Philip Hallinger · Wen-Chung Wang

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With Chia-Wen Chen and Dongyu Li

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Acknowledgments

As described in Chap. 1, this book summarizes a line of inquiry that spans not only my own career but that of my mentors and key collaborators. I wish to begin by acknowledging some of the key influences on the research contained in this volume.

One of the earliest scholars to highlight the potential importance and complexity of an instructional leadership perspective was Prof. Edwin M. Bridges, one of my dissertation mentors. His 1967 article, 'Instructional leadership: A concept re-examined' published in the *Journal of Educational Administration*, was by no means the first mention of instructional leadership in the educational leadership literature. However, it was one of the first efforts to critically examine and identify the challenges that arise when school leaders adopt this perspective on school leadership. Professor Bridges (1982) also articulated the need for sound research tools in order to conduct productive empirical inquiry on this construct. Indeed, this was highlighted in his 1982 review of research on educational administrators that appeared at the same time that my dissertation was being completed. It was typical of Prof. Bridges' scholarship that he guided not only his own scholarship but that of others toward the resolution of important problems he had identified in field.

Professor Larry Cuban, another dissertation mentor, also shaped this scholarship in significant ways. As a former school superintendent, he offered continuous support and belief in the potential of scholarship aimed at improving the practice of school leaders. At the same time, however, he never hid his skepticism as to whether principals could fulfill the lofty expectations implied in calls for 'stronger instructional leadership'. Nonetheless, he has always been a constructive, friendly, and open-minded critic of my work and challenged me to become self-critical rather than a 'true believer'.

My colleague Joe Murphy also figured prominently in the development of the PIMRS framework and instrument. Our careers have been intertwined since 1981 when we were working together in a California school district under the mentorship of Pete Mesa, a school superintendent whose influence on us continues to this day. The hallmark of our collegial relationship has been the critical but

supportive evaluation of the other's ideas. Many of the ideas presented in this volume emerged from innumerable conversations with Joe.

Several other colleagues deserve mention as well. I have had the pleasure of collaborating on multiple projects with Professors Daniel L. Duke, Ronald H. Heck and Kenneth Leithwood over the past 25 years. Each has brought his own perspective to our collaboration, enriching my own ideas, and challenging me to expand my perspectives on the challenges of leading schools. These collaborative partnerships, without question, affirm the value of finding and working with colleagues who possess complementary perspectives and skill sets.

Roland Barth, founder of the Harvard Principals' Center, and my dear friend and colleague Ruth Greenblatt also deserve mention. They shaped this work by always reminding me of the importance of maintaining a strong link to the real lives and work of school leaders. Both taught me important lessons about the value of passion and EQ in leadership.

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Introduction

This book describes the development and use of the *Principal Instructional Management Rating Scale* (PIMRS), a rating instrument used for assessing the instructional leadership of principals. As of March 2015, the PIMRS has been used in over 250 studies of principal instructional leadership conducted in more than 30 countries. It has also been used by principals and school district leaders internationally to gain insight into patterns of leadership practice in their schools.

In 1979, Ronald Edmonds launched the 'effective schools movement' with publication of a seminal article on instructionally effective schools in *Educational Leadership*. In this article, he articulated the importance of principal instructional leadership as a factor contributing to school effectiveness. Although the American literature on educational administration had previously identified the principal's educational leadership as a key to determining school quality (e.g., Gross and Herritt 1965; Lipham 1964), the principal's instructional leadership role remained poorly understood and ill-defined (Bossert et al. 1982; Bridges 1967; Erickson 1967, 1979). Moreover, the literature lacked conceptual frameworks that clearly delineated its key dimensions and reliable instruments for measurement (Bridges 1967, 1982).

Hallinger (1983) undertook development of the PIMRS as a means of stimulating a more rigorous treatment of this role of the principal. The goal in developing the PIMRS was to design an instrument that met the following requirements:

1. The instrument would focus on specific job-related behaviors of school principals concerned with leading and managing teaching and learning in schools.
2. The content foci of the instrument would be drawn from research related to principal and school effectiveness.
3. The instrument would meet measurement standards required for use in principal evaluation, needs assessment, research, and district-level policy analysis.

Over the subsequent decades, the PIMRS has become the most widely used instrument for studying principal leadership in the world (see reference list for a list of PIMRS studies). Perhaps of greater importance, the PIMRS has also offered a framework for thinking about instructional leadership, not only in the USA but throughout the world.

Studies that used the PIMRS have also been included in some of the key reviews of research on educational leadership and management conducted over the past 20 years (e.g., Bell et al. 2003; Hallinger 2011a; Hallinger and Heck 1996a, 1996b, 1998; Hallinger and Leithwood 1994; Leithwood et al. 2008; Robinson et al. 2008; Scheerens 2012; Southworth 1990, 2002, 2003; Witziers et al. 2003). From a research perspective, this represents a significant contribution since programmatic research depends, in part, upon the sustained use of common conceptual frameworks and measurement instruments. These characteristics of use of the PIMRS by the global community of researchers in educational leadership and management serve as a measure of its contribution to the maturing literature on leadership and learning.

This book provides a comprehensive review of the scale's conceptual foundations, its measurement properties, and the ways it has been used in research and practice. The book is organized as follows.

1. Chapter 1 provides background information on the historical development of instructional leadership in practice and research.
2. Chapter 2 introduces the conceptual frameworks that underlie the PIMRS instrument.
3. Chapter 3 describes the procedures that were employed in developing the PIMRS instrument.
4. Chapter 4 includes a description of the original reliability results as well as updated results from a meta-analysis of reliability findings.
5. Chapter 5 examines the results of the PIMRS original validation study, followed by an updated assessment of the scale's internal validity.
6. Chapter 6 reports the development of a PIMRS Teacher Short Form.
7. Chapter 7 offers a personal reflection on future directions in research on instructional leadership.
8. *Appendices* offer additional information on various analyses included in the chapters.

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Chapter 1
The Evolution of Instructional Leadership

This chapter provides an historical overview of global discourse on instructional leadership. It traces the development of instructional leadership as a practice-related construct that emerged in the USA during the 1950s and 1960s. Then we examine its transformation during the 'effective schools movement' of the 1980s into a theoretically-grounded, research-based construct. Over the ensuing decades, offshoots from the 'core construct' of instructional leadership emerged in the form of sister constructs of learner-centered leadership and leadership for learning. This reflected the growing interest in principal leadership which emerged around the world during the 1990s and 2000s. The chapter offers insight into the roots of instructional leadership and sets the stage for more detailed consideration of conceptual and methodological issues that we address in subsequent chapters.[1]

Among the global trends in educational leadership and management that have emerged over the past 50 years, few have been more significant, widespread or persistent than the effort to understand linkages between school leadership and learning (Bell et al. 2003; Bridges 1967; Erickson 1979; Gross and Herriot 1965; Hallinger and Heck 1996a, b, 1998; Leithwood et al. 2010; Rigby 2014; Robinson et al. 2008; Scheerens 2012; Witziers et al. 2003). The "elusive search" (Witziers et al. 2003) for insights into the nature of school leadership that 'makes a difference for student learning' has engaged scholars in studying a variety of leadership models over the past five decades. These include instructional leadership (e.g., Bossert et al. 1982; Bridges 1967; Hallinger and Murphy 1985; Leitner 1994), transformational leadership and transactional leadership (e.g., Krüger et al. 2007; Leithwood 1994; Leithwood and Jantzi 2000, 2005; Leithwood and Sun 2012; Silins 1994), educative leadership (Duignan and Bhindi 1997; Duignan and MacPherson 1992), strategic leadership (e.g., Davies et al. 2005), teacher leadership (e.g., Barth 2001; Lambert 1998, 2002; York-Barr and Duke 2004), collaborative leadership (Hallinger and Heck 2010) and distributed leadership (Gronn 2002, 2003; Spillane 2005, 2006).

[1]Portions of this chapter were taken from content previously published in Hallinger (2011a).

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Recent syntheses of the global literature on educational leadership support the conclusion that, among these competing models, instructional leadership has demonstrated the strongest empirically-verified impact on student learning outcomes (e.g., Bell et al. 2003; Hallinger 2011b; Leithwood et al. 2006; Robinson et al. 2008; Southworth 2003). In the context of a global trend towards strengthened school accountability (Leithwood 2001; Walker and Ko 2011), this conclusion has further enhanced the prominence of instructional leadership as a focus for school policymakers and practitioners. It also provides a rationale for *why* school personnel *should* focus on enhancing capacities for instructional leadership as a lever for school improvement (Hallinger 2003, 2011b; Heck and Hallinger 2009, 2014; Leithwood et al. 2011; Printy, no date; Robinson et al. 2008).

This chapter traces the evolution of instructional leadership in theory and practice since the mid-20th century. We begin with its emergence as an influential conception of leadership in the literature in the 1950s in the USA. Then we highlight its maturation during the 1980s with the advent of the effective schools movement. During this decade, instructional leadership held the high ground as the most influential leadership model in the educational leadership literature, at least in the USA. Finally, the chapter examines its waning influence during the 1990s, and subsequent reemergence and transcendence during the accountability era starting at the turn of the 21st century.

1.1 Emergence of Instructional Leadership in the USA: Effective Principals and Effective Schools

Instructional leadership emerged in the USA during the 1950s as a 'practice-based prescription' rather than a theory-driven construct (Bridges 1967; Erickson 1967; Lipham 1981). During the middle years of the 20th century, practical wisdom shared by principals, school superintendents, teachers and parents in the United States conveyed the 'truism' that 'good schools have good principals' (e.g., Grobman and Hynes 1956; Gross and Herriott 1965; Lipham 1964, 1981; Miller 1960; Tyack and Hansot 1982; Uhls 1962). This normative belief was prominently featured in the discourse of school professionals and subsequently gained the attention of scholars.

Edwin Bridges laid the initial groundwork for research on instructional leadership in a paper published in the *Journal of Educational Administration in 1967*. In this cocneptual paper, he critiqued the professional and scholarly discourse on principal instructional leadership.

> Of the seven major task areas for which principals have responsibility, curriculum and instruction has generated the most sound and fury. On the one hand, the principal has been exhorted to exert instructional leadership, while on the other hand, he has been told flatly that such a role is beyond his or any other human being's capacity. The problem with these disputations is that the exponents of a given position have neither defined sharply what is signified by the concept of instructional leadership nor made their assumptions explicit. (Bridges 1967, p. 136)

Bridges' observations were predictive of two key trends in school leadership practice that would unfold over the subsequent decades. First, he pointed to the need for a sound conceptual definition of this 'practice-based' term. Lacking a clear definition, he asserted that practitioners would gain little leverage over the types of behaviors and practices that comprised this role. Nor would they understand how, when and where to employ them in their schools. Moreover, without a clear conceptualization, researchers would be unable to develop tools for reliable measurement of this construct.

Second, Bridges highlighted the tension that existed (and continues to exist to this day) between prescriptions for principals to 'be instructional leaders' and the 'contextual realities' of leading schools (Hallinger and Murphy 2012; Murphy et al. 1987). Even as researchers made progress in defining and elaborating the nature of instructional leadership, this tension has remained a recurring theme in succeeding decades (e.g., Barth 1986, 1990; Bossert et al. 1982; Cuban 1988; Donaldson 2001; Edington and Dibenedetto 1988; Firestone and Herriot 1982; Hallinger and Murphy 2012; Marshall 1996, 2004; Sweeney 1982). Indeed, this recognition presaged the later emergence of related constructs of 'teacher leadership' and 'distributed leadership' as possible means of resolving this tension between prescription and practice.

Consequently, during the 1960s and 1970s this practical wisdom was unable to offer reliable guidance for policymakers, educators of leaders, or school leaders (Bridges 1967, 1982; Erickson 1967, 1979). Nonetheless, perusal of the professional and scholarly literatures of this era suggests that support for the importance of principal leadership continued unabated in the USA (Bossert et al. 1982; Bridges 1982; Erickson 1979; Gross and Herriot 1965; Gross and Trask 1976). This received further impetus from research that identified skillful support of principals as critical to successful change implementation in schools (e.g., Barth and Deal 1982; Berman and McLaughlin 1977, 1978; Fullan 1982; Hall 2013; Hall and Hord 2002; Leithwood and Montgomery 1986; McLaughlin and Marsh 1978; Sarason 1982).

The volume of discourse on instructional leadership took a quantum leap forward in the early 1980s with the emergence of the 'effective schools movement' in the USA and UK. Erickson's review of research on school leadership in 1979 was prescient in foretelling the implications of this new research for school leadership.

> Three years ago I opined that the most promising relevant work, largely ignored by scholars identified with "educational administration," was the work on "school effects." The literature during the last three years has further reinforced my dual conviction that "school effects" studies, broadly defined, represent the current leading edge in the research domain I am assessing, and that few scholars affiliated with "educational administration" are taking note of them, though nothing could be more profoundly pertinent than the school effects studies to the consequence of educational organization… I am suggesting, then, to scholars who seek more exciting turf than those barren acres. Charters bemoaned: "Here [in the school effects literature] is green sward. Here ideas are growing fast, in all directions. Here are explanations provocative and practice-relevant." (Erickson 1979, p. 10)

1.2 Effective Schools Movement of the 1980s: The Rise of Instructional Leadership

During the 1970s, selected scholars began to investigate why some schools were able to overcome the challenges of achieving positive learning outcomes for all students. The schools studied in this research were typically operating in challenging circumstances, serving students from low socio-economic backgrounds and located in poor urban neighborhoods (e.g., Brookover et al. 1977, 1982; Brookover and Lezotte 1977; Edmonds and Fredericksen 1978; Rutter et al. 1979; Weber 1971). Nonetheless, their performance results, as assessed by student learning outcomes, consistently exceeded those of schools in the same or other comparable neighborhoods (Edmonds 1979, 1982). The 'effective schools' research sought to identify features, processes, and conditions evident in these schools that could explain their higher than expected levels of performance (Clark et al. 1984; Eubanks and Levine 1983; Purkey and Smith 1983, 1985). One of the findings from this research reinforced the importance of focusing on leadership exercised by the principal. In the words of Ron Edmonds, the so-called 'father of the effective schools movement':

> In the improving schools, the principal is more likely to be an instructional leader, more assertive in his/her institutional leadership role, more of a disciplinarian, and perhaps most of all, assumes responsibility for the evaluation of the achievement of basic objectives. (Edmonds 1979, p. 18)

Edmond's summary of the distinguishing characteristics of principals of 'instructionally effective urban primary schools' represented the next significant point in the historical evolution of the instructional leadership construct. The significance of this line of empirical inquiry was its finding that schools could potentially help to overcome inequalities that arose from the socio-economic circumstances of their students (Clark et al. 1984; Edmonds 1979; Purkey and Smith 1983; Rosenholtz 1985). This offered optimism in the face of earlier research findings that student socio-economic status explained by far the largest portion of variations in student learning outcomes within and between schools (Coleman et al. 1966).

The effective schools research yielded a commonly-quoted set of five or seven 'effective schools factors'. These were proposed to explain why these schools outperformed other schools serving similar student populations and with similar levels of resources (Brookover and Lezotte 1977; Edmonds 1979; Purkey and Smith 1983). Frequently cited in these lists of effective schools factors was the finding that instructional leadership was a hallmark of instructionally effective schools (Bossert et al. 1982; Edmonds 1979; Purkey and Smith 1983). Principals in these schools were described as strong, directive leaders with a discernible focus on the development of teaching and learning schools (Bamburg and Andrews 1990; Bossert et al. 1982; Edmonds 1979; Hallinger and Murphy 1985, 1986). It is no exaggeration to say that Edmonds's (1979, 1982) articulation of this role in instructionally effective schools precipitated a new era in research and practice on principal leadership.

Concurrent with the emergence of the effective schools research, a policy trend that would influence leadership research and practice was initiated in 1982. The US Secretary of Education, Terrence Bell issued a national report on the status of American education which asserted that declining education quality was placing the 'nation at risk'. This initiated a new era of national education reform in the USA.

American policymakers, looking for solutions to improve education quality, were quick to grasp onto the policy implications of the effective schools research. Findings from the effective schools research offered a ready solution to the problem facing policymakers. These dual forces combined to create a policy-driven focus on principal leadership in general, and instructional leadership in particular. These led, for example, to a revamping of principal preparation curricula and the launch of a nation-wide network of 'Principal Leadership Academies' (Hallinger and Wimpelberg 1992). In a broader sense, the policy-driven focus on principal leadership also legitimized and created an 'emerging market' for research that focused on 'principal instructional leadership'.

1.2.1 A New Era of Research on Instructional Leadership

In 1982, Stephen Bossert and colleagues at the Far West Lab in San Francisco published a seminal literature review that built directly on the recommendation highlighted in Erickson's 1979 review. Their research team synthesized findings from several related literatures that bore upon the principal's role in managing teaching and learning in schools (e.g., effective schools, leadership, classroom effectiveness research, organizational studies). While these scholars continued to acknowledge methodological limitations of this 'knowledge base', like Erickson (1979), they also claimed to see—for the first time—the possibility of a 'conceptual foundation' for a productive program of research targeting principal instructional leadership and its impact on teaching and learning.

The Far West Lab instructional management framework developed by Bossert et al. (1982) became a valuable lens used by scholars for conceptualizing how instructional leadership is enacted in schools. Moreover, findings from the Bossert review were largely supported by other contemporary reviews of this literature (e.g., Erickson 1979; Leithwood et al. 1990; Leithwood and Montgomery 1986; Hallinger and Murphy 1985; Murphy et al. 1983; Purkey and Smith 1983). This body of reviews stimulated efforts to develop conceptual frameworks theorizing the dimensions that comprised the instructional leadership role (e.g., Hallinger 1983; Hallinger et al. 1983) and research instruments (e.g., Hallinger and Murphy 1985; Leithwood and Montgomery 1986; Villanova et al. 1981).

Concurrent with work being conducted at the Far West Lab in San Francisco, Hallinger and Murphy (Hallinger et al. 1983) were seeking to apply findings from the emerging research on effective schools for the enhancement of both research and practice. Located in a school district's research office, our project involved the development of conceptual frameworks as well as research instruments (see

Hallinger and Murphy 1985; Hallinger et al. 1983; Murphy et al. 1983; Weil et al. 1984). The PIMRS conceptual framework and associated research instrument (i.e., *Principal Instructional Management Rating Scale*, represented products of this research and development effort (Hallinger 1983; Hallinger and Murphy 1985).

