘scientific reductionism’ has been used to describe various reductionist ideas concerning science. Put simply, it helps understand complex phenomena by reducing them to their simpler basic parts. According to this approach, where the whole is no more than the sum of its components, the best scientific strategy is to attempt to explain the smallest possible entities, thus aiming to give explanations to macroscopic properties in terms of microscopic components (Jones 2000; Rosenberg 2006).

Using this methodology, Descartes (1985, pp. 58–59) compared a sick man to a badly constructed clock and a healthy man to a well-made clock: ‘A clock constructed with wheels and weights’ is like the body of a man that is ‘as a kind of machine equipped with and made up of bones, nerves, muscles, veins, blood and skin’. A clock that is badly made and tells the wrong time is like ‘a body [that] suffers from dropsy, for example’. He added, ‘When I consider the purpose of the clock, I may say that it is departing from its nature when it does not tell the right time; and similarly when I consider the mechanism of the human body, I may think that, in relation to the movements which normally occur in it, it too is deviating from its nature’.

According to Descartes' view, the entire universe, as well as everything in it, can be regarded as a clockwork mechanism; to understand it, one needs only to investigate the parts and then to put them together correctly. Recognising the smallest components in isolation from each other makes for knowing the total; all one has to do is reassemble all components and recreate the whole. In other words, the answer to every 'what is this' question would always be 'this is what it is made of' (Lewontin and Levins 2000; Mazzocchi 2008).

Three hundred years after Descartes, Ludwig von Bertalanffy, an Austrian-born biologist (1901–1972), developed his ideas in contrast to Descartes's reductionism and thus may be seen as having planted the seeds for ST. At the time, Bertalanffy was addressing a major conflict between the mechanists and the vitalists about the meaning of life: what separates living matter from non-living matter. The mechanists had claimed that what we call life is simply an epiphenomenon (a secondary phenomenon occurring as a consequence of a primary one) resulting from physical and chemical processes (Craver 2007; Darden 2006). The vitalists, on the other hand, believed in a life force that animates all living matter (Bedau and Cleland 2010; Bowler 2001).

Bertalanffy did not believe that chemical and physical laws alone could explain the behaviour of living creatures; neither did he accept the idea that an unperceivable force could explain it. According to Bertalanffy, both mechanists and vitalists were making the same mistake by attempting to define life solely at the molecular level, without ST. That is, neither group was taking into account the organisation and interrelationships of the molecules. To answer the question 'What separates living matter from non-living matter?' Bertalanffy advocated examining not only microscopic particles but also how they influence one another within the whole, as a web of relationships among molecules: 'A fundamental contrast is found when we consider not single processes, but their totality within an organism or a partial system of it, such as a cell or organ. Then we find that all parts and processes are so ordered that they guarantee the maintenance, construction, restitution, and reproduction of the organic systems' (Bertalanffy 1949, p. 13).

Bertalanffy's tenet – that the whole takes a form that cannot be recognised from its parts – actually served as the basis for ST. This view was innovative at the time, considering the whole to emerge from the relationships between the parts, which affect each other through complex networks of interactions. Importantly, Bertalanffy asserted that the parts and their interactions have meaning only after the whole has emerged. He argued that this was true not only for living creatures, whose life gives meaning to their brain, heart and lungs, but also for any and every system. Years later, Bertalanffy (1968) confirmed this viewpoint as a fundamental scientific approach, claiming that the only way to fully understand why a phenomenon arises and persists is to understand its parts in relation to the whole. This approach has since been adopted by many scientists and scholars in a wide range of fields: Every phenomenon must be viewed from the perspective of the whole system to which it belongs as well as its subsystems and the relationships between its various components (Hammond 2005).

## Applied ST

ST was first mentioned explicitly nearly 60 years ago, by Bertalanffy and others, as a mode of scientific investigation. As an investigative methodology, ST claims to offer a broad view, which enables more in-depth and more accurate understanding of scientific phenomena. Later, ST also became extensively discussed as a means for facing real-world problems. Based on the assumption that its scientific benefit could apply to real-world situations, ST was recommended as a useful way to gain deeper understanding of reality and thus to deal effectively with various assignments and challenges.

The following are examples of ST uses in diverse fields. Scott Leischow et al. (2008) described how public health agencies worldwide used ST to minimise the risk of a future global communicable-disease pandemic of the deadly H5N1 Avian influenza (bird flu). Theo Andrew and Doncho Petkov (2003) outlined the advantages of ST over other approaches for planning a complex rural telecommunications infrastructure that comprised a multifaceted system of people and technology including political, sociological and economic aspects. Than van Mai and Ockie Bosch (2010) reported on the efficacy of ST application in the development of the popular yet complex Cat Ba Reserve tourism system in northern Vietnam, which had been threatened by overuse of underground water, lack of skilled workers, poor infrastructure and more. Their study showed how ST was an effective tool for explaining the complexities of the tourism system and for providing a mechanism for group learning and decision making to achieve desirable outcomes.

These examples illustrate uses of ST as a methodology for real-world problem solving. In this context, some authors have recommended ST as an effective management approach. Managers today are expected to cope with increasing complexity and change. They are asked to tackle a much greater diversity of challenges, which often come in richly interconnected problem situations. Given these conditions, ST has been suggested as a way for managers to deal successfully with the challenges posed by organisations (e.g. Ackoff 1999; Checkland and Poulter 2006; Sterman 2000).

## ST and learning

Is ST an innate talent or a learned ability? Presumably, natural ability to think systemically is required (Frank 2002). However, based on 120 journals of graduate students in a ST course, Carol Ann Zulauf (2007) demonstrated that ST can be learned. She showed that once students were introduced to ST, they could link their decisions to consequences, see the delays in a system, refrain from blaming external 'others' and figure out how they themselves were contributing to the existence of a certain issue or problem. To impart ST knowledge, various methods are used, such as hypermedia (Thurston 2000), metaphors (Taber 2007), case studies (Blizzard et al. 2012) and systems modelling (Hung 2008). Scholars have suggested that ST may also be required indirectly through experience (e.g. Frank 2002). However,



empirical studies focusing on indirect ST acquisition through vocational training or professional experience are still lacking.

The field that most frequently suggests ST as a way of learning today is that of education for environmental sustainability. This multidisciplinary and multifaceted subject encompasses ecological, economic, cultural and other aspects; involves many contributing factors such as building, transport, consumerism and lifestyle; interfaces with many other fields such as law, agriculture and engineering; and deals with short-term, long-term and unintended consequences. To optimally grasp this multidimensional domain, a way of learning is needed that enables learners to see the intricacies, the interrelationships and the big picture in time and space. For this reason, ST has already become a staple of environmental education for sustainability (e.g. Ben-Zvi-Assaraf and Orion 2009; Lewis et al. 2008; Porter and Cordoba 2009; Riess and Mischo 2010; Stone 2010; Williams 2008).

Likewise, the concept of ‘systems biology’ has been used widely in the biosciences in a variety of contexts. Systems biology is ‘about putting together rather than taking apart, integration rather than reduction ... It requires that we develop ways of thinking about integration that are as rigorous as our reductionist programmes, but different ... It means changing our philosophy, in the full sense of the term’ (Noble 2006, p. 21). In this context, the contribution of ST to improved acquisition of a meaningful understanding of biological issues was recently explored (Boersma et al. 2011; Verhoeff et al. 2008). Similarly, ST’s contribution to students’ understanding was also explored with regard to organic reactions – chemical reactions involving organic compounds (Vachliotis et al. 2011). In addition, ST has been noted as an effective way to study technology, by focusing on learning elemental structures and dynamic processes in technological systems (Barak and Williams 2007).