Indeed, the effective schools research stimulated a growing number of largely North American scholars to undertake empirical investigations of the principal's instructional leadership role (e.g., Andrews and Soder 1987; Bamburg and Andrews 1990; Biester et al. 1984; Blank 1987; Blasé 1987; Blasé and Blasé 1996; Braughton and Riley 1991; Brewer 1993; Dwyer et al. 1983a, b; Eberts and Stone 1988; Glasman 1983, 1984; Goldring and Pasternak 1994; Goldring and Sullivan 1996; Hallinger et al. 1994, Hallinger et al. 1996; Hallinger and Murphy 1985; Heck 1992, 1993; Heck et al. 1990; Howe 1995; Jones 1987; Krug 1986; Leitner 1994; Leithwood and Montgomery 1986; O'Day 1983; Pounder et al. 1995; Sheppard 1996; Snyder and Ebmeier 1992; van de Grift 1989, 1990). These studies were directed at building a more substantial empirically grounded knowledge base capable of elucidating the antecedents, practices, and effects of instructional leadership (e.g., Leithwood et al. 1990; Hallinger and Heck 1996a, 1998).

'Antecedents' were comprised of two sets of variables conceptualized as influencing or 'moderating' the principal's practice of instructional leadership (Bossert et al. 1982; Hallinger and Heck 1996a; Leithwood et al. 1990). The first set of antecedents was comprised of personal characteristics of principals themselves. These included characteristics such as principal gender, years of teaching and administrative experience, prior training, and other personal traits (e.g., emotional intelligence). These variables have been studied in order to understand potential sources of influence that could be leveraged through recruitment and selection as well as through preparation, training and development.

The second set of antecedents consisted of features of the organizational context that were proposed to 'shape' the practice of instructional leadership. These included school level and size, socio-economic status and prior achievement of the student body, teacher quality, and features of the school district (Bossert et al. 1982; Cuban 1988; Hallinger and Heck 1996a; Leithwood et al. 1990). For example, numerous scholars noted that the effective schools research was conducted primarily in urban primary schools. These schools represent quite specific socio-organizational 'contexts' for the exercise of leadership. Thus, scholars and practitioners questioned whether prescriptions for leadership practice in all schools could be based on findings from studies conducted in such a narrow cross-section of schools (e.g., Bossert et al. 1982; Firestone and Herriot 1982; Rowan et al. 1983; Sweeney 1982).

At the heart of this research was a focus on describing principal leadership practices. Studies of the instructional leadership 'practices' of principals sought to identify, describe and differentiate patterns of behaviors demonstrated by school principals in enactment of this role (e.g., see Dwyer 1986; Dwyer et al. 1983a, b; Hallinger et al. 1983; van de Grift 1989, 1990).

The third strand of research on instructional leadership was aimed at analyzing the impact of instructional leadership practice on various school level outcomes.

Outcomes were conceptualized at two organizational levels. The first were 'school conditions' such as instructional organization, school climate, teacher trust, teacher collective efficacy and teacher commitment. Impact studies also examined leadership effects on 'distal' variables such as school quality, school improvement, and student learning. These were operationalized through a variety of measures of school success. We discuss these approaches to conceptualizing studies of instructional leadership further in Chap. 3 (see also Hallinger 2011a).

1.2.2 Characteristics of Instructional Leaders

In a more general sense, research conducted during this period sought to elaborate on Edmond's description of 'strong instructional leaders' provided by Edmonds and other effective schools researchers (e.g., Brookover and Lezotte 1977; Rutter 1983; Rutter et al. 1979). Instructional leaders were viewed as culture builders (Barth 1980, 1990; Barth and Deal 1982). They sought to create an 'academic press' that fostered high expectations and standards for students, as well as for teachers (Barth 1990, 2001; Bossert et al. 1982; Mortimore 1993; Glasman 1984; Hallinger et al. 1996; Hallinger and Murphy 1985, 1986; Heck et al. 1990; Purkey and Smith 1983). Consistent with Bridges' (1967) earlier observation, instructional leaders were described as a minority of principals who had managed to overcome the pressures that push principals away from engagement in curriculum, instruction and the classroom (see Barth 1986, 1990; Cuban 1988; Hallinger et al. 1983; Hallinger and Murphy 2012; Marshall 1996, 2004).

Instructional leaders were described as being goal-oriented (Andrews and Soder 1987; Bossert et al. 1982; Dwyer 1986; Edmonds 1979). Even in the face of competing priorities, they were able to define a clear direction and motivate others to join in achievement of a collective vision for the school. In instructionally effective schools, this direction focused primarily on the improvement of student learning outcomes (Bamburg and Andrews 1990; Bossert et al. 1982; Edmonds 1979; Glasman 1984; Goldring and Pasternak 1994; Hallinger et al. 1996; Hallinger and Murphy 1986; Heck et al. 1990; Leithwood et al. 1990; Leithwood and Montgomery 1986; Leitner 1994; Murphy et al. 1982; O'Day 1983). Terms such as vision, mission and goals became strongly situated in the vocabulary of principals who wished to succeed in the evolving environment of American education during this era (Hallinger and Heck 2002; Hallinger and Leithwood 1994; Leithwood 1994).

Instructional leaders were described as leading from a combination of both expertise and charisma. They used influence more than 'position power' in motivating staff towards collective goals. These were 'hands-on' leaders, 'hip-deep' in curriculum and instruction (Cuban 1984). They did not shy away from working directly with teachers on the development of teaching and learning (Bossert et al. 1982; Cuban 1984; Dwyer 1986; Edmonds 1979; Hallinger et al. 1996; Hallinger and Murphy 1986; Heck et al. 1990; Leithwood et al. 1990). Instructional leaders

focused on coordinating, controlling, and supervising curriculum and instruction as well as monitoring progress towards desired outcomes (Bamburg and Andrews 1990; Bossert et al. 1982; Cohen and Miller 1980; Dwyer 1986; Dwyer et al. 1983a, b; Eberts and Stone 1988; Firestone and Herriot 1982; Glasman 1984; Goldring and Pasternak 1994; Hallinger et al. 1996; Heck 1992, 1993; Heck et al. 1990; Jones 1987; Leitner 1994; Teddlie and Stringfield 1993; Wellisch et al. 1978).

It was also noted during this era that, on average, female principals appeared more active and adept at this role than many of their male counterparts (see Adkinson 1981; Eagly et al. 1992; Gross and Herriot 1965; Gross and Trask 1976; Hallinger 1983, 2011a; Nogay 1995; Nogay and Beebe 1995). Scholars suggested a variety of potential explanations for this consistent pattern of differentiated practice among men and women in the principalship. These explanations included differences in expertise in teaching and learning, personal values, emotional competencies, and communication style.

1.2.3 Continuing Tensions

Even in the heyday of the effective schools movement, however, skeptics continued to call attention to the 'gap' between prescriptions and practice (Barth 1986; Barth and Deal 1982; Cuban 1984, 1988). Respected practitioner-scholars warned against placing such 'high expectations' on school principals and asserted that descriptions of instructional leaders in the effective schools literature presented an 'overly heroic' view of their capabilities (Meindl 1995). This underplayed the challenges of enacting this role across a wide range of different school contexts (Cuban 1988). These descriptions spawned feelings ranging from inadequacy to guilt among many principals who wondered why they had such difficulty fulfilling these lofty role expectations (Barth 1986; Donaldson 2001; Hallinger and Murphy 2012; Marshall 1996, 2004).

Indeed, as suggested by various scholars (e.g., Barth 1980, 1986; Bridges 1967; Cuban 1988), the findings of effective schools studies diverged from previous observational studies of school principals. This body of research had consisted of two main approaches. The first was represented by 'work activity' studies modeled after corporate sector studies conducted by Henry Mintzberg. During the 1970s and 1980s, numerous scholars observed the work activities of principals (e.g., Kmetz and Willower 1982; Martin and Willower 1981; Peterson 1977–1978; Willower and Kmetz 1982), school superintendents (Duignan 1979), and college presidents (Glenn 1975). Although the conceptual framework employed in these studies did not focus on instructional leadership, the studies yielded findings with implications for this role. Specifically, this research described the work days of school administrators as characterized by brief, fragmented interactions usually initiated by others. Implicit in this description was the implication that principals had difficulty finding time and sustaining a focus on curriculum and instruction.

A second body research has examined the time use of principals in terms of allocation to different domains of the job. Some of these studies have used direct observation, some self-report from principals, and others have relied on time logs and personal electronic devices used to prompt principals to self-monitor their activities (Buttram et al. 2006; Hemphill et al. 1965; Horng et al. 2010; Lee and Hallinger 2012). These studies have tended to yield a similar picture of principals who allocate a relatively small proportion of their time to instructional leadership.

Scholars have described powerful forces that draw principals away from rather towards engagement in instructional leadership (e.g., Barth 1990; Cuban 1988; Firestone and Herriot 1982; Goldring et al. 2008; Hallinger and Murphy 2012; Horng et al. 2010; Marshall 1996, 2004; May et al. 2012; Murphy et al. 1987; Sweeney 1982). Cuban's (1988) historical analysis highlighted the weak results of past efforts to press principals towards a 'full embrace' of the instructional leadership role. He proposed that there is a "DNA" in the principalship that drives principals away from instructional leadership and towards managerial and political leadership roles (see also, Barth 1980, 1986, 1990; Barth and Deal 1982; Hallinger and Murphy 2012; Murphy et al. 1987). Marshall (1996, 2004) later highlighted the ways in which organizational forces create a 'force-field' around classrooms that principals often find difficult to penetrate.

Policy-driven efforts to foster sustainable instructional leadership must take these forces into account, or accept the predictable consequences of principals who suffer from unfulfilled expectations and burnout (Barth 1990; Bridges 1967; Donaldson 2001; Hallinger and Murphy 2012; Horng et al. 2010; Marshall 1996, 2004; Murphy et al. 1987). Thus, even as America's policymakers sought to employ principals as 'drivers' for education reform, some scholars worried that this would leave the principals 'running on empty' (see Barth 1986, 1990; Donaldson 2001; Hallinger and Murphy 2012). They questioned whether instructional leadership represented a leadership model that could be applied to the principalship in all schools (e.g., Barth 1986, 1990, 2001; Barth and Deal 1982; Cuban 1984, 1988).

Another group of critics focused on 'technical limitations' of the emerging literature on instructional leadership (Bridges 1982; Erickson 1979; Leithwood et al. 1990; Murphy 1988; Murphy et al. 1983; Rowan et al. 1982). Although progress was being made, these scholars continued to criticize the lack of theoretical models that articulated how this role influenced student learning and the use of research designs ill-equipped to test for causal effects.

Although these findings related to instructional leadership were compelling, the extent of their relevance to *all* schools was less clear. For example, Hallinger and Murphy (1986), called attention to differences in the instructional leadership practices used by principals in 'instructionally effective schools' located in high and low SES environments. They noted that similar 'practices' (e.g., defining a school mission) were enacted differently by the principals at least partly in response to the needs and opportunities afforded by the school's socio-economic environment. This sensitivity to the school context was consistent with Bossert et al.'s (1982) earlier assertion that the 'community' represented an important moderator of principal instructional leadership.

Since schools differ widely in terms of needs and resources, some scholars asserted that the type of leadership required to move them forward could not be distilled into a single leadership style or 'list' of broadly applicable behaviors, practices or actions (Barth 1986). Thus, Edmond's assertion of the importance of 'strong instructional leadership by the principal' was attended by ambiguity concerning both the nature of the role as well as the means by which it contributed to school effectiveness and improvement (Barth 1986; Barth and Deal 1982; Bossert et al. 1982; Cuban 1984; Leithwood and Montgomery 1986; Murphy 1988; Murphy et al. 1983; Rowan et al. 1983). These limitations were cause for concern in light of burgeoning attempts to embed this 'emerging research base' into government policies and principal training curricula in the USA (Barth 1986; Cuban 1984; Hallinger and Wimpelberg 1992).

These developments during the 1980s signaled the gradual transformation of instructional leadership from a practice-oriented, prescriptive conception of principal leadership into a theory-informed, research-based construct. Findings generated from this body of research further highlighted the potential for contributing to the profession's understanding of how principal leadership contributes to student learning (Bridges 1982; Hallinger and Heck 1996a, 2011a, b; Leithwood et al. 1990). As a result, by the mid-1990s, Hallinger and Heck (1996a, b, 1998) observed that instructional leadership had become the most prevalent perspective adopted by researchers engaged in the study of school leadership effects in North America.

1.3 The Paradigm Wars of the 1990s: Instructional Leadership Versus Transformational Leadership

This overview of the evolution of instructional leadership highlights the linkage between the socio-political context of education and the role expectations proposed for school leaders (Cuban 1988). With this perspective in mind, three emergent developments characterized the 1990s. First, during the 1990s policy reforms in the USA began to refocus on school restructuring and teacher empowerment. These reforms asserted the importance of professionalizing education, empowering teachers as professionals, and building staff capacity as strategies for school improvement. The focus on principal instructional leadership highlighted during the 1980s appeared increasingly out of place in this policy environment.

Concurrently, in the early 1980s, Ken Leithwood at OISE in Canada began to adapt the construct of transformational leadership from the business sector as a guiding model for leading schools (Leithwood 1994; Leithwood and Jantzi 1999, 2000, 2005; Leithwood and Sun 2012; Mulford and Silins 2003; Silins 1994). Theoretical conceptions of transformational leadership originated in studies of political and managerial leaders outside of the education sector (Bass 1985, 2008; Bass and Avolio 1994; Burns 1978). This conception of leadership emphasizes the

leader's role in inspiring others towards a collective vision of change, and motivating members to develop capacities that enable higher levels of performance (Bass 1985).

A core feature of instructional leadership had been its emphasis on the principal's *direct engagement* with teaching and learning processes (Bossert et al. 1982; Hallinger and Heck 1996a; Hallinger and Murphy 1985). Moreover, although instructional leadership highlighted the role of a collective vision, it 'assumed' that improving academic performance of all students was the preeminent goal for America's schools. Although transformational leadership emphasized the leader's role in vision-building and capacity development, it did so without any specific assumptions concerning the substantive focus of those goals (Leithwood 1994). *Moreover, transformational leadership did not posit any direct engagement with teaching and learning by the principals* (Hallinger 2003). Cuban (1984, 1988) referred to these contrasting leadership foci as 'emphasizing first-order' (i.e., instructional leadership) versus 'second-order' (transformational leadership) changes in school practice. Gradually, transformational leadership began to eclipse instructional leadership in the professional and scholarly discourse in educational leadership during this decade.

These dual trends were balanced by a third development. This was represented by a series of published research reviews on principal leadership published during the 1990s (Hallinger and Heck 1996a, b, 1998; Hallinger and Leithwood 1994; Leithwood et al. 1990; Southworth 1990, 2002). These reviews began to offer a more refined view of both the extent and means of principal impact on student learning in schools. They supported the broad importance of principal leadership, and instructional leadership in particular. Thus, despite its 'political incorrectness' instructional leadership did not fade away (Hallinger 2005), and indeed continued to influence research and practice (Hallinger 2003, 2011a). Nonetheless, a status report on school leadership at the turn of the millennium would have highlighted the waxing status of transformational leadership and the waning of instructional leadership (Hallinger 2003).

1.4 2000 to the Present: The Reemergence of Instructional Leadership in Research and Practice

Up to this point, our introduction makes little reference to literature on instructional leadership from outside of North America. This reflects our reading of the literature which clearly identifies the roots of this construct in American educational practice. Indeed, prior to the turn of the millennium, there was less emphasis on the importance of principal leadership, never mind instructional leadership, in educational discourse in most other parts of the world. However, changing sociopolitical trends associated with globalization began to reshape the discourse resulting in a broader recognition of the importance of principal instructional leadership in particular.

National contexts that had not traditionally placed great weight on school leadership began, for the first time, to focus on leadership and its development. This was evident in publication of the first systematic reviews of research on school leadership conducted by scholars outside of the USA (e.g., Bell et al. 2003; Mulford and Silins 2003; Southworth 2002, 2003; Witziers et al. 2003). Launch of the National College for School Leadership (NCSL) in the UK during the late-1990s introduced a new 'center of gravity' that explicitly affirmed the centrality of school leadership in the United Kingdom (Bush and Glover 2003). Activities of the NCSL gathered both pace and influence at the turn of the 21st century. Its influence was felt not only in the UK, but also in other parts of Europe and the British Commonwealth (Bolam 2003; Huber 2004; Tomlinson 2003).

These developments contributed to a gradual, but strengthening global consensus concerning the conceptual linkage between successful school leadership, educational reform, and school improvement. Globally, policymakers, educators and scholars arrived at the conclusion that although effective leadership cannot guarantee successful education reform, sustainable school improvement is seldom found without active, skillful leadership from principals (Fullan 2006; Hall and Hord 2002; Hallinger 2011b; Hallinger and Heck 2010; Leithwood et al. 2008; Leithwood et al. 2004).

The question remained, however, *what should be the focus of school leadership*? Should principals focus on improving teaching and learning (instructional leadership) or attend more broadly to building capacity for improvement (transformational leadership)? The answer to this question emerged as a consequence of policy trends as well as research results.

1.4.1 Global Policy Trends

During the early years of the 21st century, the pendulum of educational goals began to shift once again. At the turn of the 21st century, a new trend emerged that has been referred to alternately as 'new managerialism', 'new public management' and the 'accountability movement' (Leithwood 2001). Starting in the UK and USA, governments around the world began to reorient education policies around a conception of education reform that placed a greater emphasis on the learning outcomes of students.

In the USA, policies embedded in *No Child Left Behind* and *Race to the Top* reframed the principal as accountable for the school's results. This refocused attention on the role of principals as instructional leaders. America's new accountability-oriented frameworks placed responsibility for student learning results squarely on the shoulders of principals (Hallinger 2011b; Hallinger and Murphy 2012; Neumerski 2012; Nettles and Herrington 2007; Leithwood 2001; Schoen and Fusarelli 2008; Silva et al. 2011). This, for example, resulted in policies that mandated comprehensive systems of teacher and principal training and evaluation that raised the bar in terms of standards of performance (Leithwood 2001; Murphy

and Shipman 2003; Silva et al. 2011). *Race to the Top* mandated the replacement of principals (and teachers) in schools that fail to demonstrate annual improvements in learning results for students.

In the UK, reforms associated with the 'new public management' represented a structural attempt to redefine the role of principals as instructional leaders. Like in the USA, management reforms introduced penalties for principals who failed to meet government accountability targets (Bell et al. 2003; Bolam 2003; Bush and Glover 2003; Leithwood 2001; Southworth 2002; Tomlinson 2003). A similar trend emerged, over time, as well in East Asia (e.g., Hallinger 2003, 2010; Hallinger and Lee 2013, 2014; Huber 2004; Walker and Ko 2011). In this changing policy context, some scholars asserted that school accountability policies were transforming instructional leadership from an option into a necessity. This was certainly the case in the USA (Murphy 2008; Nettles and Herrington 2007; Schoen and Fusarelli 2008; Silva et al. 2011).