### **ST as beneficial for specific aspects of school performance**

ST may be valuable not only for students’ classroom performance but it may also yield positive outcomes in school performance. Several researchers have singled out ST as a means to facilitate specific processes or as a tool for improving school functioning in a particular field, as can be seen from the following examples. In the context of schools’ educational reforms, Sheri Miller-Williams and Kira Kritsonis (2009) recommended viewing comprehensive school reform through the lens of ST. Theodore King and Frick (2000) also claimed that schools cannot be redesigned effectively without the employment of ST skills. As to carrying out ST, they suggested a mode of enquiry that includes asking questions and drawing diagrams to help educational designers break out of their traditional notions of schooling and realise their dreams of creating something entirely new.

Regarding parent–school relationships, Marilyn Price-Mitchell (2009) drew on ST to reframe parent–school partnerships as learning communities aimed at creating new knowledge and innovation, where the experiences and capabilities of teachers and parents interact to make tacit knowledge explicit. In the context of the *No Child Left Behind* federal legislation in the USA, Patty Chance (2005) proposed the use of

a systems approach to public relations, asserting that ST helps educational leaders see public relations as a continual, systematic process that is essential for engaging school community support to improve students' learning.

ST may also be significant in developing schools as professional learning communities, as recommended by Caryn Wells and William Keane (2008). These researchers demonstrated how Senge's (2006) aforementioned 'laws' of ST may be implemented to develop professional learning communities in school systems. Moreover, ST may be valuable in evaluating curricula and educational programmes. Ralph Jaspardo (1998) claimed that curriculum evaluation via ST can ensure district-wide uniformity and consistency in evaluation. Melissa Dyehouse et al. (2009) compared linear and ST approaches for evaluating educational programmes, demonstrating how ST can provide a framework for representing many of the components in a complex programme and how it may offer a more precise and explicit method for interpreting and assessing programme results.

### The *Systems School Leadership* approach

Unlike the studies mentioned above on specific aspects of school performance (e.g. school reform, collective learning, parent–school partnership, curriculum evaluation), we consider ST not as a tool or technique, but rather as a holistic way of thinking or orientation to the world for school leaders. For this reason, we advocate that principals' implementation of ST in school life should not be limited to specific fields, but instead should holistically span all facets and processes within the school and its environment. We endorse ST as a lens through which school leaders should view wholes. It is a broad conceptual framework encompassing leaders' deliberations, analysis and decision making.

We conducted research to identify the major characteristics of this holistic approach – the *Systems School Leadership* approach – where school leaders adopt the systems view and perform at the systems level (Shaked and Schechter 2013). To glean which ST skills characterise highly performing school leaders, the study employed semi-structured interviews as well as focus groups with 28 school principals who were recommended by their superintendents as outstanding leaders with strong school achievements. Generating ST themes was an inductive process, grounded in the various perspectives articulated by participants.

The findings of this research revealed four main characteristics of *Systems School Leadership*. The first characteristic – *leading wholes* – refers to principals' conceptualisation of all aspects of school life as one large system. When a need arises for change or improvement, the principal who leads wholes will not isolate small components and attempt to repair them, but will rather consider a large number of interactions as they mutually influence each other. The second characteristic – *considering interconnections* – refers to principals' awareness that countless mutual influences are at play among various elements within the school, each of which is connected to others, affecting them and being affected by them. This realisation may result in principals' willingness to assume responsibility rather than blame others. The third characteristic – *adopting a multidimensional view* – refers to the ability to 'juggle' between several aspects of a given issue

simultaneously, noticing a wide range of reasons for its emergence and existence, taking into account a variety of its consequences and predicting various options for its future development. The fourth characteristic – *evaluating significance* – refers to the ability to evaluate elements of school life according to their significance for the entire system, distinguishing between important and unimportant issues to be resolved and identifying patterns.

Significantly, in line with ST, this list of four main characteristics of *Systems School Leadership* should be seen as overlapping, interconnected and interrelated. School leaders who perform at the *Systems School Leadership* level should be considered as such not merely because they demonstrate several of these characteristics, but rather because they reveal an overall ability to interrelate all of these components in the reality of schools. The components of *Systems School Leadership* should be seen as reflections of this comprehensive approach.

### **Implementation of ST in educational leadership**

The identification of these *Systems School Leadership* characteristics offers a new perspective to the research on implementation of ST in educational leadership. Let us now revisit two of the specific facets of school performance addressed above – educational reform and school–parent relationships – but this time as they might be handled by principals who operate more holistically, from a *Systems School Leadership* perspective.

Inasmuch as ST has been recommended for implementing schools' educational reforms (King and Frick 2000; Miller-Williams and Kritsonis 2009; Zmuda et al. 2004), principals' efforts to lead and execute school educational reform could be based on the four characteristics of *Systems School Leadership*. Each of the four characteristics holds many implications for educational reform, as seen in the following examples. (1) *Leading wholes*: Principals who lead whole would view reform not as a collection of changes, but as an orientation towards a central theme, which is its conceptual backbone and should serve as both the source and the target of all of the reform's components. (2) *Considering interconnections*: When designing the reform, principals can take into account the mutual effects among school elements, understanding that one element of school can be improved by changing another supposedly unrelated element. (3) *Adopting a multidimensional view*: Principals who uphold such a view would lead a desired improvement simultaneously in all of the various spheres with which it is associated. School improvement that is focused on students' self-regulated learning, for example, requires a change in textbooks, teaching staff, teaching methods, relationships with parents and more. (4) *Evaluating significance*: Principals can distinguish wisely between important and less important issues that should be addressed, looking for leverage points, where the smallest efforts can produce the highest results. They can also identify hidden patterns, which reveal problems that need to be solved.

Moreover, inasmuch as ST has been recommended for parent–school relationships (Price-Mitchell 2009), the design of such relationships could be based on the four characteristics of *Systems School Leadership*. Each characteristic holds

implications for parent–school relations, as seen in the following examples. (1) Leading wholes: Principals who view the whole can expand their view of the school to see parents as an integral part rather than an external factor with which the school must live in peace. (2) Considering interconnections: School leaders can understand that the relationships between parents and school are influenced not only by direct interactions between the two but also by many events occurring in school. (3) Adopting a multidimensional view: Principals should see parents concurrently as customers, partners and also as resources, seeing simultaneously the needs of pupils, parents, teaching staff and other stakeholders. (4) Evaluating significance: Principals should recognise the main factors that will affect relationships with parents and should rank them as high priority.

The same applicability of the four *Systems School Leadership* characteristics holds for other educational areas, for which ST has been recommended, such as fostering teachers' collective learning and evaluating curricula and educational programmes.

### **Opportunities for *Systems School Leadership* screening and development**

We would like to conclude by discussing practical processes for applying *Systems School Leadership* among prospective and currently performing school principals, including screening for ST-skilled principal candidates and three major opportunities for developing ST skills. We pinpoint three opportunities for developing school leaders' skills acquisition: during preparatory programmes; during principals' first years on the job, supported by veteran school principals as mentors; and throughout their entire career. Such opportunities may not only provide school principals with ST skills but may also improve their functioning throughout the aforementioned stages of professional development.

#### ST screening for principal candidates

Selecting a new school principal is challenging, and several researchers have described attempts to locate the most skilled leaders (e.g. Kwan 2012; Steiner and Barrett 2012; Walker and Kwan 2012). Bearing in mind the significance of ST in the context of school leadership, it would seem advisable to choose school principals right from the outset according to their ST capacities, among other considerations. In order to investigate ST skills, researchers have frequently used interviews (e.g. Frank 2002, 2006; Hung 2008; Taber 2007). This tool may be useful not only for scientific investigation but also in order to assess potential candidates for the post of principal. Without saying so explicitly, interviewers should try to bring interviewees to express their views regarding school management, so as to reveal to what extent the candidate possesses ST capacities. The interviews may include sets of questions such as the following: (a) 'Please tell me about a conflict that arose at your school. What do you see as the causes of this conflict? What were its implications? How do you think this conflict should have been treated?'; (b) 'Which important processes are currently occurring at your school? Why do you think they are important? What

are their consequences? Could anything compromise them, and what should be done to prevent this?'; and (c) 'What is the issue that your school needs to improve the most? Why? What might happen if this issue is not improved? What can increase the chances of this issue being improved?' Other methods, such as simulations or case analysis, also seem suitable for assessing ST skills.