From the 1960s to the 1980s when instructional leadership first emerged, some scholars questioned its practical relevance as a guiding metaphor for school leadership (e.g., Barth 1986; Bridges 1967; Cuban 1984). Rather remarkably, several decades later, 'instructional leadership' had become widely accepted by policymakers and practitioners in many parts of the world as an essential element of management practice in schools.

1.4.2 Research Trends

As indicated above, prior to the turn of the millennium interest in principal instructional leadership was a largely 'North American phenomenon'. Indeed, it is only in the last decade that the terms instructional leadership and leadership for learning have gained broader international currency. This changing policy discourse was also evident in growing global interest among scholars in understanding the ways in which school leaders contribute to school improvement and student learning (Hallinger and Heck 2011a). This broadening scholarly interest in instructional leadership can be traced in the chronology of research publications that emerged from the UK (e.g., Bell et al. 2003; Day et al. 2010; Hunter Foundation 2005; MacBeath and Cheng 2008; Southworth 2000, 2002), continental Europe (Hall and Southworth 1997; Krüger et al. 2007; Lindberg and Vanyushyn 2013; Scheerens 2012; van de Grift and Houteen 1999; Witziers et al. 2003), East Asia (Hallinger and Lee 2013; Hallinger et al. 1994; Walker and Ko 2011) and Australia/New Zealand (Caldwell 2003; Mulford and Silins 2003, 2009; Robinson et al. 2008).

The growing body of international research became increasingly focused on clarifying the contribution of school leadership to improvements in teaching and learning in schools. With this maturing body of empirical research, a new phenomenon emerged in the development of this knowledge base. This was represented by 'meta-analytic studies' that sought to build upon earlier research syntheses

(e.g., Bell et al. 2003; Hallinger and Heck 1996a, 1998; Hallinger and Leithwood 1994; Leithwood et al. 2005; Leithwood and Jantzi 2005). These meta-analyses of the school leadership literature applied quantitative techniques for integrating the results of multiple studies that had investigated the effects of school leadership on learning (see Leithwood and Sun 2012; Robinson et al. 2008; Witziers et al. 2003).

Notably, the Robinson et al. (2008) meta-analysis was explicitly organized to answer the question posed earlier: *what type of leadership produces the greatest effects on student learning*? The data analyzed in this meta-analytic study found stronger 'effect sizes' for instructional leadership when compared with transformational, transactional and strategic leadership. As such, findings from this meta-analysis as well as other research syntheses published during this decade gave further impetus to the policy-driven emphasis on instructional leadership noted above (see also Day et al. 2010; Hallinger 2011b; Leithwood et al. 2004, 2008; Louis et al. 2010).

As discussed in the next chapter, the predominant, though often implicit, view of school leadership effects during the 1980s suggested that 'principals cause the effects on student learning outcomes'. In contrast, however, Hallinger and Heck (1996a, b, 1998) asserted that this predominant 'direct effects conceptualization of leadership' was theoretically unjustifiable and empirically unproven. Instead, they proposed that 'indirect or mediated effects' models held greater theoretical and practical leverage for understanding the relationship between leadership and learning. These models proposed that school principals achieved their impact on student learning by motivating and influencing teacher practice. This proposition influenced research conducted during the succeeding decade (e.g., see Bryk et al. 2009; Hallinger and Heck 2010, 2011a, b; Hallinger and Lee 2013, 2014; Heck and Hallinger 2009, 2010, 2011, 2014; Krüger et al. 2007; Knapp et al. 2009; Lee and Hallinger 2012; Lee et al. 2012; Lindberg and Vanyushyn 2013; Marks and Printy 2003; Mulford and Silins 2009; Nettles and Herrington 2007; Neumerski 2012; Opdenakker and Van Damme 2007; Printy et al. 2009; Silva et al. 2011; Spillane 2006; Wahlstrom and Louis 2008; Wiley 2001).

Findings from the most recent generation of research on school leadership and learning highlight three main avenues or paths through which scholars propose that leadership contributes to learning: (1) defines a school mission and goals; (2) designs academic structures and processes; (3) develops people. In light of these findings, we propose that instructional leadership is a process of mutual influence (Hallinger and Heck 2011a, b; Heck and Hallinger 2011) that is both adaptive and responsive to the changing conditions of the school over time. The dynamic nature of this model of leadership effects implies that the means through which leadership is linked to learning cannot be reduced to a list of dispositions, strategies or behaviors (Leithwood et al. 2006, 2008). No such list could fully account for the contextually contingent nature of successful leadership practice (Barth 1986; Bossert et al. 1982; Hallinger and Heck 2011a, b; Heck and Hallinger 2009, 2011). We shall elaborate on this point in the following chapters as we discuss the main paths of leadership effects.

1.5 Conclusions

Fifty years after publication of Bridges' (1967) initial challenge, instructional leadership has become increasingly accepted globally as a normative expectation in the principalship. Even as fads and fashions in leadership models have waxed and waned, scholarly interest in instructional leadership has remained surprisingly consistent and strong. Over the ensuing decades scholars have generated a substantial body of empirical research on instructional leadership that has been the subject of analytical reviews by scholars throughout the world. The scope and findings of these reviews affirm that instructional leadership has become firmly entrenched in the firmament of global research, policy and practice. One can conclude that instructional leadership has been accepted as a core element of school leadership in a wider array of contexts around the world than was the case even as recently as a decade ago.

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Chapter 2
Conceptual Framework

> Lack of strong conceptual underpinnings for thinking about, never mind measuring instructional leadership, had represented a persisting impediment to efforts to assess or develop instructional the instructional leadership of school principals. The PIMRS conceptual framework was the first research-informed framework widely adopted by researchers and practitioners. This chapter describes the PIMRS conceptual framework as a prelude to discussing the development of the PIMRS rating instrument.[1]

The quotation from Bridges (1967) included in Chap. 1 highlighted the importance of starting with a sound definition of what is meant by instructional leadership. Bridges had asserted that coherent discussions about the instructional leadership role of the principal were invariably hindered by the lack of a common definition of the construct. This chapter first introduces two of the most salient conceptual models of instructional leadership. Then, these models are placed in a broader perspective of leadership for learning.

2.1 Conceptualizing Instructional Leadership

Two predominant conceptual models of instructional leadership emerged during the 1980s in the USA. These were developed by Bossert et al. (1982) at the Far West Lab for Research and Development in San Francisco, and a complementary model developed by Hallinger and Murphy (1985). We examine each of these in turn.

[1]This chapter draws extensively on material published in Hallinger (2005, 2011a) and Hallinger and Murphy (1985).

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
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2.1.1 The Far West Lab Instructional Leadership Model

In their seminal review of the literature, Bossert et al. (1982) sought to more clearly define the construct of 'instructional management'. Instructional management was conceptualized as actions and strategies employed by principals that are intended to impact the school's instructional organization and learning climate with the goal of improving learning outcomes for students. They chose the term "instructional management" because they inferred that this role of the principal revolved around managerial functions concerned with the coordination and control of curriculum and instruction (e.g., Cohen and Miller 1980). Their instructional management framework (see Fig. 2.1) became an influential model that, to this day, continues to guide researchers in this field.

Several features of the Bossert framework are worthy of note:

- The model gives priority to a specific domain of the principal's activities, *instructional management* (Bridges 1967; Cuban 1988; Edmonds 1979; Erickson 1979; Lipham 1981; Robinson et al. 2008).
- Approaches to instructional leadership are shaped by *personal characteristics* of principals (Goldring et al. 2008; Hallinger 2011a, c; Leithwood and Beatty 2008; Leithwood et al. 2008). These characteristics range from demographic factors (e.g., prior professional experience, gender, years of tenure as principal) as well as attitudes or dispositions (e.g., self-efficacy, resilience, optimism, openness to learning).
- Principal leadership is framed within an *organizational context*, thereby recognizing that leadership is influenced by organizational features such as school and district size and complexity, socio-economic status of the community, and socio-cultural features of the education environment (e.g., Belchetz and Leithwood 2007; Bridges 1977; Goldring et al. 2008; Hallinger and Heck 2011c; Hallinger and Murphy 1986; Teddlie et al. 2000; Wiley 2001). Leaders do not operate in a vacuum; their work is *moderated* or shaped by features of the context in which they work.

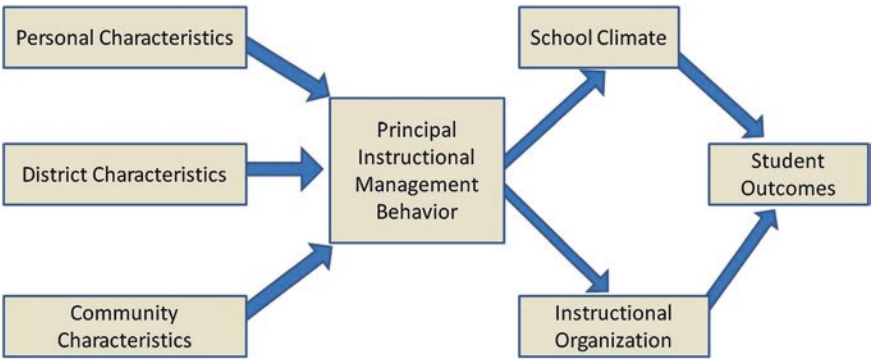

Fig. 2.1 Far West Lab instructional management framework (Bossert et al. 1982, p. 40)

- The principal's effects on student outcomes are also *mediated* by features of the school (i.e., Hallinger and Heck 1996a, b, 1998, 2010, 2011a, b). This is consistent with what Bridges (1977, 1982) termed 'achieving results through people'.
- The ultimate effectiveness of the principal's efforts is based upon the impact achieved on students learning and development (Edmonds 1979; Mulford and Silins 2003, 2009; Purkey and Smith 1983).

Although Bossert and his colleagues initially employed the term instructional management, over time instructional leadership came to be more commonly used by scholars and practitioners in the USA. The formal distinction between these terms lies in the sources of 'power' used to achieve results. Instructional leadership became the preferred term due to recognition that principals who operate from this frame of reference rely more on expertise and influence than on formal authority (i.e., position power) to achieve a positive impact (e.g., Blasé 1987; Hallinger 2003; Hallinger and Heck 1996a; Leithwood and Jantzi 2005; Leithwood et al. 1990, 2008; Knapp et al. 2009).

As noted in the previous chapter, the use of these terms prior to 2000 was a predominantly North American phenomenon. More recently, some scholars have proposed use of the term, 'leadership for learning' rather than instructional leadership (e.g., Knapp et al. 2009; MacBeath and Cheng 2008). Although they assert differences between the terms, in this volume we use them interchangeably.

2.1.2 PIMRS Instructional Leadership Model

Another early attempt to provide a clear definition of instructional leadership was represented in the work of Hallinger and Murphy (Hallinger et al. 1983; Hallinger and Murphy 1985; Murphy et al. 1983). Our conceptual framework incorporated three dimensions: *Defines the School Mission, Manages the Instructional Program*, and *Develops a Positive School Learning Climate* (Hallinger 1983; Hallinger et al. 1983; Hallinger and Murphy 1985; see Fig. 2.2). These dimensions were further delineated into 10 instructional leadership functions. We will briefly review the basis of these constructs.

2.1.2.1 Defines the School Mission

A prominent synthesis of the school leadership effects research conducted during the 1990s by Hallinger and Heck (1996a) identified vision and goals as the most significant avenue through which school leaders impact learning. More recently, in a meta-analysis of the school leadership effects literature, Robinson et al. (2008) reaffirmed this conclusion. Indeed, they placed vision and goals as the second most significant path through which principals contribute to improved learning in classrooms. Vision refers to a broad picture of the direction in which the school seeks to move (e.g., educating the whole child). In contrast, goals refer

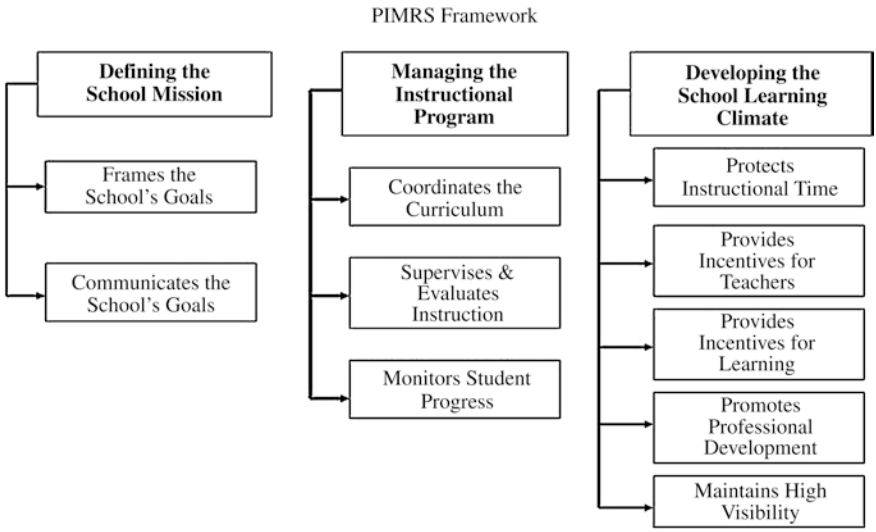

Fig. 2.2 PIMRS conceptual framework (Hallinger 1983; Hallinger and Murphy 1985, p. 221)

to the specific targets that need to be achieved on the journey towards that vision (Hallinger and Heck 2002).

This dimension refers to the principal's role in determining the areas in which the school will focus its resources during a given school year. A notable finding that has emerged over the years with respect to the use of vision and goals in school improvement concerns the conceptualization of these constructs by scholars studying instructional leadership and transformational leadership (Hallinger and Heck 2002; Ylimaki 2006). The instructional leadership literature asserted that goal-related constructs (e.g., vision, mission, goals) must contain an academic focus (e.g., Hallinger and Heck 1996a; Murphy 1988, 2005; Robinson et al. 2008). In contrast, the application of transformational leadership to education (e.g., Leithwood, 1994; Mulford and Silins 2003), left open the 'value' question as to the focus of the vision and goals. Research findings that compare these two different treatments of goals on leadership for learning favor the instructional leadership approach (e.g., Leithwood et al. 2006, 2010; Robinson et al. 2008; Sun and Leithwood 2015). Thus, for the purposes of school improvement, the school vision and goals should be learning focused. This highlights the critical role that principals play in sustaining a school-wide focus on learning in the face of competing priorities (Hallinger 2003; Kurland et al. 2010). We note that this finding is supported by research on successful implementation of school-based management as well as school improvement, and applies even in contexts where there is strong collaborative leadership (Barth 1990; Leithwood and Menzies 1998; Murphy 2005; Sashkin 1988).

Vision and goals achieve their impact through two primary means (Hallinger and Heck 2002; Sun and Leithwood 2015). First they inspire people to contribute, even sacrifice, their effort towards the achievement of a collective goal

(Kantabutra 2005, 2009, 2010; Thompson 1968; Thompson and McEwen 1958; Ylimaki 2006). This motivational power of vision is also highlighted in the theory of transformational leadership (Hallinger 2003; Hallinger and Heck 2002; Leithwood 1994; Leithwood and Jantzi 2005; Sun and Leithwood 2015). Through joining a collective effort to reach a challenging but meaningful goal, people may come to realize new aspirations and achieve higher levels of performance (Sashkin 1988; Seeley 1992). Goals also impact performance by limiting staff attention to a more narrow range of desired ends and scope of activities. Clearly defined goals provide a basis for making decisions on staffing, resource allocation, and program adoption. They help to clarify what we will do and what we will not do (Kantabutra 2005, 2009, 2010; Saphier and King 1985; Sun and Leithwood 2015).

Although early research on effective schools identified a 'clear academic vision and mission' as a hallmark of these schools (Edmonds 1979; Purkey and Smith 1983), subsequent studies elaborated on important differences in the use of goals across different school contexts. Hallinger and Murphy found that effective schools in high SES contexts with a history of success appeared to operate with a clear academic vision and mission, but without clearly defined goals (Hallinger and Murphy 1986). In contrast, low SES effective schools that had more recently 'turned around' had both a clear academic vision and mission as well as clearly defined goals. The researchers proposed that in schools with a history of success, the vision was strongly embedded in the school's culture and provided implicit guidance in maintaining the school's direction. The low SES effective schools had used goals as a means of developing a shared vision and direction for improvement. This finding is supported in recent research conducted on school improvement that we will describe in greater detail below (Day et al. 2010; Duke 2004; Hallinger and Heck 2011a, b; Murphy and Meyers 2008).

Consequently, two functions, Frames the School Goals and Communicates the School Goals, comprise the dimension, *Defines the School Mission*. These functions concern the principal's role in working with staff to ensure that the school has a clear mission and that the mission is focused on academic progress of its students (Andrews and Soder 1987; Bamburg and Andrews 1990; Hallinger et al. 1996; Heck et al. 1990; Leithwood et al. 2004, 2006, 2008; Purkey and Smith 1983; Robinson et al. 2008). While this dimension does not assume that the principal defines the school's mission alone, it does propose that the principal is responsible for ensuring that such a mission exists and for communicating it widely to staff. This dimension is the starting point for creating a learner-centered school (Hallinger and Heck 2002; Knapp et al. 2009).

Frames the School Goals

Instructionally effective schools generally have a clearly defined mission or set of goals which student achievement. The emphasis is on fewer goals around which staff energy and other school resources can be mobilized. A few coordinated objectives, each with a manageable scope, appear to work best. The goals should incorporate data on past/current student performance and include staff responsibilities

for achieving the goals. Staff and parent input during the development of the school's goals seem important. Performance goals should be expressed in measurable terms (Bossert et al. 1982; Clark 1980; Davies et al. 2005; Edmonds 1979; Hallinger and Heck 2002; Robinson et al. 2008; Venezky and Winfield 1979).

Within this model, we have asserted that there is no single best approach for a principal to take in setting goals. Goals could be set by the principal or in collaboration with staff. The bottom-line, however, is that the school should have clear, academic goals that staff support and incorporate into their daily practice. This picture of goal-oriented, academically-focused schools contrasted with the typical situation in which schools are portrayed as pursuing a variety of vague, ill-defined, and sometimes conflicting academic and non-academic goals.