A recent study by Nicholas Sun-Keung Pang and John Pisapia (2012) suggested a link between school leaders' ST and the development of well-performing schools. In a previous study, Pisapia et al. (2005) defined the three strategic thinking skills with apparent links to leader success: reframing, reflection and ST. Based on related literature, Pisapia and Daniel Reyes-Guerra (2007) presented the Strategic Thinking Questionnaire, designed to assess these skills. Sample items included the following: 'I seek different perceptions', 'I review the outcomes of past decisions', 'I try to extract patterns in the information available' and 'I track trends by asking others if they notice changes in our context, or environment'. Using this questionnaire, Pang and Pisapia (2012) found that for Hong Kong school leaders ST was the strongest predictor of leader effectiveness. This research not only substantiated the argument that ST can be an important conceptual framework for school principals who wish to develop well-performing schools but also raised the possibility that prospective school principals' ST skills can be assessed using a questionnaire.

### Preparatory programmes for prospective school principals

The first opportunity to actually impart ST skills is during principals' preparatory programmes. School principals' preparatory programmes have recently been criticised for being out of touch with current school realities, and many scholars have expressed their doubts as to the sufficiency of traditional approaches for preparing and licensing principals (e.g. Hess and Kelly 2007; Levine 2005; Oplatka and Waite 2010; Tirozzi 2004). Leaders of the University Council for Education Administration in the USA have asserted that 'we must rethink and revise our practice in several areas' (Young and Kochan 2004, p. 121), and Theodore Kowalski (2004), an influential scholar of educational administration, has advocated 'substantial reforms in administrator preparation, programme accreditation, and state licensing standards' (p. 93). Ways to improve these programmes are often sought and many suggestions have been made (e.g. Schechter 2011; Davis et al. 2005; Murphy 2006; Oplatka 2009).

As shown in the present review, ST is a necessary competency for successful school principals; therefore, principal preparatory programmes should explicitly incorporate acquisition of ST skills into their curriculum. Indeed, we contend that ST should be one of the main subjects taught in these programmes, and mastering it must be the primary goal. Because learners' everyday reality helps shape the knowledge that they discover and create during the learning process (Wertsch 1985), it is important to contextualise prospective school principals' acquisition of ST skills. They may practise these skills in relation to their own schools – by analysing conflicts, decisions or dilemmas taken from their daily lives through the prism of ST – or by applying the *Systems School Leadership* approach to school challenges observed in their practicum process. Such authentic, situated learning

allows learners to take part in activities directly related to the application of what has been learned (Brown et al. 1989). In addition to direct teaching of ST knowledge, it is important to integrate the ST perspective into other subjects that are studied during the preparatory programme (e.g. school economics, school decision making and instructional leadership), as well as in peer workshops. Thus, state-of-the-art pedagogies for teaching ST skills should be implemented in principal preparatory programmes, including the design of powerful learning environments that promote preservice principals' active construction of ST knowledge; development of self-regulatory skills to prompt, monitor and evaluate ST application; and situated learning embedded in authentic situations in order to foster ST transfer.