Communicates the School Goals

This function is concerned with the ways in which the principal communicates the school's most important goals to teachers, parents, students etc. Principals can ensure that the importance of the school's goals is understood by discussing and reviewing them with staff on a regular basis during the school year, especially in the context of instructional, curricular, and budgetary decisions. Both formal communication channels (e.g., goal statements, staff bulletins, articles in the principal or site council newsletter, the school handbook, assemblies) and informal ones (e.g., parent conferences, teacher conferences, curricular meetings, other discussions with staff, can be used to communicate the school's primary purpose (Brookover et al. 1982; Brookover and Lezotte 1977; Edmonds 1979; Hallinger et al. 1996; Hallinger and Murphy 1986; Heck 1992, 1993, 2000; Kantabutra 2005, 2009, 2010; Leithwood et al. 2006; Leitner 1994; Marks and Printy 2003; Robinson et al. 2008; Sun and Leithwood 2015; Ylimaki 2006).

The instructional leader's role in defining a school mission was captured in a study of effective California primary schools conducted by Hallinger and Murphy (1986). In the course of their study, they observed teachers in their classrooms for several days. One teacher had an affective education activity center entitled "I am…" in the back of the room. However, during the classroom observations the researchers never saw students working at it (p. 339). When queried about this, the teacher observed:

> Yes, the affective activity center is something I really like to use with my students. However, this particular class has not made the usual progress in basic subjects, so I've had less time for affective activities. Our focus in the school is on ensuring that every one of our students has mastered basic subjects. We really try to make time for optional subjects as well. However, our principal *expects us to spend as much time on reading, writing, spelling, and math as is necessary to achieve this objective* (emphasis added). So I adjust the time accordingly. (Hallinger and Murphy 1986, p. 339)

Later during one of his interviews, the principal repeated this expectation almost word for world. It was obviously something that had been discussed with and among the staff many times. This comment captures several characteristics of the instructional leader's role in defining a clear mission. First, at this school the mission

was absolutely clear. It was written down and visible around the school. Second, it was focused on academic development appropriate to the needs of this particular school population. Third, the mission set a priority for the work of teachers. Fourth, it was known and accepted as legitimate by teachers throughout the school. Fifth, the mission was articulated, actively supported, and modeled by the principal.

2.1.2.2 Manages the Instructional Program

The second dimension, *Manages the Instructional Program*, focuses on the coordination and control of instruction and curriculum. This dimension incorporates three leadership (or what might be termed management) functions: Supervises and Evaluates Instruction, Coordinates the Curriculum, Monitors Student Progress. This dimension focuses on the role of the principal in "managing the technical core" of the school (Hallinger 2003; Hallinger and Heck 1998; Leithwood et al. 2006; Marks and Printy 2003; Murphy 1988; Robinson et al. 2008; Spillane 2006; Weick 1976, 1982). In larger schools, it is clear that the principal is not the only person involved in monitoring and developing the school's instructional program. Yet this framework assumes that coordination and control of the academic program of the school is a key leadership responsibility of the principal, even when day-to-day tasks are delegated extensively to others.

This dimension requires the principal and other leaders to be engaged in stimulating, supervising and monitoring teaching and learning in the school. Although time constraints may limit the principal's own personal efforts in this domain (e.g., Buttram et al. 2006; Marshall 1996), it remains critical to model and organize the whole leadership team to ensure that this gets done (Barth 1990; Hallinger and Heck 2010, 2011a, b; Heck and Hallinger 2014; Hayes et al. 2004; Kleine-Kracht 1993). Obviously, these functions also demand that the principal have expertise in teaching and learning, as well as a commitment to the school's improvement. It is this dimension that requires the principal to become "hip-deep" in the school's instructional program (Bossert et al. 1982; Cuban 1984; Dwyer 1986; Dwyer et al. 1983a, b; Edmonds 1979; Hallinger and Murphy 1986; Marshall 1996, 2004).

By way of example, we would again recall the principal in the example cited above. In discussions of how school leaders monitored student progress, several different teachers at this school observed that the principal "knew the reading level and progress of all 650+ students in this primary school" (Hallinger and Murphy 1986). This particular behavior is not a requirement for instructional leadership. However, it reflects the degree of this principal's involvement in monitoring student progress and in managing the school's instructional program.

Supervises and Evaluates Instruction

A central task of the principal is to ensure that the goals of the school are being translated into practice at the classroom level. This involves coordinating the classroom objectives of teachers with those of the school and evaluating classroom

instruction. In addition, it includes providing instructional support to teachers and monitoring classroom instruction through formal and informal classroom visits both by the principal and others engaged in instructional support (Attinello et al. 2006; Goldring and Berends 2009; Goldring et al. 2009; Hallinger et al. 1996; Hallinger and Heck 1996a; Heck et al. 1990; Joyce and Showers 2002; Kimball et al. 2004; Levine 1982; Lipham 1981; Liu and Zhao 2013; Loup et al. 1996; Reynolds et al. 2003; Robinson et al. 2008; Showers 1985).

This particular function remains controversial. Over the past decade, the teacher evaluation function of the principal has attracted increased attention (Danielson 2007; Hallinger et al. 2014; Kimball and Milanowski 2009; Kimball et al. 2004). Yet, we note that there remains relatively little empirical support for its impact on teaching and learning quality (Baker et al. 2010; Darling-Hammond 2006; Darling-Hammond et al. 2012; Darling-Hammond and Youngs 2006; Hallinger et al. 2014; Jacob and Lefgren 2008; Murphy et al. 2013). Within the PIMRS framework this function emphasizes the importance of developing the instructional capacity of teachers more than on the formal evaluation of teachers (Attinello et al. 2006; Duke 1990; Fullan 2001; Hallinger et al. 2014; Reynolds et al. 2003; Showers 1985).

Coordinates Curriculum

A characteristic which stands out in instructionally effective schools is the high degree of curricular coordination. School curricular objectives are closely aligned with both the content taught in classes and the achievement tests used by the school. In addition, there appears to be a fairly high degree of continuity in the curricular series used across grade levels. This aspect of curricular coordination is often supported by greater interaction among teachers within and across grade levels on instructional and/or curricular issues (Alexander and Cook 1982; Brookover et al. 1982; Cardno and Collett 2004; Clark 1980; Cohen and Miller 1980; Cooley and Leinhardt 1980; Glatthorn et al. 2009; Ho 2010; Levine 1982; Oakes 1989; Robinson et al. 2008; Spillane 2006; Venezky and Winfield 1979; Wellisch et al. 1978).

Monitors Student Progress

Instructionally effective schools place a strong emphasis on both standardized and criterion referenced testing. The tests are used to diagnose programmatic and student weaknesses, to evaluate the results of changes in the school's instructional program, and to help in making classroom assignment. The principal plays a key role in this area in several ways. He/she can provide teachers with test results in a timely and useful fashion, discuss test results with the staff as a whole, with grade level staff and individual teachers, and provide interpretive analyses for teachers detailing the relevant test data in a concise form (Anderson, Leithwood and Strauss 2010; Brookover et al. 1982; Edmonds 1979; Goldring and Berends 2009; Hallinger et al. 2013; Hattie 2009; Heck 2000, 2006; Knapp et al. 2009; Purkey and Smith 1983; Stallings 1980; Stallings and Mohlman 1981; Venezky and Winfield 1979).

2.1.2.3 Develops a Positive School Learning Climate

Principals also appear to influence learning by 'enabling' teachers to do their job more efficiently and effectively. Hallinger and Heck (1998) termed this "shaping academic structures and processes". Leithwood et al. (2006, 2008, 2010) and Leithwood and sun (2012) later referred to this as 'designing the organization'. Both labels convey the notion that leaders play a critical role by attending to the organization of work structures and processes. There is clear evidence that work structures such as the use of grade level and instructional teams shape patterns of teacher interaction and engagement (e.g., Oakes 1989; Rosenholtz 1985). In terms of the school's culture, these structures can also shape expectations, norms and capacity of the school to change (Barth 1990, 2001; Deal and Peterson 2009; Leithwood et al. 2008; Sashkin 1988; Saphier and King 1985). Due to their formal position in the hierarchy, principals play a key role in determining the nature of these structures.

Thus, the third dimension, *Develops a Positive School Learning Climate* includes several functions: Protects Instructional Time, Develops Professional Development, Maintains High Visibility, Provides Incentives for Teachers, and Provides Incentives for Learning. This dimension is broader in scope and intent than the second dimension and overlaps with dimensions incorporated into transformational leadership frameworks (Hallinger, 2003; Leithwood et al. 2006). It conforms to the notion that successful schools create an "academic press" through the development of high standards and expectations and a culture that fosters and rewards continuous learning and improvement.

Instructionally effective schools develop cultures of continuous improvement in which rewards are aligned with purposes and practices (Barth 1990; Glasman 1984; Hallinger et al. 1996; Hallinger and Heck 2010, 2011a, b; Hallinger and Murphy 1986; Heck and Hallinger 2009, 2010, 2011; Heck et al. 1990; Leithwood and Montgomery 1986; McDill et al. 1969; Mortimore 1993; Purkey and Smith 1983; Walker 2012). Finally, the principal must model values and practices that support the continuous improvement of teaching and learning (Dwyer 1986; Hallinger 2003; Hallinger and Murphy 1985; Leithwood and Jantzi 2005; Leithwood et al. 2008; Leithwood and Sun 2012; Marks and Printy 2003).

Protects Instructional Time

The work of Jane Stallings and others on allocated learning time initially called attention to the importance of providing teachers with blocks of uninterrupted work time. Improved classroom management and instructional skills are not used to the greatest effect if teachers are frequently interrupted by announcements, tardy students, and requests from the office. The principal has influence over this area through the development and enforcement of school-wide policies related to the interruption of classroom learning time (Bossert et al. 1982; Wynne 1980).

Maintains High Visibility

The contexts in which the principal is seen provide one indicator to teachers and students of his/her priorities. Although a significant portion of the principal's time may be out of his/her control, the principal can set priorities on how the remaining time is to be spent. Visibility on the campus and in classrooms increases the interaction between the principal and students as well as with teachers. This can have positive effects on student behavior and classroom instruction (Barth 1980, 1990; Brookover et al. 1982; Casey 1980; Clark 1980; Hallinger and Murphy 2012; Leithwood and Jantzi 2005; Leithwood et al. 2008; Leithwood and Sun 2012; Marks and Printy 2003; Walker 2012; Wolcott 1973; Wynne 1980).

Provides Incentives for Teachers

In a general sense this function seeks to align goals, outcomes and rewards in a more coordinated system of human resource management (e.g., Heneman and Milanowski 2007; Milanowski et al. 2005; Odden and Wallace 2008). Few monetary rewards are available principals to use with teachers. The single salary schedule and tenure system constrain principals with respect to motivating teachers through the use of monetary rewards. However, in schools money may only be slightly more effective than praise and recognition as an incentives. This suggests that the principal should make the best use of both formal and informal ways of motivating teachers and creating a school culture based on trust, mutual respect and success (Anderson 1982; Bryk et al. 2009; Knapp et al. 2009; Leithwood and Jantzi 1999, 2000, 2005; Leithwood and Sun 2012; Levine and Stark 1982; Lezotte et al. n.d.; Lortie 1969, 1975; McDill et al. 1969; Saphier and King 1985).

Promotes Professional Development

Robinson et al.'s (2008) meta-analysis again offers insight into this issue. Their results found that the principal's support for and participation in the professional learning of staff produced the largest effect on the learning outcomes of students. The principal has several ways of supporting teachers in their efforts to improve teaching and learning. He/she can arrange for, provide, or inform teachers of relevant opportunities for staff development. The principal also can encourage staff development that is closely linked to the school's goals (Brookover et al. 1982; Clark 1980; Day et al. 2010; Hallinger and Heck 1996a, 2010, 2011a, b; Heck and Hallinger 2009, 2011; Kruger et al. 2007; Joyce and Showers 2002; Little 1982; Louis et al. 2010; McLaughlin and Marsh 1978; Robinson et al. 2008; Rutter et al. 1979; Showers 1985; Sleegers et al. 2002).

Provides Incentives for Learning

The last function of the principal covered under the heading of School Learning Climate is the function Provides Incentives for Learning. It is possible to create a

school learning climate in which academic achievement is highly valued by students. Shaping a climate of success involves providing multiple, visible opportunities for students to be rewarded and recognized for their academic achievement and improvement. The rewards need not be fancy or expensive, but students should have opportunities to be recognized for their achievement both within the classroom and before the school as a whole (Brookover et al. 1982; Duke and Canady 1991; Hallinger et al. 1983; Lasley and Wayson 1982; McDill et al. 1969; Rutter et al. 1979; Wynne 1980).

The above dimensions of instructional leadership describe the scope of responsibilities of the principal and the school's leadership team with respect to leading learning. However, it is also useful to place these responsibilities into the broader context of how leadership achieves its effects in schools.

2.2 Modeling the Relationship Between Leadership and Learning

Phrases such as instructional leadership, leadership for learning, and school improvement leadership all imply the existence of a relationship between the strategies of leaders and growth in student learning. As noted above, however, it is only since the 1960s that scholars began to study school leadership as directed *explicitly* toward improvement in the quality of teaching and learning (e.g., Gross and Herriott 1965). Although progress has been made in defining the nature of these relationships, scholars in the UK (Bell et al. 2003; Southworth 2002, 2003), USA (Bossert et al. 1982; Hallinger and Heck 1996a, 1998), Canada (Leithwood et al. 2004; Leithwood and sun 2012; York-Barr and Duke 2004), Netherlands (Krüger et al. 2007; Sleegers et al. 2002; Thoonen et al. 2012; Witziers et al. 2003), and ANZ (Mulford and Silins 2003, 2009; Robinson et al. 2008) continue to debate the meaning of empirical findings on school leadership effects.[2]

Moreover, as suggested by the Far West Lab Model presented earlier in this chapter (Bossert et al. 1982), the predominant assumption that leadership impacts school improvement understates the extent to which leaders are also influenced by the organizational environment (Belchetz and Leithwood 2007; Hallinger and Heck 1996a; Krüger et al. 2007; Leithwood et al. 2004; Southworth 2002). Thus, we suggest that research on school leadership effects must take into account features of the organizational context and continue to approach issues of causal inference with caution.

In 1988, Pitner proposed several conceptual models that sought to explain the means by which leadership could impact student learning. The models included direct effects, indirect effects and reciprocal effects models of leadership for

[2]As is common in the school effectiveness literature, we use the term school effects to indicate statistically significant associations between variables. These associations do not need to be causal in nature.

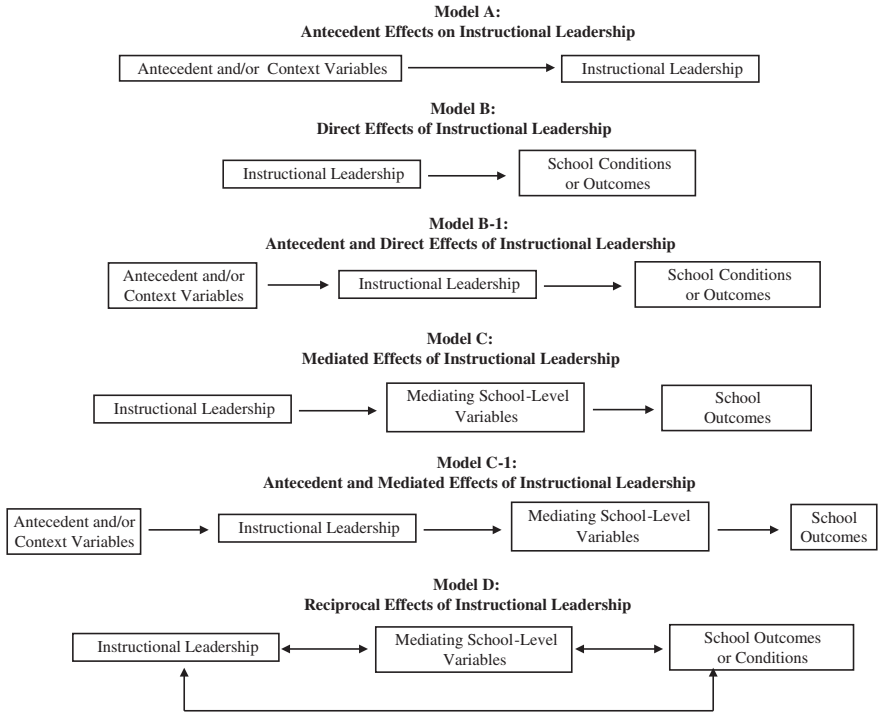

Fig. 2.3 Conceptual models of leadership and learning (adapted from Hallinger and Heck 1996a, p. 16; Pitner 1988, pp. 105–108)

learning (see Fig. 2.3). A decade later, Hallinger and Heck elaborated on these models in a review of empirical research on principal leadership and student learning (Hallinger and Heck 1996a, b, 1998).

- *Direct effects models* proposed that leadership effects could results directly from the actions of principals, and moreover, that these effects could be identified by analyzing the relationship between comparing measures of leadership and measures of student learning in samples of principals and students.
- *Indirect effects models* proposed that leaders obtained effects on students by impacting the structure, culture and people in the school organization (e.g., Bridges 1977). The Bossert model show in Fig. 2.1 represents one influential indirect (also referred to as mediated effects) model of leadership and learning. In the Bossert (1982) model, principal leadership influences learning through the principal's efforts to shape the school learning climate and instructional organization of the school.
- *Reciprocal effects* models propose that leadership is a process of mutual interaction and influence both between leaders and followers and between the leader and his/her organizational context (e.g., school culture, community). In one sense, reciprocal effects models incorporate indirect interactions. However, they

differ from standard indirect effects models by seeking to measure the dynamic relationship of the leader within his/her school environment (Hallinger and Heck 2011a, b; Heck and Hallinger 2010; Sivasubramaniam et al. 2002; Tate 2008).

As suggested in Fig. 2.3, the comprehensiveness of any of these models can be enhanced through the inclusion of personal antecedent (e.g., personal characteristics of the principal) or context (e.g., school size, school level, student SES) variables. This could be depicted, for example, by incorporating antecedent variables into Models B, C or D in Fig. 2.3.

More recently researchers have tested these models as a means of furthering our understanding of how leadership contributes to school improvement and student learning (Hallinger and Heck 2010, 2011b; Heck and Hallinger 2009, 2011; Leithwood et al. 2010; Mulford and Silins 2009; Robinson et al. 2008; Witziers et al. 2003). The most recent results affirm earlier contentions that indirect and reciprocal effects models hold the greatest potential for understanding how leadership impact learning (e.g., Hallinger and Heck 2011a, b; Heck and Hallinger 2009, 2011, 2014; Leithwood and sun 2012; Marks and Printy 2003; Mulford and Silins 2009; Robinson et al. 2008; Witziers et al. 2003). These studies also affirm the influence of the school environment on the exercise of leadership. That is, as suggested earlier, different styles of leadership appear to be more and less appropriate depending upon the state of organizational conditions (e.g., see Belchetz and Leithwood 2007; Day 2009; Day et al. 2010; Duke 2004; Goldring et al. 2008; Hallinger and Murphy 1986; Leithwood et al. 2008; Hallinger and Heck 2011c; Murphy and Meyers 2008).

We end this discussion of recent conceptual advances in research on instructional leadership with a brief discussion of one additional development. During the 1990s, as research in educational leadership and management expanded into a global enterprise, selected scholars began to assert that the 'socio-cultural context of leadership also matters' organizations (Cheng 1995; Hallinger et al. 2005; Hallinger 1995; Hallinger and Leithwood 1996; Walker and Dimmock 2002). They proposed that a sound global knowledge base should attend to both similarities and differences in the practices and effects of school leadership.

While some parts of the 'global' (i.e., Western) knowledge base are undoubtedly highly relevant across national and cultural contexts, we know little about which features (i.e., theories and findings) are 'universally' applicable and which are context dependent. Researchers have only recently begun to explore empirically how cultural factors impact the utilization of educational leadership practices outside of so-called 'Western' cultural contexts. Thus, these scholars proposed the socio-cultural context as an additional context variable moderating school leadership (see Hallinger 2011c; Lee and Hallinger 2012). While the past decade has seen a considerable increase in research output from Asia in this domain, it remains a ripe area for future investigation throughout the world (Hallinger and Bryant 2013a, b). We will return to this point in the concluding chapter.

2.3 Conclusion

As elaborated in these first two chapters, instructional leadership emerged as a practice-based construct in the mid-20th century in the USA. Over time, scholars have made substantial progress in providing greater clarity concerning conceptualizations of this role. Today, there is considerable agreement on the broad nature of this role as well as its impact on key school conditions and student learning (Leithwood et al. 2006; Louis et al. 2010; Robinson et al. 2008). Consequently, we find increasing interest from policymakers, practitioners and scholars around the world in both the dimensions that comprise this construct as well as in ways of strengthening its application in practice.

Implicit in this interest in instructional leadership is a desire to understand how school principals, and other leaders, shape conditions in the school that directly impact learning outcomes for students. This has led scholars to work with more complex mediated and reciprocal effects models as they seek to identify the 'paths' through which school leaders achieve results (e.g., Hallinger and Heck 1996a, 2011a; Heck and Hallinger 2014; Leithwood et al. 2010, 2012; Sebastian and Allensworth 2012). Moreover, as noted, greater attention has been paid in the recent past to understanding how the organizational and socio-cultural context of schools moderates the exercise of school leadership (Bajunid 1996; Belchetz and Leithwood 2007; Cheng 1995; Dimmock and Walker 2005; Goldring et al. 2008; Hallinger 1995, 2011b; Hallinger and Leithwood 1996; Lee and Hallinger 2012).

Advancing this research has required the development of more reliable research tools and research methods in studying the enactment and effects of school leadership. This leads to the next chapter in which we describe an effort that was undertaken to develop an instrument for measuring instructional leadership based upon the Hallinger and Murphy (1985) conceptual framework presented above.

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Chapter 3
Developing the PIMRS Instrument

Although instructional leadership initially emerged as a practice-based construct, the development of formal conceptual frameworks in the early 1980s set the stage for the design of new research tools. These would enable scholars and practitioners to reliably measure the instructional leadership practices of school principals. The PIMRS was the first instrument developed explicitly for this purpose. This chapter describes the steps taken in developing the PIMRS as a 'behaviorally anchored' rating scale designed for the purpose of measuring principal instructional leadership.

3.1 Development of the PIMRS Instrument

As noted in the previous chapters, up until the early 1980s there were no validated tools available for measuring instructional leadership, either in research or practice (Bossert et al. 1982; Bridges 1982; Erickson 1979; Murphy et al. 1983; Murphy 1988). Articulation of the PIMRS conceptual framework (Hallinger 1983; Hallinger and Murphy 1985) laid the foundation for the subsequent development of instrumentation capable of providing reliable measurement of instructional leadership. Reliable measurement tools were a prerequisite in order for scholars to address challenges laid down in contemporary reviews of research (e.g., Bridges 1982; Campbell 1979; Erickson 1979; Haller 1979). Although the author's goal was to develop an instrument that could be used for research on instructional leadership, other purposes were also envisioned. These included principal needs assessment and principal evaluation. In Chaps. 4 and 5 we discuss the different standards and treatments that apply when the scale is used for these varying purposes.

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3.2 Behaviorally Anchored Rating Scales

The methodology used to develop the PIMRS followed steps prescribed by Latham and Wexley (1981) for constructing 'behaviorally anchored rating scales' (BARS). BARS employ items that are 'anchored' in statements of critical job related behaviors on which raters can base their appraisal of an individual's performance within a given dimension of a job. The strength of the BARS approach lies in its specificity. The scales make explicit to the appraiser what is expected and what must be observed with respect to the appraisee's on-the-job behavior. These scales can serve multiple functions within organizations: as the basis for a job description; as part of a performance feedback system for coaching and staff evaluation; as a blueprint for the development of staff training in the areas measured by the instrument; and as an aid in manpower planning (Cravens et al. 2013; Goldring et al. 2009; Latham and Wexley 1977, 1981; Latham et al. 1979; Porter et al. 2010a, b; Smith and Kendall 1983; Smither et al. 2005).

3.3 Item Construction

The author worked closely with administrators in a school district that was engaged in research-informed school improvement (see Hallinger et al. 1983; Murphy et al. 1982, 1983; Weil et al. 1984). The first step in the development of the PIMRS was to perform a careful job analysis of the principal's role as an instructional leader. The job analysis drew on theory and research from several domains. First, as suggested earlier, the author's conceptualization of instructional leadership had been heavily influenced by research conducted on instructionally effective schools (e.g., Bossert et al. 1982; Bridge et al. 1979; Brookover et al. 1977, 1982; Brookover and Lezotte 1977; Edmonds 1979, 1982; Purkey and Smith 1983). This perspective on instructional leadership was further filtered through contemporary analyses of principal roles (e.g., Barth 1980; Barth and Deal 1982; Bridges 1967, 1977, 1982; Casey 1980; Cohen and Miller 1980; Cotton and Savard 1980a, b; Crowson et al. 1981; Erickson 1967, 1979; Getzels et al. 1968; Glasman and Binianimov 1981; Hemphill et al. 1965; Lipham 1981, 1964; March 1978; Martin and Willower 1981; Peterson 1977/1978; Willis 1980). Finally, the author also referred to the broader literature on organizational leadership of the period (e.g., Meyer and Rowan 1977; Weick 1976, 1982).

This review of relevant literature was supplemented by semi-structured interviews conducted with school administrators designed to elicit their perceptions of important dimensions of the instructional leadership role of the principal. These interviews included school superintendents as well as principals. This job analysis yielded the three dimensions and eleven functional domains that were described in Chap. 2.

The author then worked inductively to generate relevant job practices and behaviors that comprised each of the 11 job functions. The following steps were followed to generate the scale items (Hallinger 1983; Hallinger and Murphy 1985).

1. The 'expert opinions' of the school superintendent and his administrative team were solicited in order to generate a list of critical job related behaviors within each of the 11 job functions (see Latham and Wexley 1981).
2. The list was then supplemented with behaviors 'deduced by the author from literature' related to each of the job functions. The resulting list of critical job related behaviors contained 60 behavioral statements concerning the principal's role as an instructional leader.
3. The behavioral statements were then rewritten to describe a 'discrete behavior' and to fit the same stem and response category. This resulted in an expanded total of 89 behavioral statements. The increased number of items resulted from the deconstruction of statements that had contained more than one discrete behavior.
4. The resulting list was then reviewed again with the administrative team to attain maximum clarity and reduce overlap between items. This reduced the length of the scale from 89 to 71 items.

For each item, the rater assesses the frequency with which the principal enacts a behavior or practice associated with the particular instructional leadership function. Each item is rated on a Likert-type scale ranging from (1) almost never to (5) almost always (see Fig. 3.1). Three parallel forms of the PIMRS instrument were subsequently developed: a Principal Form, a Teacher Form and a Supervisor Form. The items that comprise each form are identical; only the stems change to reflect the differing perspectives of the role groups.

To what extent do you . . . ?	ALMOST NEVER				ALMOST ALWAYS
I. FRAME THE SCHOOL GOALS					
1. Develop a focused set of annual school-wide goals	1	2	3	4	5
2. Frame the school's goals in terms of staff responsibilities for meeting them	1	2	3	4	5
3. Use needs assessment or other formal and informal methods to secure staff input on goal development	1	2	3	4	5
4. Use data on student performance when developing the school's academic goals	1	2	3	4	5
5. Develop goals that are easily understood and used by teachers in the school	1	2	3	4	5

Fig. 3.1 Sample items from the PIMRS Principal Form 2.1

3.4 Initial Validation Study

Chapters 4 and 5 address the reliability and validity of the PIMRS in detail. For the purposes of the current chapter, we only wish to review the results of the initial PIMRS validation study (see Hallinger 1983; Hallinger and Murphy 1985). This study involved collecting data with the instrument in ten primary schools in a California school district. The raters were drawn from three role groups: (1) teachers at each of the schools (total of one hundred and four); (2) 10 primary school principals; and, (3) three supervisors from the district office. The district office supervisors included the superintendent, deputy superintendent, and the director of instruction. The same rating instrument was administered to each group, though the questionnaires were completed at different times and under different conditions.

The validation study incorporated a variety of steps designed to assess the PIMRS' reliability and validity (see Chaps. 4 and 5). Reliability was tested using the PIMRS Teacher Form. Ten of the 11 functional subscales exceeded the reliability standard of 0.80 recommended by Latham and Wexley (1981). The size of the *alpha* coefficients for the subscales ranged from a low of 0.78 for the Incentives to Improve Teaching, to a high of 0.90 on three different subscales, Supervises and Evaluates Instruction, Coordinates Curriculum, and Monitors Student Progress. The reliability coefficients for the subscales are contained in Table 3.1.

Several dimensions of validity were also examined in the validation study (see Chap. 5): face validity, context validity, and discriminant validity. The validation

Table 3.1 Reliability estimates from the original PIMRS reliability study (Hallinger 1983)

#	Subscale	Reliability[a]	N teachers
1	Frames school goals	0.89	(77)
2	Communicates school goals	0.89	(70)
3	Supervises and evaluates instruction	0.90	(61)
4	Coordinates curriculum	0.90	(53)
5	Monitors student progress	0.90	(52)
6	Projects instructional time	0.84	(70)
7	Maintains high visibility	0.81	(69)
8	Provides incentives for teachers	0.78	(70)
9	Promotes professional development	0.86	(58)
10	Provides incentives for learning	0.87	(61)
11	Maintains high academic standards	0.83	(76)

[a]Reliability estimates are Cronbach's *alpha* coefficients

study sought to create the most efficient tool for collecting data on the relevant instructional leadership dimensions and job functions. Here efficiency refers to the capacity of the scale to collect the highest quality data with the least number of items. Based on our review of the reliability and validity results, the author eliminated several items and one sub-scale, Maintains High Academic Standards. This reduced the length of the scale to 50 items (Hallinger 1982). In sum, all three forms of the final validated instrument retained 50 items organized into three broad dimensions and 10 job functions. In 2012, a shortened version of the Teacher Form was developed (see Chap. 6).

This version of the scale has been used by researchers with minor revisions over the ensuing 30 years. Over time, other researchers also examined features of the scale's reliability and validity in studies conducted in the USA (Howe 1995; Jones 1987; Leitner 1990) as well as in other countries (e.g., see Taraseina 1993; Wotany 1999). In 2012–2013, the authors conducted a variety of additional analyses of the PIMRS instrument's reliability (Hallinger et al. 2013) and validity (Hallinger and Wang 2014). These integrative analyses drew upon extensive data generated by PIMRS users over the past several decades and are described in detail in Chaps. 4 and 5. The results of this updated assessment of the measurement properties of the PIMRS indicate that the scale meets relevant standards of reliability and validity required when used to collect data for the purposes of research, needs assessment and principal evaluation.

3.5 Analyzing PIMRS Data

As noted above, the PIMRS was designed to provide data on multiple dimensions of the instructional leadership role and from different perspectives (e.g., teachers, the principal, supervisors). One point of caution is not to mix scores from different role groups. That is, ratings obtained from teachers cannot be combined with those of central office supervisors or the principal's own self-assessment. Moreover, aggregated scores obtained from teachers, principals and supervisors *cannot be directly compared* as they reflect different perspectives. Given these properties of the instrument, users are cautioned that some thought and planning are required concerning the types of scores and respondents that are desired by the user(s).

3.6 Levels of Analysis

The PIMRS can be employed to provide profiles of principal instructional leadership on one or more of the following three analytical levels: whole score, three dimensions, ten functions. Most commonly, the instrument is used to

provide feedback on the three dimensions or the 10 leadership functions. In most instances, we do not suggest that users score the instrument as a single instructional leadership score as this can ignore potentially important variability contained in the sub-scales of the instrument. While principals may find data on specific items potentially useful in clarifying the reasons behind higher or lower scores on a particular job function, item scores have limited utility for research, evaluation or district planning purposes. Thus, we encourage users to use either the three dimensions or 10 instructional leadership functions.

When employing the instrument for research purposes, the three dimensions generally provide sufficient discrimination in facets of the principal's role. Analysis at the level of the 10 functions may unduly complicate analytical procedures without contributing substantially greater clarity in results. Of course, it is easy enough for a researcher to conduct analyses for both the three dimensions and 10 job functions. Similarly, for the purpose of principal evaluation, we suggest that scoring at the level of the three dimensions may suffice. However, when using the scale for needs assessment for an individual principal or a school system it may be useful to have more highly differentiated data profiles such as those provided by the function-level analysis.

3.7 Scoring the PIMRS

Each subscale in the PIMRS consists of five items. Each item is scored on a "1" to "5" scale ("Almost Never" to "Almost Always"), denoting the frequency with which the specific behavior is enacted. Several types of scores have proved worthwhile in analyzing PIMRS data.

1. *Item averages*: These are obtained by averaging the scores from/the respondents on each item. Thus, if 25 teachers completed the assessment, their responses on item one would be averaged to obtain a mean score for that item.
2. *Item distributions*: Sometimes the mean score masks the perceptions of the various respondents. A mean score of 3.5 on an item may be obtained with different distributions of teachers ratings of the principal. For example, the same mean could be obtained with many teachers rating the principal around 2.5 and others at 4.5, or with most of the teachers rating the principal between 3.2 and 3.8. Thus, the interpretation of the same mean score can vary according to the distribution of responses.
3. *Subscale averages and distributions*: The subscale average computed at the dimension and/or function level is the most commonly used approach to analyzing PIMRS data. This score portrays the administrator's performance within a given instructional leadership dimension or job function. The subscale average is obtained by averaging the item scores within each subscale. Where there is more than one respondent, the score is obtained by averaging the averages of different respondents. That is, in step one find the mean score on the subscale Frames

School Goals from each of the teachers. Then average their mean scores on this subscale to obtain a 'grand mean' score. Again, it is desirable to portray the distribution of averages in order to get a sense of the spread of teacher perceptions.

4. *Group comparison scores*: Another type of PIMRS analysis is the comparison of perceptions of different role groups. Role group comparison scores portray the perceptions of the different role groups (i.e., teachers, supervisors and principal self-assessment) using any of the measurement methods listed above.

The comparative profile of instructional leadership shown in Fig. 3.2 offers an opportunity for the principal to compare his/her self-perceptions with those of the teaching staff and/or a supervisor(s). In analyzing the graph, the principal could not only identify areas of relative strength with respect to the 10 instructional leadership functions, but also differences between self-perceptions and those of one's teachers.

If we accept coaching as a process of data-gathering, feedback and self-reflection, these differences in perception can be employed as a stimulus for reflection, goal-setting, action steps, and further data gathering. The use of the profile also offers a data-driven approach to assessing change over time in the principal's practice in specific areas within this key domain of the role (see Goldring 2010; Goldring et al. 2009; Hallinger 2012).

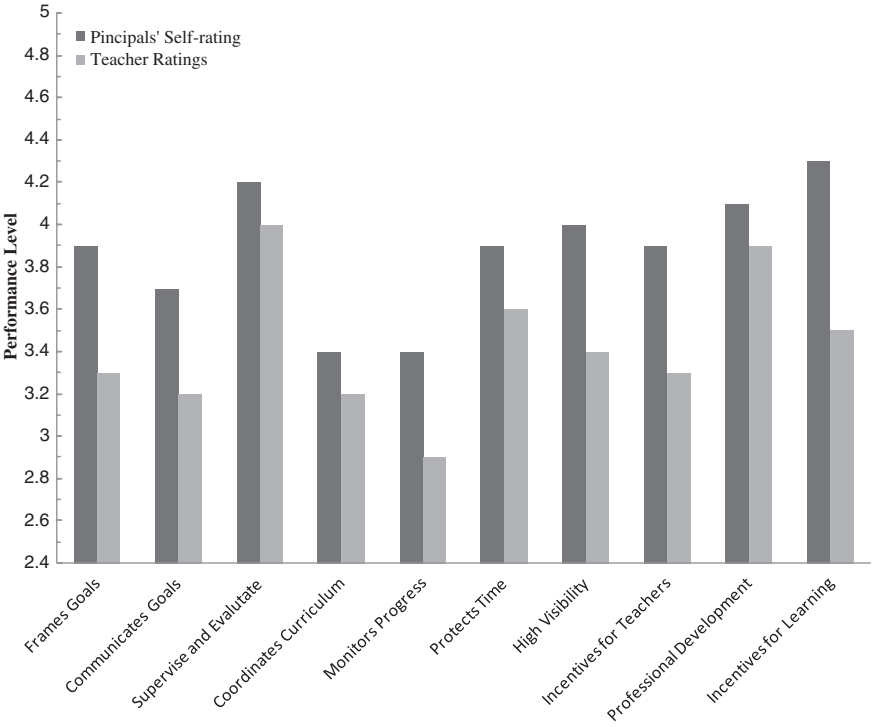

Fig. 3.2 Comparing teacher and principal perceptions of instructional leadership functions

It should be noted, however, that these comments only refer to descriptive statistics used in initial analysis of scores, and in feedback provided to principals. When used for research purposes, more advanced statistics are typically applied to PIMRS data in order to understand patterns of relationships among the principal's leadership and various features of the school. Hallinger (2011, 2012) described the different approaches used by researchers, as well as strengths and weaknesses, in greater detail.