### Support programmes for new school principals

The second opportunity to provide school principals with ST skills is during their first years on the job. Naturally, the first year of a school principal's tenure is not easy. Many new principals are forced to struggle through their beginning years (Fleck 2008). However, the notion that novice school principals should be provided with a wise, experienced guide and role model when they first assume their positions has only recently gained widespread support (Wallace Foundation 2007). Thus, productive mentoring aims to provide the mentees with an opportunity for daily translations of educational theory into field practice, with the guidance of a mentor who is versed in the language of the school and capable of understanding and interpreting the real-world problems that the mentee may encounter. This is important because it enriches the mentee's understanding of 'the subtle relationship between theories and the daily practice, such as the interactions with parents, teachers, staff and students' (Daresh 2004, p. 504). Quite a few studies have found that new principals feel that support programmes are necessary for their professional development during their first year on the job (e.g. Kingham 2009; Silver et al. 2009; Woolsey 2010). Despite the satisfaction of both mentors and mentees, many existing mentoring programmes are falling short of their potential and do not do enough to help prepare principals to become knowledgeable and courageous leaders of better teaching and learning in their schools (Wallace Foundation 2007). Basing beginning principals' mentoring programmes on the concept of ST may address this disadvantage and render these programmes much more useful, by providing the beginning principals with a perspective through which they can deeply understand their everyday reality and find effective strategies for creating well-functioning schools. Practically, the periodic mentoring meeting should help the beginning school principal see the school system as a whole, recognising how each subsystem functions as part of the entire system and understanding that there are mutual influences among the school's components. This viewpoint will enable mentor and mentee to analyse the school's main needs, priorities, capabilities, constraints and limitations, and to reveal valuable management information hidden among many details of everyday school life.

ST may also be a framework and central theme for joint work of the education ministry's superintendents with the new principals, focusing on collaborative learning opportunities both at the district and school levels (Camborn-McCabe et al. 2005; Kelly and Peterson 2009; Peterson and Barnett 2005). The first years of

school leadership seem to be the optimal career stage for internalising ST concepts and adopting ST methods and tools, because new school principals often desire a perspective that will arrange the abundance of details, stakeholders and demands with which they must cope, and therefore they feel open to new approaches. Superintendents must work with school principals on improving instruction by providing the resources for teams to meet and review performance data (Schmoker 2006). In particular, today's superintendents must generate collective learning opportunities for principals at district level, and must facilitate, support and provide the framework for ST.

### School principals' lifelong learning

The third opportunity to provide school principals with ST skills is through the continuous process of lifelong learning throughout their years on the job. The notion of lifelong learning, which views learning as an infinite pursuit of knowledge that should take place on an ongoing basis (Field 2006; Hargreaves 2004), has recently received much attention as an approach for the professional development of educators (e.g. Dolan 2012; Hersterman 2012; Sahin et al. 2010). However, there is almost no research regarding lifelong learning among school principals. ST should be a cornerstone of school leaders' lifelong learning: It may be a central issue in principals' ongoing professional development, providing them with a perspective through which to holistically comprehend their everyday challenges and find new effective management strategies.

One example of ST as a subject for lifelong learning is the school network, which is a recently conceived model for organising schools and for changing and improving patterns of instruction and learning (Schechter and Haviv 2013). A school network consists of principals and staff members from various schools who meet in order to advance educational practices, share their professional expertise with each other and learn from their colleagues' experience. They also seek solutions to problems common to their schools in cases where each school on its own cannot solve them. This network learning structure, focusing on the interrelatedness and interconnectedness among schools, may develop principals' ST skills.

### Conclusions

This article argues that ST enables the development of highly performing schools and therefore offers a way for schools to meet currently high expectations in the contemporary era of accountability. For this reason, mastery of the ST approach and its skills' acquisition are vital for today's school principals. Further research should explore the effect of incorporating ST as part of prospective school principals' screening and preparatory programmes, new school principals' mentor-based support programmes and in-service school principals' lifelong learning. Researchers would also do well to further identify the characteristics of school principals who possess high ST aptitude and to understand the process of acquiring ST skills through vocational training and professional experience.

Linear thinking does not work in situations characterised by ambiguity, complexity or fast and furious changes. Overreliance of school principals on linearity does not fit current realities. It may result in failing to identify forces impacting school environments and thus in failing to develop well-performing schools that meet the presently high expectations voiced by parents, superintendents and society at large. As a holistic conceptual framework, ST enables schools to achieve their goals, first and foremost by attaining satisfactory results in terms of students' achievements. Viewing school reality from the ST perspective provides a deep understanding of everyday challenges, alongside strategies for coping with them effectively. Contemporary principals have to think less linearly and more strategically, less concretely and more holistically, less specifically and more synergistically – basically, they need to see wholes.

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