3.8 Interpreting PIMRS Scores

It is important to recognize that the PIMRS does not measure 'principal effectiveness' per se. Rather, the PIMRS is used to assess the extent of the principal's engagement in the practices that comprise the instructional leadership role. Although higher item and subscale scores may suggest greater instructional leadership engagement or activity by the administrator, even the most effective principals do not necessarily score '5' on all subscales of the PIMRS. Indeed, it is conceivable that "optimal engagement" would not entail 'Almost Always' demonstrating a specific job behavior. This implies that "an effective instructional leader" would not necessarily receive a predominance of ratings of '5'. Mean scores of 4 and above should, therefore, be treated as indicators of 'high engagement'.

Contextual factors that could potentially influence the principal's exercise of instructional leadership include school level and size, faculty age and experience, student background and levels of achievement. Thus, users of the PIMRS are further encouraged to interpret the results in relation to: (1) the needs of their school; (2) the score of other administrators in the district; (3) changes in scores from the prior year(s).

Researchers have consistently reported significant differences between teacher and principal perceptions of the principal's instructional leadership. Principal self-report scores substantially higher than those obtained from teachers (e.g., Brown 1991; Corkill 1994; Dennis 2009; Haack 1991; Haasl 1989; Hallinger 1983, 2011; Hallinger et al. 2013; Henderson 2007; Krug 1986; Mallory 2003; Marshall 2005; Meek 1999; Meyer 1990; O'Day 1983; O'Donnell 2002; Reid 1989; Shatzer 2009; Smith 2007; Stevens 1996; Vinson 1997). Notably these 'role set' (Merton 1957) differences in PIMRS ratings obtained from teachers and their principals extend to contexts other than the USA. Empirical comparisons have yielded a similar pattern of results in Thailand (Hallinger and Lee 2013, 2014; Poovatanikul 1993; Ratchaneeladdajit 1997; Taraseina 1993), Guam (San Nicolas 2003), the Philippines (Saavedra 1987; Salvador 1999; Yogere 1996), the Maldives (Wafir 2011), Hong Kong (Chan 1992), and Taiwan (Chi 1997; Tang 1997; Yang 1996).

This is not necessarily a cause for concern and is indeed consistent with other studies both in education (Porter et al. 2010a, b) and other organizations (Brutus et al. 1999; Church 1997; Conway and Huffcutt 1997; Harris and Schaubroeck

1988; Murphy and Deshon 2000; Smither et al. 2005). Moreover, it should be noted, in addition, that despite differences in the magnitude of ratings obtained by the two role groups, there is often a similar pattern in their ratings on the various sub-scales that comprise the PIMRS (Hallinger 2011).

System administrators can also aggregate data obtained across a number of schools in order to identify system-wide patterns of strength and weakness in principal instructional leadership. Hallinger and Lee (2013, 2014) also used this approach to develop a national profile of system capacity for instructional leadership in Thailand. This information can be used for the purposes of planning staff development for principals, recruitment and selection of new principals and middle level leaders, succession planning, and revision of system policies. Figure 3.3 offers a different data displays for 10 principals from the same school system, focusing analysis on the three instructional leadership dimensions.

Interpretation of Fig. 3.3 would focus on mean performance as well as variability of performance across the principals on the three dimensions. For example, we can see that the principals as group as a whole appear considerably stronger in terms of defining a clear mission than in managing the instructional program or developing a positive school learning climate. This is reflected in a stronger

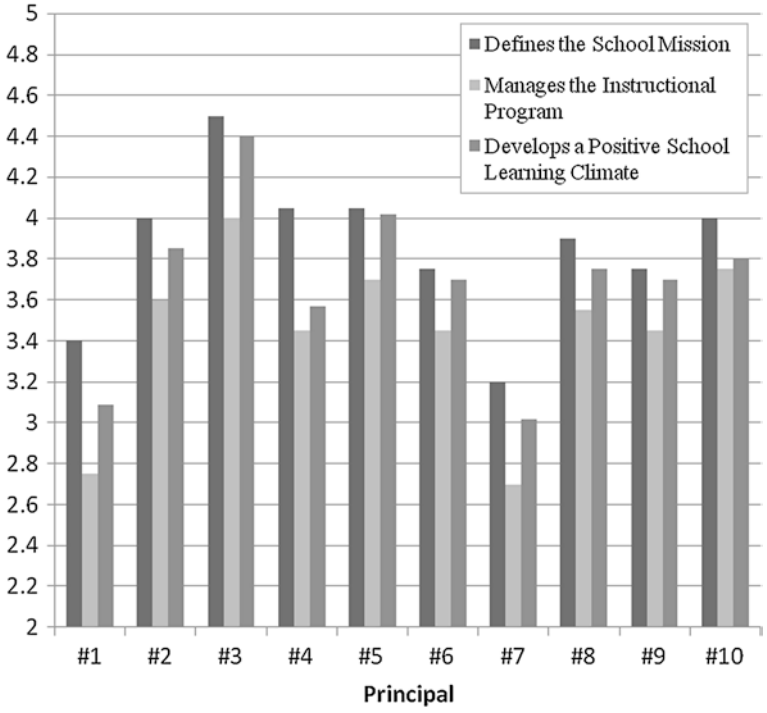

Fig. 3.3 Comparison of 10 principal instructional leadership profiles (*horizontal lines* indicate mean score for each dimension)

overall mean performance (not tabled) as well as the fact that this dimension was strongest for every principal, regardless of their mean self-rating.

The profile also highlights differences between principals. Thus we can see that principal #3 appears to stand out as an instructional leader, while principals #1 and 7 appear to be relatively weaker. Based on this profile, one could subsequently drill down to examine these performance trends in terms of the 10 leadership functions, as well as individual performance profiles. These illustrative profiles are offered to indicate the direction that school systems have taken in employing these data, both to stimulate individual principal development as well as for planning system-wide training.[1]

With these trends in mind, we recommend that system leaders employ multiple data sources when using the scale for purposes of practice. Displays that highlight differences in perceptions may be more useful than a single score, whether obtained from teachers, the principals, or supervisors. For research purposes, collecting principal self-report data represents an 'easier research design' to implement. However, these scores are often inflated in comparison to scores obtained from teachers. Therefore, although the Principal Form yields reliable data we also recommend collecting data from teachers whenever possible. Indeed, as described in Chap. 6, we recently developed a PIMRS Teacher Short Form in order to reduce the burden of collecting data from teachers.

3.9 Summary

This chapter has described the development of the PIMRS. Using procedures for designing behaviorally anchored rating scales, steps were employed to develop items corresponding to key dimensions in the PIMRS conceptual framework. The original validation study provided initial evidence that the PIMRS collected reliable and valid data on principal instructional leadership. Further detailed and updated information on the measurement properties of the PIMRS is offered in subsequent chapters.

The chapter also elaborated on how data obtained from the instrument can be used. Two main sources of variation in data use derive from the multi-level scale and the possibility of multiple respondent groups. Thus, researchers who use the scale must carefully plan both data collection (e.g., which groups to collect data from) as well as data analysis procedures (e.g., which 'levels' of the scale and what types of analyses to employ). We note that these choices impact the utility of the results from the data collection effort. We will elaborate further on these issues in succeeding chapters.

[1]This description of uses of the scale by district districts is taken from Hallinger 2012.

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Chapter 4
Reliability of the PIMRS

This chapter introduces information concerning the reliability of the PIMRS as a tool for assessing principal instructional leadership. A key step in instrument development lies in establishing the accuracy, or reliability, of the instrument. The chapter presents information based a comprehensive meta-analytic study of reliability results that have accumulated over the past 30 years. Drawing upon extensive data from multiple school levels, respondent groups and countries, the authors conclude that the teacher and principal forms of the PIMRS meet standards of reliability necessary for use in both research and practice.[1]

4.1 The Concept of Reliability

Lang and Heiss (1998) defined reliability as the consistency with which an instrument yields the same or similar responses across different settings and times. Several different approaches have been employed for assessing the reliability of test instruments. These include test-retest, parallel forms, and internal consistency (Gay 1992; Kerlinger 1966). Studies employing the PIMRS have relied exclusively on measures of 'internal consistency' of the instrument. Internal consistency refers to the degree to which items conceptually grouped into subscales correlate with each other (Kerlinger 1966).

With respect to the PIMRS, we conceptualize the 'true score' for each principal as the mean score across all possible observations by all teachers in the school on all occasions, using all possible measuring devices. When a high correlation exists among different teachers' observations of the principal's job performance, one can conclude that the instrument yields consistent or reliable data.

In practice, however, it is unlikely that perfect inter-rater reliability (i.e., a 100 % inter-rater correlation) ever exists. No two raters ever have exactly the same set

[1]The content of this chapter draws extensively from our meta-analytic reliability study published in the *Educational Administration Quarterly* by Hallinger et al. (2013).

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of experiences with or opportunities to observe the principal in the workplace. This applies whether the respondent group is comprised of teachers, supervisors, parents or any other potential respondent group.

Since we never achieve 'perfect agreement' in perceptions, reliability is inherently a relative concept. That is, we focus on describing 'the extent' to which an instrument provides reliable data. Moreover, as we shall discuss later in this chapter, the standard of reliability that is considered 'desirable' depends upon the purpose for which the data will be employed (e.g., research, needs assessment, performance evaluation).

It is also the case that the reliability of a measurement instrument varies according to the conditions under which it will be used. For example, a physical scale used to measure a person's weight may provide accurate measurement when placed on a flat surface, but not on an uneven surface. Similarly, a principal survey instrument may provide different measurements depending upon the country or school level in which it is administered. In sum, the 'conditions' under which a measurement instrument is used also bear upon the reliability of its measurements. Therefore, instead of simply declaring that the PIMRS is 'reliable' we seek to inform the reader as to the reliability of the measurement instrument when used with different respondent groups and in different contexts.

In Chap. 3 we briefly referred to the results of the reliability analysis included in the original PIMRS validation study. However, as noted, additional studies have also assessed the reliability of the PIMRS under different conditions. These studies have varied with respect to the 'form' of the scale that was used (i.e., Teacher Form or Principal Form), the 'level' of the scale on which reliability was calculated (i.e., whole scale, three dimensions, 10 functions), the 'school level' (i.e., primary, middle, secondary), and the national context (i.e., North America or Asia) in which the study was conducted.

These variations in the use of the PIMRS could contribute potentially useful information to our effort to understand the reliability of the PIMRS when used under different conditions. Indeed, the existence of a 'dataset' comprised of data drawn from multiple studies conducted under 'different conditions' offered the authors a unique opportunity to extend the instrument validation process. This chapter describes our extended study of the reliability of the PIMRS. In the following chapter, we discuss a similar study focusing on the validity of the PIMRS instrument.

4.2 Methods of Assessing Internal Consistency

To date, researchers have uniformly focused on assessing reliability of the PIMRS through tests of internal consistency. Our review of this literature found that scholars have employed three different statistical tests for this purpose (Hallinger et al.

2013). They have used Cronbach's (1951) *alpha* test, Ebel's (1951) test, and more recently a reliability test based on generalizability theory (see Hallinger et al. 2013). Before presenting the detailed reliability results of our meta-analysis, we provide an overview of these different approaches to assessing the internal consistency of the PIMRS.

4.2.1 Cronbach's Test of Internal Consistency

Gathering data with the PIMRS directly from principals represents a type of 'self-assessment'. The resulting score reflects a latent trait or characteristic of the individual subject (Kerlinger 1966). This is a typical case faced in measurement, and one in which researchers often employ Cronbach's (1951) *alpha* test of the internal consistency of scale items. As suggested above, reliability is often conceptualized as the ratio of true score variance to observed score variance. This can be represented mathematically as follows.

$$\rho_{xx'} = \frac{\sigma^2_{True}}{\sigma^2_{True} + \sigma^2_{Error}} \tag{4.1}$$

In the computational formula used for Cronbach's *alpha* test, the true score variance is equal to the observed score variance minus error variance. Observed score variance is expressed by the variance of each test taker's total score. The use of 'Cronbach's *alpha*' has become so ubiquitous in survey research that it has become synonymous with the concept of measurement reliability. Thus, we note that numerous researchers have employed Cronbach's test to examine the reliability of the PIMRS Teacher and Principal Forms (see Hallinger 2011a; Hallinger et al. 2013).

Nonetheless, some researchers have asserted that application of the coefficient *alpha* to the PIMRS Teacher Form violates a fundamental assumption of Cronbach's test (e.g., Hallinger et al. 1994; Howe 1995; Jones 1987; Leitner 1994; Taraseina 1993). When analyzing a PIMRS data set obtained from teacher respondents, Cronbach's *alpha* test treats each teacher's responses 'independently'. That is, the formula aggregates the total sample of teachers from different schools into a single group in order to arrive at an assessment of the instrument's internal consistency. In reality, however, teachers are 'nested' within schools, and each school's teachers are actually rating *their own principal*.

This contrasts with the Principal Form where it is correct to calculate reliability from an aggregation of principal self-ratings. For the Teacher Form, however, reliability estimates of internal consistency *should* be based on the combined ratings of teachers grouped by their schools. This capability is lacking in Cronbach's test.

4.2.2 Ebel's Test of Internal Consistency

Given this limitation of Cronbach's *alpha* test, several researchers (e.g., Hallinger et al. 1994; Howe 1995; Jones 1987; Leitner 1990; Taraseina 1993) employed Ebel's (1951) test of reliability to assess the internal consistency of the PIMRS Teacher Form. This test aggregates teacher ratings from a set of schools in which the respondents are grouped within their schools.

Ebel's formula is represented as a ratio of true variance in principal scores over observed variance in principal scores. Let k denote the (mean) number of teachers within a school that gave ratings to their principal, MS_{between} denotes the mean square between principals, and MS_{within} denotes the mean square within principals (errors). The reliability of these k ratings given to principals is:

$$r_k = \frac{MS_{\text{between}} - MS_{\text{within}}}{MS_{\text{between}}} \tag{4.2}$$

Because of its capacity to group teachers by their schools, Ebel's (1951) test is superior to Cronbach's *alpha* when used to analyze the reliability of data obtained from the PIMRS Teacher Form. Nonetheless, Ebel's method still suffers from two technical limitations (Schmitt 1996). First, the formula assumes that teachers are randomly selected from the same population. This assumption is not, however, tenable. In fact, teachers are nested within particular schools and they are rating their own particular principals. The other problem is that Ebel's formula ignores variability in item-level scores on the relevant subscales. This can distort the estimate of scale reliability.

4.2.3 Generalizability Theory Test of Internal Consistency

When reviewing the body of PIMRS studies and their approaches to assessing the scale's reliability, we took note of these limitations of Cronbach's and Ebel's tests of internal consistency when applied to data obtained from the PIMRS Teacher Form. In order to address these limitations, we therefore selected a different reliability test based on generalizability theory (Gen Theory).

We assert that the optimal structure for approaching analysis of reliability of the PIMRS Teacher Form is illustrated in Fig. 4.1. Here teachers' scores are nested within principals (i.e., schools). Teachers evaluate their principals via the same item set, so the item effect is crossed with teachers. This design, with teachers nested within principals and crossed with items, is called a 'split-plot design'. This approach to reliability analysis recognizes that the reliability coefficient for the PIMRS Teacher Form should be concerned with determining the dependability of *principal means*, rather than *individual teacher ratings*. Therefore, reliability should be based on an assessment derived from teachers' ratings of their particular principals, school by school.

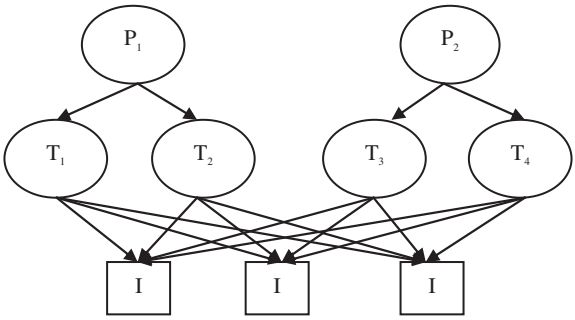

Fig. 4.1 Structure of split-plot design (P is principal, T is teacher, and I is items)

Table 4.1 Summary of random effects ANOVA for Split-plot Design

Source of variance	Sources as confounded	df	E(MS)
p	p	$n_p - 1$	$\text{MS (p)} = \sigma^2\,(\text{e}) + n_i\sigma^2\,(\text{t, pt}) + n_t\sigma^2\,(\text{pi}) + n_t n_i \sigma^2\,(\text{p})$
within p t p × t	t, pt	$n_p(n_t - 1)$	$\text{MS(p} \times \text{t)} = \sigma^2(\text{e}) + n_i\sigma^2(\text{t, pt})$
i	i	$n_i - 1$	$\text{MS(i)} = \sigma^2(\text{e}) + n_t\sigma^2(\text{pi}) + n_p n_t \sigma^2(\text{i})$
p × i	Pi	$(n_p - 1)(n_i - 1)$	$\text{MS(p} \times \text{i)} = \sigma^2(\text{e}) + n_t\sigma^2(\text{pi})$
within p × i t × i p × t × i, e	ti, tpi, e	$n_p(n_t - 1)(n_i - 1)$	$\text{MS(p} \times \text{t} \times \text{i)} = \sigma^2(\text{e})$

Note p indicates principal, *t* is teacher, *i* is items, and *e* is random error; *df* is the degree of freedom. *E(MS)* is the expected value of mean square

According to generalizability theory, the random effects analysis of variance for a split-plot design, with teacher (t) nested within principals (p), and crossed with items (i), yields estimates of five components of variance. These are presented in Table 4.1.

In Table 4.1, the constants n_p, n_i, and n_t are, respectively, the numbers of principals, items, and teachers per school that are sampled. Because the numbers of teachers sampled from each principal are different, we assert that the harmonic mean should be represented as n_t.

The layout in Table 4.1 includes the main effect of principal, the main effect of item, the interaction between teacher and principal, the interaction between principal and item, and the error term. According to Kane (Kane et al. 1976), the reliability of a split plot design is represented as:

$$\rho_p = \frac{\sigma_p^2 + \frac{1}{n_i}\sigma_{p\times i}^2}{\sigma_p^2 + \frac{1}{n_i}\sigma_{p\times i}^2 + \frac{1}{n_t}\sigma_{p\times t}^2 + \frac{1}{n_t n_i}\sigma_e^2} \tag{4.3}$$

where the two interactions, $\sigma^2_{p\times i}$ and $\sigma^2_{p\times t}$, are supposed as the fixed number 0 in the testing situation.

With these limitations in mind, our own analyses of reliability of data sets comprised of teacher responses to the PIMRS used a formula based on Gen Theory (Cronbach et al. 1972; Kane et al. 1976).[2] This approach not only takes into account the hierarchical, nested structure of the teacher data, but also utilizes the variability of item-level scores. Thus, we assert that a more accurate way of calculating the reliability of scores obtained from teacher respondents is represented in the following formula:

$$\rho_p = \frac{\sigma^2_p}{\sigma^2_p + \frac{1}{n_t n_i}\sigma^2_e} \tag{4.4}$$

where σ^2_p is the variance of principals, σ^2_e is the error variance, n_t is the number of teachers per school, and n_i is the number of items. It should be noted that the number of teachers per school is assumed to be identical across schools in this formula. In cases where schools have different numbers of teachers, one can use their harmonic mean to substitute for n_t. Thus, the reliability for principal ρ_p can then be calculated using the following formula:

$$\hat{\rho}_p = \frac{[MS_p - MS_{p\times t} - MS_{p\times i} + MS_e]}{[MS_p - MS_{p\times t} - MS_{p\times i} + MS_e] + MS_e} \tag{4.5}$$

where MS_p is the mean square of principal, $MS_{p\times t}$ is the mean square of principal by teacher, $MS_{p\times i}$ is the mean square of principal by item, MS_e is the mean square of error (Kane et al. 1976).

4.2.4 Summary

In sum, different tests are suitable for assessing the reliability of different forms of the PIMRS. Cronbach's *alpha* test represents an appropriate means of assessing internal consistency for the PIMRS Principal Form. However, the nature of data obtained through the PIMRS Teacher Form calls for a different type of test. After reviewing the capabilities of various tests, we determined that the Gen Theory test of reliability yields the most accurate estimates of internal consistency in situations where teachers are rating their principals (Hallinger et al. 2013).

[2]The reader should note that this formula can only be used when the researcher has access to the 'raw data set'. It cannot be applied to summarized data such as mean scores on subscales.

These observations framed our approach to reanalyzing secondary data collected by PIMRS researchers for the purposes of updating our understanding of the reliability of the PIMRS. Therefore, we used Cronbach's test to assess the reliability of the PIMRS Principal Form, and the Gen Theory test for the PIMRS Teacher Form. It should however, be noted that the Gen Theory test could only be used for studies where we had access to raw, item-level, teacher response data.[3] We describe the practical contingencies involved in test selection in greater detail below.

The findings from this review of different reliability tests are also relevant for researchers using the PIMRS in future empirical research. Although the results of the meta-analysis of reliability results conducted below are sufficient to establish instrument reliability for most PIMRS researchers, this discussion provides useful guidance for researchers who intend to use the instrument in 'first-use settings'. Thus, for example, researchers using the PIMRS in settings where the reliability of the scale has not been previously established (e.g., Chile, Kenya, Germany) should conduct reliability tests on their data sets. This discussion has highlighted which test is suitable for the different forms of the PIMRS. The syntax used to conduct each of these tests in SPSS is included in Appendices I and J.

4.3 Method

We recently undertook a study that sought to understand what has been learned about the reliability of the different forms of the PIMRS when used with different respondent groups and across different contexts (Hallinger et al. 2013). As noted earlier, over 250 PIMRS studies have been reported in the literature (see reference list). This study sought to integrate reliability results obtained from different studies in order to develop a comprehensive picture of the PIMRS scale's reliability.

Our study employed meta-analysis, a set of statistical procedures that is frequently used to quantitatively integrate findings from different studies (Glass 1977; Lipsey and Wilson 2001). Meta-analysis offers an means of synthesizing quantitative findings as empirically derived knowledge accumulates and matures over time. Thus, this was considered a suitable method for updating our understanding of the reliability of the PIMRS. Meta-analysis would enable a more comprehensive, updated and differentiated perspective on the PIMRS scale's reliability than would be possible from any single validation study.

[3]We note that this procedure could not be applied to the secondary studies since they authors seldom reported the detailed level of statistical information required to compute reliability with this approach.

At the outset of the meta-analytic study we reviewed all PIMRS studies in order to determine their relevance to our goal of assessing the scale's reliability. Some studies were too small in scale (e.g., case study of a single principal). Others did not report sufficient data for our purpose. This search of the PIMRS literature yielded 43 previously conducted studies that contained potentially relevant data.

Our detailed review of these PIMRS studies yielded three different groups of studies. The first group consisted of studies that had reported reliability results as a part of their data analysis procedures. These studies typically included a reliability table in either the method or results section of the paper. A second group consisted of studies that had not explicitly analyzed reliability of the PIMRS, but which reported sufficient statistical information in their tables for the computation of reliability coefficients. A third group consisted of studies for which we were able to obtain the raw PIMRS data directly from the researchers. Given the raw dataset, we could compute reliability coefficients.

As we shall describe, these different types of data presented different challenges in our effort to integrate reliability results from different studies. For the purposes of this chapter, we discuss the secondary data in terms of two categories: data extracted from written reports and raw data. We present these data sources separately since they presented different challenges and required different treatment in data analysis.

4.3.1 Data Source: Extracted Data

We located 28 studies in which the researcher had either reported reliability results or included information from which reliability could be computed. We proceeded to extract relevant information from these studies. These data included the author(s), year, national context, school level(s), respondent group(s), sample size(s), reliability test, and reliability results by scale level. These data were entered into a table in MS Excel.

As in all meta-analyses, variability in the design and methodology of the component studies presented challenges in terms of our goal of quantitative integration of data (Lipsey and Wilson 2001). As noted earlier, studies used different tests with different forms of the PIMRS. Researchers also reported results at different scale levels (i.e., full scale, three dimensions, 10 functions), and for different school levels (e.g., primary, middle, secondary). Thus, the data culled from the written reports yielded a collage of information that challenged our ability to quantitatively integrate the results. Adequacy of comparable data was a potential impediment in our attempt to develop a comprehensive assessment of the reliability of the PIMRS.

4.3.2 Data Source: Raw Data Sets

Given the frequent and continuing use of the PIMRS instrument among researchers[4] (Hallinger 2011a; Hallinger et al. 2013), it was potentially feasible to obtain raw data collected by scholars in recently completed PIMRS studies. Raw item-level data offers several advantages for the purpose of meta-analysis. First, it allows researchers to use a consistent test for calculating reliability estimates. Thus, for example, we could not combine reliability coefficients obtained from studies that had used Cronbach's and Ebel's tests. Second, it affords the opportunity to compare the pattern of reliability estimates obtained from different methods of calculation. Third, access to item-level data enables calculation of a more comprehensive set of reliability estimates (e.g., full scale, three dimensions and 10 functions). In contrast, the reliability estimates extracted from research studies typically reported only one, or at most two, of the three scale levels. Fourth, use of raw data would make it possible to apply the 'best' test for the particular dataset. In sum, access to raw data would enable us to exploit the full power of meta-analytic techniques resulting in a more robust synthesis of results.

We subsequently contacted authors of PIMRS studies that had been completed between 2008 and 2012 with the goal of gaining access to original item-level PIMRS data. We were able to obtain access to 25 original data sets comprised of PIMRS responses from 19 different researchers.[5] When these were combined with the extracted data, we had 52 data sets derived from 43 independent studies. The data sets were separated into two groups, based upon the data source, either principals (see Table 4.2) or teachers (see Table 4.3). We describe each of these in turn.

4.3.2.1 Principal Self-report Data

Principals represented the data source in 19 of the studies (see Table 4.2). As noted earlier, it was standard procedure for the researchers to employ Cronbach's *alpha* in testing the reliability of the PIMRS Principal Form. As shown in Table 4.2, there were 13 raw data sets and six data sets comprised of extracted data. We eliminated three studies that had surveyed fewer than 15 principals from our analyses (i.e., Carr 2011; Gjelaj Merturi 2010; Shafeeu 2011). We set a higher standard for the minimum sample size of principals needed in order to obtain sound results within a single study. This left us with 16 studies in the principal respondent data

[4]The publisher reports that during 2013 there was an average of 10 PIMRS requests per month from researchers globally. For example, in December 2013 requests for use of the PIMRS came from the USA (4), Malaysia (2), Philippines (2), Bhutan, Nigeria, United Arab Emirates, Saudi Arabia, Pakistan, and Vietnam.

[5]The discrepancy in totals presented is due to the fact that some researchers collected both teacher and principal response data. We treat these as separate data sets. Moreover, in some instances data were not usable.

Table 4.2 Data sources for reliability meta-analysis of the PIMRS Principal Form

#	Author	Year	Data type	Nation	N (P)	School level
1	Anderson	2006	Extracted	USA	190	Secondary
2	Babcock	1991	Extracted	USA	213	Primary
3	Carr	2011	Raw	USA	6	Primary
4	Carson	2013	Raw	USA	77	Secondary
5	Dunn	2010	Extracted	USA	128	Primary/ Secondary
6	Gjelaj Merturi	2010	Raw	USA	10	Primary
7	Goldring	2012	Raw	USA	58	Primary/ Secondary
8	Greb	2011	Raw	USA	31	Primary
9	Hallinger[a]	2013	Raw	Thai	1195	Primary/ Secondary
10	Long	2008	Raw	USA	67	Secondary
11	Lyons	2010	Raw	USA	15	Secondary
12	Minus	2010	Extracted	USA	62	Middle
13	Munroe	2009	Raw	USA	35	Primary
14	Nogay	1995	Extracted	USA	61	Secondary
15	Peariso	2011	Extracted	USA	36	Secondary
16	Shafeeu	2011	Raw	Maldives	10	Primary/ Secondary
17	Todd	2006	Raw	USA	122	Secondary
18	Wang	2011	Raw	Chin	23	Secondary
19	Wong	2010	Raw	Malaysia	195	Primary/ Secondary

'Raw' refers to data extracted from original data sets. 'Extracted' refers to data extracted from study reports

[a]Given the large size and uniqueness of the Hallinger and Lee (2013, 2014) data set from Thailand, elaboration on its characteristics seems warranted. Unlike the other studies, this research employed a short form of the PIMRS comprised of 20 items. This short version of the instrument was used to collect data from a nationally representative sample of 1,195 principals in Thailand. In order to prepare these data for meta-analysis, we applied a set of procedures to transform the 20 item scale so that the reliability results would approximate those of the 50 item test. We employed the Spearman Brown test to correlate the items included in this study with results obtained from the raw data sets that had employed the full PIMRS comprised of 50 items. This procedure resulted in revised reliability estimates for both the full PIMRS as well as its three dimensions. The distribution of items in the short form was, however, insufficient to obtain an accurate estimation of reliability for the 10 leadership functions

set. Four had collected data in East Asia and 12 in the USA (see Table 4.3). The studies were distributed across all school levels (i.e., primary, middle, secondary schools).[6] The sample size of principals in these studies ranged from 15 to 1195

[6]In the Goldring and Hallinger studies the data were coded by school level and we were, therefore, able to analyze the reliability by school level in our subsequent research. In some other studies (e.g., Wong 2010), we lacked access to school codes, so we could not break the data down for school level analyses.

Table 4.3 Data sources for reliability meta-analysis of the PIMRS Teacher Form

Author	Year	Data type	Nation	N (T)	N (P)	School level	Reliability test
Adam	2012	Raw	USA	128	9	Secondary	Gen theory
Aste	2009	Extracted	USA	248	6	Primary	Cronbach's *alpha*
Carson	2013	Raw	USA	95	77	Secondary	Gen theory
Chappelear	2011	Extracted	USA	213	18	Secondary	Cronbach's *alpha*
Clark	2009	Extracted	USA	356	90	Primary	Cronbach's *alpha*
Coltharp	1989	Extracted	USA	128	14	Primary	Cronbach's *alpha*
Dale	2010	Raw	USA	177	36	Primary	Gen theory
Dupont	2009	Extracted	USA	126	1	Primary/Secondary	Cronbach's *alpha*
Fancera	2009	Raw	USA	580	100	Secondary	Gen theory
Fulton	2009	Extracted	USA	174	24	Secondary	Cronbach's *alpha*
Gallon	1998	Extracted	USA	514	34	Primary/Secondary	Cronbach's *alpha*
Geiselman	2004	Extracted	USA	979	180	Primary	Cronbach's *alpha*
Goldring	2012*	Raw	USA	1610	58	Primary/Secondary	Gen theory
Greb	2011	Raw	USA	107	31	Primary	Gen theory
Hallinger	1983	Extracted	USA	104	10	Primary/Secondary	Ebel
Hart	2006	Extracted	Int'l	524	18	Primary/Secondary	Cronbach's *alpha*
Howe	1995	Extracted	USA	393	34	Primary	Ebel
Jones	1987	Extracted	USA	405	29	Secondary	Ebel
Leitner	1994	Extracted	USA	412	26	Primary	Ebel
Lyons	2010	Raw	USA	176	15	Secondary	Gen theory
MacNeil	1992	Extracted	USA	903	56	Primary	Cronbach's *alpha*
Minus	2010	Extracted	USA	298	62	Middle	Cronbach's *alpha*
Nogay	1995	Extracted	USA	424	76	Secondary	Cronbach's *alpha*
O'Day	1983	Extracted	USA	140	19	Primary	Cronbach's *alpha*

(continued)

Table 4.3 (continued)

Author	Year	Data type	Nation	N (T)	N (P)	School level	Reliability test
Ponnusamy	2010	Raw	Malaysia	105	14	Primary	Gen theory
Roudebush	1996	Extracted	USA	358	12	Primary	Cronbach's *alpha*
Shafeeu	2011	Raw	Malaysia	201	10	Primary/Secondary	Gen theory
Shatzer	2009	Raw	USA	280	37	Primary	Gen theory
Sheppard	1993	Extracted	Canada	624	50	Primary/Secondary	Cronbach's *alpha*
Taraseina	1993	Extracted	Thailand	774	10	Secondary	Ebel
Wafir	2011	Extracted	Maldives	225	5	Primary	Cronbach's *alpha*
Wang	2011	Raw	China	156	23	Secondary	Gen theory
Waters	2005	Extracted	USA	127	7	Primary	Cronbach's *alpha*

* Goldring (2012) provided an unpublished dataset to the researchers

principals, with a mean of 157 principals per study, and a total sample of 2508 principals.

After extracting *alpha* reliability estimates from the research reports, we proceeded to calculate Cronbach's *alpha* coefficients for the raw data sets that we had obtained. The latter data sets were preferred since access to item-level data made it possible to generate *alpha* reliability coefficients for the full scale, three dimensions and 10 leadership functions. We then combined the full set of *alpha* reliability coefficients into a single MS Excel table in preparation for meta-analysis.

4.3.2.2 Teacher Data

The teacher respondent data set consisted of data gathered in 33 studies conducted between 1983 and 2012 (see Table 4.3). The 33 studies were comprised of 11 raw data sets and 22 extracted data sets.

The studies shown in Table 4.3 came from five different countries: USA (25), Canada (2), China (1), Thailand (1), Malaysia (2), the Maldives (1), as well as one study that analyzed a cross-cultural data set (Hart 2006). The sample size of these teacher data sets ranged from 95 to 1610, with a mean of 359 teachers per study, and a total sample of 10,080 teachers. Respondents included teachers in primary, middle, and secondary (i.e., high) schools.

4.3.3 Meta-analytic Procedures

As noted above, meta-analysis is a method of quantitatively integrating findings reported in multiple independent studies. Meta-analysis is most frequently applied as a means of ascertaining the trend in *substantive findings* across studies (Glass 1977). For example, meta-analyses of leadership effects studies in education conducted by Witziers and colleagues (2003), Robinson and colleagues (2008), and Scheerens (2012) represent this species of meta-analysis.

Rodriguez and Maeda (2006) also applied meta-analytic methods to the generalization of reliability coefficients. This involves mathematically synthesizing the reliability coefficients obtained from different studies weighted by their sample sizes. The resulting reliability estimate is more accurate than a reliability coefficient obtained from any single study (Rodriguez and Maeda 2006). Thus, we concluded that meta-analysis of reliability results obtained from multiple PIMRS studies would enable us to gain a more comprehensive and accurate picture of the instrument's reliability when used under different conditions.

Take the *alpha* coefficient as an example. It is assumed that each of K studies ($k = 1, \ldots, K$) provides an estimate of the population *alpha* coefficient. Let α_k be the *alpha* coefficient, n_k be sample size, J_k be the number of items, in study k. The *alpha* coefficient should thus be transformed as:

$$T_k = (1 - \alpha_k)^{1/3} \tag{4.6}$$

with error variance:

$$v_k = \frac{18J_k(n_k - 1)(1 - \alpha_k)^{2/3}}{(J_k - 1)(9n_k - 11)^2} \tag{4.7}$$

Then, the weighted mean transformed *alpha* is:

$$\overline{T} = \frac{\sum (T_k / v_k)}{\sum (1/v_k)} \tag{4.8}$$

with an error variance of $1/\Sigma(1/v_k)$. Finally, the generalization reliability for the *alpha* coefficient is $\left|1 - \overline{T}^3\right|$ (Rodriguez and Maeda 2006). In sum, this approach to meta-analytic transformation of data provides a 'weighted average' of the reliability estimates derived from a set of studies. The 'weighted average' adjusts for the sample size of the particular studies, giving greater weight to studies with larger samples.

This formula could be applied across studies that had used the PIMRS Principal Form since they had all used the same test (i.e., Cronbach's *alpha*). However, when synthesizing the results of studies that had used the PIMRS Teacher Form, we categorized the data sets in order to maintain the integrity of results obtained from different reliability tests. As noted earlier, reliability results obtained from different tests cannot be treated as directly comparable.

4.4 Results

In this section of the chapter, we present the results of our meta-analysis applied to a combination of raw and extracted secondary data contained in 52 data sets obtained from 43 independent studies. We organize our presentation of the results first for the PIMRS Principal Form and then for the PIMRS Teacher Form.

4.4.1 Reliability of the PIMRS Principal Form

The results of our efforts to integrate reliability findings on the PIMRS Principal Form are presented in Appendix A. Cronbach's *alpha* was the statistic used for estimating reliability employed in these studies. The full sample consisted of 2508 principals. As indicated in Appendix A, the whole-scale *alpha* reliability estimate was 0.96. Reliability estimates for the three instructional leadership dimensions were 0.88 for *Defines the School Mission*, 0.91 for *Manages the Instructional*

Program, and 0.93 for *Develops a Positive School Learning Climate*. These all reflect a high level of scale reliability.

The summary coefficients, termed *rho-hat*, for the 10 instructional leadership functions were consistently and substantially lower than estimates for the full scale and three dimensions. Estimates ranged from a low of 0.74 on Creates Incentives for Teachers to a high of 0.85 on Frames the School Goals. This level of variability among subscales is not unexpected, however and the reliability of the function-level sub-scales is still sufficient for use in research and principal needs assessment.

Numerous scholars and practitioners have noted that features of the school context may shape or moderate the leadership behavior of principals (e.g., Goldring et al. 2008; Hallinger 2011b; Hallinger and Murphy 1986; Leithwood and Belchetz 2007). For example, differences in structural complexity and size create different challenges for principals seeking to exercise instructional leadership in primary and secondary schools (Cuban 1988). Similarly, the cultural context of the school may also shape the job description and normative expectations of principals (Hallinger and Lee 2013, 2014; Hallinger and Leithwood 1996).

We took advantage of the breadth of our data sources to analyze the reliability of the PIMRS instrument across different school levels and cultural contexts. Of course, we were limited to school levels and cultural contexts in which the scale had been used, and for which we had access to data. Despite these limitations, this is a potentially important contribution of the study, since it allows researchers to gain insight into how the scale responds under different conditions.

Although there were some minor variations, the pattern of reliability results did not vary significantly either across different school levels or in the two cultural contexts included in this analysis (i.e., USA and East Asia). However, it should be noted that our data on PIMRS reliability in East Asia were less comprehensive than for the USA (see Hallinger et al. 2013 for details). Moreover, we acknowledge that East Asia consists of a wide variety of cultural contexts. Therefore, the results for East Asia should be interpreted as preliminary rather than conclusive.

4.4.2 Reliability of the PIMRS Teacher Form

For the PIMRS Teacher Form, the results of the meta-analysis are organized in terms of the three different reliability tests. The findings are based on the synthesis of data sets comprised of 8153 respondents with an average of 19.6 teachers per school. The 18 data sets that employed Cronbach's *alpha* were comprised of 6465 teachers, with an average sample size of 22 teachers per school. The four data sets that employed Ebel's test included 1984 teachers with an average sample size of 22 teachers per school. The 11 data sets containing Gen Theory coefficients included 3615 teachers, with an average sample size of 11 teachers per school.

Table 4.4 Principal variance, error variance and gen test Reliability estimate for the three PIMRS dimensions

Dimension	$\hat{\sigma}_p^2$	$\hat{\sigma}_e^2$	$\hat{\rho}_p$
Whole scale	0.251	0.615	0.99
Defines school mission	0.297	0.339	0.97
Manages the instructional program	0.348	0.554	0.98
Develops school climate	0.259	0.572	0.98

Although we were unable to mathematically combine the results of the three different reliability tests, it was of interest to understand how the magnitude of reliability coefficients differed depending upon the test that was used. In order to gain insight into this issue, we applied the Cronbach's *alpha* and Gen Theory reliability tests to our raw data. The results indicated that the Gen Theory formula tended to yield slightly higher coefficients than the results obtained from the Cronbach test when applied to the same data (not tabled). We suggest that this is because of the capacity of the Gen Theory test derive the reliability from teachers grouped by school and from item-level responses rather than averaged responses. For reasons expressed earlier, we consider the estimates obtained from the Gen Theory test to be the most accurate approach to representing the reliability of the data. Moreover, these results provide a useful benchmark for interpreting the reliability results from the other tests displayed in Appendices B and C.

The Gen Theory data set consisted of data gathered in 11 studies conducted between 2000 and 2012. The sample size of teacher respondents for the studies ranged from 95 to 1610, with a mean of 329 teachers per study, and a total sample of 2313 teachers. The number of teachers in each school ranged from 3 to 28. An average of five teachers was sampled from each school. The statistical procedure yielded a full-scale reliability of 0.99, with coefficients of 0.97 (*Defines the School Mission*), 0.98 (*Manages the Instructional Program*) and 0.98 (*Develops a Positive School Learning Climate*) for the three dimensions (see Appendix B). The combined reliability estimates for the 10 instructional leadership functions ranged from a low of 0.90 (Maintains High Visibility) to a high of 0.95 on several functions. The reliability estimates, $\hat{\sigma}_p^2$ and $\hat{\sigma}_e^2$ for the whole scale and each dimension are listed in Table 4.4, where the average number of teachers in each school is 4.98.

Despite these high reliability coefficients, we noted considerable variability in the actual coefficients reported study by study. We further observed that these estimates are consistently higher than the estimates reported for the PIMRS Principal Form. Consistent with the results obtained for the Principal Form, results obtained from Cronbach's test were slightly lower than from the Gen Theory test results for the PIMRS Teacher Form.

We followed the main analysis of the Teacher Form data sets with analyses of reliability across school levels and cultural contexts.[7] These results bore similar patterns to the results of the main analysis. The results of the Gen Theory test

[7]See note *vii* above. The same rationale was applied to the categorization of studies for the analysis shown in Table 4.4.

indicated reliability levels consistently above 0.90 across both cultural contexts and school levels (Hallinger et al. 2013). Again, the reliability estimates were somewhat lower for the 10 functions than for the three dimensions and full scale. Results from the Gen Theory test were also somewhat higher than those from Cronbach's test.

4.5 Conclusion

This chapter provided an updated comprehensive assessment of the reliability of the PIMRS instrument. Extensive use of the PIMRS instrument over time and access to recently collected data sets enabled us to apply more powerful statistical methods towards understanding the reliability of the PIMRS when used in different ways, with different groups and in different settings. We note that this type of comprehensive assessment of instrument reliability is extremely rare in the educational leadership literature (Bridges 1982; Haller 1979; Hallinger 2011a). In this final section of the chapter, we first present a summary and interpretation of the results. Then we discuss the limitations and implications of the findings.

4.5.1 Summary of Results

Meta-analyses of reliability results were conducted separately for the Principal and Teacher Forms of the PIMRS. In each case, we provided analyses for the whole scale as well as its component dimensions and function level sub-scales. The pattern of results was quite consistent with Gay's (1992) observation that even in highly reliable measurement instruments, the subscale reliability of sub-scales tends to decrease with the number of items.

The PIMRS Principal Form demonstrated very high reliability for the whole scale and three dimension-level subscales, with *alpha* coefficients exceeding 0.90. The 10 function-level sub-scales all exceeded 0.80. Despite considerable variation in the number of studies and sample sizes, we found no substantial variation in the pattern of the results for the PIMRS Principal Form across school levels or between the two socio-cultural contexts included in this study, the USA and East Asia.

Meta-analysis of results for the PIMRS Teacher Form demonstrated a consistently higher level of reliability for all three levels of scale measurement than the PIMRS Principal Form. Results of the meta-analysis showed that all three scale levels yielded mean *alpha* coefficients above 0.90. This result was also consistent across the various measured organizational and cultural contexts. Thus the two commonly used forms of the instrument yielded high *alpha* coefficients. What does this mean, however, for the use of the scale in practice?

4.5.2 Interpretation of Results

It is a popular misconception that a single standard exists for interpreting the reliability of a research instrument (Kerlinger 1966; Latham and Wexley 1981; Smith and Kendall 1966). Instead, the appropriate standard should be based on the *intended use of the data*. In general, instruments used for research and performance assessment in organizations (e.g., principal evaluation) are evaluated according to different standards (Latham and Wexley 1981).

When data are employed for research purposes, Hair and colleagues suggested a minimum acceptable range of 0.60–0.70 in reliability coefficients (Hair et al. 1998). Other scholars (e.g., Fraenkel and Wallen 1990; Kerlinger 1966; Lang and Heiss 1998; Nunnally 1978) have recommended that research instruments should meet a minimum reliability standard of 0.70. Nunnally (1978, p. 245) further emphasized that efforts to achieve reliability levels beyond 0.80 are a "waste of time" when instruments are intended for use in 'basic research'.

In contrast, when data obtained from an instrument will be used to make decisions about the fate of individuals in organizations, a higher standard of accuracy is required. Scholars have not, however, agreed upon a single standard for instruments used in performance evaluation. Latham and Wexley (1981, p. 66) proposed a *minimum reliability standard* of 0.80. Nunnally (1978) suggested a reliability standard of at least 0.90 when the data will be used for personnel decisions.

These perspectives on reliability standards are relevant to our discussion of the PIMRS. The PIMRS instrument has been used as a tool to collect data for three main purposes: research, principal needs assessment, and principal evaluation. This discussion suggests that *users should not evaluate the reliability of the instrument based upon a single standard*. Rather users should align their selection of the form of the instrument (i.e., PIMRS Principal, Teacher or Supervisor Form) and the scale level (i.e., full scale, three dimensions, 10 functions) based upon their intended use of the data.

We conclude that the PIMRS Principal Form can be used reliably for the purposes of either research or principal needs assessment. For these purposes, the instrument yields reliable data at all three levels of measurement (i.e., whole scale, three dimensions, 10 functions). If the PIMRS Principal Form is used as one of several tools in principal performance evaluation, profiles based upon the three dimensions would appear most suitable.

The results further indicate that the PIMRS Teacher Form meets a standard of reliability required for use in personnel evaluation as well as in research and needs assessment. We found that the instrument's reliability is replicable with primary, middle and secondary school principals, particularly in the USA. We do not consider the results for East Asia conclusive due to the limited coverage and small number of studies included in the sample. Thus, although we conclude that both forms of the scale meet high standards of reliability, we are more confident in the North American results as a result of the large number of studies and consistency in results.

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Chapter 5
Validity of the PIMRS

In this chapter we examine the validity of the PIMRS when used as an instrument for research, principal evaluation, and principal needs assessment. The chapter provides an overview of the concept of validity and then proceeds to report on the scale's internal validity. As in the prior chapter on reliability, this chapter draws upon an extensive dataset compiled over time from multiple researchers in order to evaluate the validity of the PIMRS. Based on the analyses presented in this chapter, the authors conclude that the PIMRS meets high standards of internal validity. Although research is underway aimed at exploring the external validity of the PIMRS the chapter only offers a preview of these results.

5.1 Concept of Validity

Reliability is a necessary condition for establishing the validity of a measurement instrument. In the words of Latham and Wexley, "A valid measure should yield consistent (reliable) data about what it is concerned with regardless of the time of day, week, or month the measures are taken, and regardless of who takes the measure" (Latham and Wexley 1981, p. 65). However, an appraisal instrument must not only provide data that are accurate and consistent (i.e., reliable) but that also measure the construct as conceptualized by the researcher and as implemented in practice (Lang and Heiss 1998). For example a bathroom scale may consistently display five pounds higher than the actual weight of the person using it. If repeated weightings are taken under the same conditions, the scale will yield consistent (i.e., reliable) measurements, but the inference (i.e., validity) about how much one weighs will be faulty.

Proper use of data collected by a survey instrument requires that the user be able to justify both the accuracy of the instrument and the inferences drawn from the scores that it yields. As Nunnally (1978) stated, "strictly speaking, one validates not a measuring instrument but rather some use to which the instrument is

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put" (p. 87). Three broad uses of test scores may be distinguished which correspond roughly to three major categories of validity evidence (Cronbach 1988; Cronbach et al. 1972).

- Selecting among a set of candidates (e.g., college entrance, teacher selection) where *predictive or criterion-related validity* is important.
- Describing the performance characteristics of a person or set of persons (e.g., principal evaluation, needs assessment) where *content validity* is relevant.
- Explaining the relationship among a set of theoretically related factors (e.g., for research) where *construct validity* is critical.

It is apparent then, that an investigator validates not the instrument itself, but rather the intended interpretation of the scores that it yields. Therefore, as with reliability, the most suitable type of validation approach depends on the intended use of the data (Cronbach 1988; Latham and Wexley 1981; Lawler 1967). With respect to the PIMRS, all three types of validity are potentially relevant since it is used for multiple purposes: principal evaluation, needs assessment, research.

5.1.1 A Taxonomy of Validity

According to the Standards for Educational and Psychological Testing (American Educational Research Association 1999), "Validity refers to the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests…. The process of validation involves accumulating evidence to provide a sound scientific basis for the proposed score interpretations." There are five distinct sources of validation evidence including:

1. evidence based on test content,
2. evidence based on response processes,
3. evidence based on internal structure of the construct,
4. evidence based on relationships of the construct to other variables/measures, and
5. evidence based on the consequences of testing (American Educational Research Association 1999).

Lissitz and Samuelsen (2007) proposed a systematic categorization of validity. Their approach includes two *primary investigative foci* and two *primary perspectives*. The category of primary investigative foci considers the *source of evidence* on validity. One kind of source is internal evidence (internal validity). Investigation of this source typically involves the analysis of the test and the procedures employed in test and item development. The second source is *external evidence* (external validity[1]). Investigation of this source typically involves analysis

[1]The terms internal validity and external validity in this book are used to describe the sources of validity evidence.

of the relationship between the test's results and other measures or criterion variables. The two primary perspectives are theoretical (conceptual) and practical (empirical) perspectives adopted towards inferences drawn based on the test output.

Assessment of internal validity focuses on content validity, reliability, latent processes, and internal structures of the measurement tool. Latent processes and internal structures belong to the theoretical perspective and content validity and reliability belong to the practical perspective. In the practical perspective, relevant evidence includes documentation of the match between items and the conceptual blueprint, and examination of item characteristics from test data that are collected.

Assessment of external validity focuses on the utility and impact of the test's application. Predictive and concurrent validity (Cronbach and Meehl 1955) represent features of external validity within the practical perspective. Predictive validity describes the relationship between the test measures and criterion performance in the future (e.g., college student performance and scores on their entrance exam). Concurrent validity describes the relationship between the test measures and other previously validated tools that are intended to measure related constructs. The multitrait-multimethod matrix (Campbell and Fiske 1959) is a widely used approach to the assessment of external validity within the theoretical perspective. It considers both the theoretical relationship among different test instruments and the effects of different data collection methods. As noted above, the current chapter reports primarily on the internal validity of the PIMRS.

5.2 Method and Test Procedures

In the "four-building-block approach" to test development Wilson (2005) describes explicit approaches and standards used in developing a valid measurement instrument. The four building blocks are construct map, item design, outcome space, and measurement model. In a construct map, the test developers classify the construct into a few ordinal categories and identify typical behaviors (item responses) to describe each category. Items are then designed to measure performance in each category based on the construct map. For each item, an outcome space is defined and a scoring rubric is developed. Finally, after test data are collected, measurement models are applied to produce measures and obtain feedback for the test development cycle. The four building blocks approach offers evidence to support internal validity based on empirical results obtained from the measurement instrument. Its rationale is grounded in the connection between the content of items and latent traits captured in the construct(s).

Using the four building blocks approach as a guide for instrument validation, we began by developing construct maps for the three dimensions of the PIMRS instrument: *Defines the School Mission*, *Manages the Instructional Program* and *Develops a Positive School Learning Climate* (see Construct Maps in Appendices C, D, E). A construct map can be interpreted as a type of assessment rubric. On the

construct map, each dimension contains three levels of proficiency, labeled as basic, proficient, and advanced. Each level has a specific definition and corresponding behavioral indicators. The goal of item design is to approximate the manifestation of the construct (e.g., *Defines the School Mission*) in the real world.

The outcome space for the PIMRS instrument is a five-point Likert-type rating scale. The outcome space for this instrument refers to the frequency with which a particular practice or behavior has been observed by the rater. Its scoring is straightforward: 1 = almost never; 2 = seldom; 3 = sometimes; 4 = frequently; 5 = almost always. A measurement model transforms categorical item responses to a location along a construct map. It helps evaluate the reasonableness of item ordering and is used in the development of instrument short forms (Chap. 7). Because all items in the PIMRS use the same rating scale, the Rasch rating scale model (Andrich 1978) was chosen to guide our analytical procedures.

In the Rasch model, the probability of person n (e.g., a teacher, the principal) endorsing score j for item i is divided into the ratee's (e.g., principal) ability θ_n, item difficulty δ_i, and step parameter τ_k (in common to all items) for each score j. The relationship among these elements of the model is written as:

$$P_{nij} = \frac{\exp(\sum_{k=0}^{j}(\theta_n - \delta_i - \tau_k))}{\sum_{m=0}^{J}\exp(\sum_{k=0}^{m}(\theta_n - \delta_i - \tau_k))}, \tag{5.1}$$

where $J + 1$ is the number of categories in the item ($J = 4$ for a five-point rating scale), and if $k = 0$, the term of $(\theta_n - \delta_i - \tau_k)$ is equal to zero.

In analyzing measurement properties of the PIMRS, θ_n represents the rating given by a teacher or the self-rating of the principal. When the value of θ_n, is high, this implies a high rating for the principal. The symbol δ_i represents the item's 'threshold'. When the threshold for an item is higher, then it is more difficult for a principal to gain a high score on that item. In this case, we can conclude that the item has 'higher difficulty'. Conversely, a lower threshold implies that it is easier for the principal to obtain a higher score.

Whereas a construct map reveals the theoretical distribution of items, a Wright Map (Wright and Master 1982) reveals the empirical distribution of performance ratings for the persons being assessed. Our analysis of internal validity included a comparison of the theoretical construct maps for each PIMRS dimension with empirical data displayed in a series of Wright Maps. Ideally, there should be a high degree of alignment between these two maps. This offers additional insight into the construct validity of the rating instrument.

5.2.1 Datasets

Our validation study employed several secondary datasets for the analysis of validity. The data sets were based on the PIMRS Principal and Teacher Forms.

Table 5.1 Data sources for studies using the PIMRS Principal Form

Author	Year	Nation	N (principals)	School level
Carr	2011	USA	6	Primary
Carson	2013	USA	77	Secondary
Gjelaj Meturi	2010	USA	10	Primary
Goldring*	2012	USA	58	Primary/ secondary
Greb	2011	USA	31	Primary
Long	2008	USA	67	Secondary
Lyons	2010	USA	15	Secondary
Munroe	2009	USA	35	Primary
Shafeeu	2011	Maldives	10	Primary/ secondary
Todd	2006	USA	122	Secondary
Wang	2011	China	23	Secondary
Wong	2010	Malaysia	195	Primary/ secondary

**Note* Goldring et al. (2012) provided an unpublished dataset to the researchers

5.2.1.1 Data Sources

The dataset used for analysis of internal validity of the PIMRS Principal Form consisted of secondary data collected in 12 studies conducted between 2008 and 2012 (see Table 5.1). These included three studies from East Asia and nine from the USA. Five studies had focused on secondary school principals, four on primary school principals, and three had collected data from principals across school levels. The sample size in these studies ranged from 6 to 195 principals, with a mean of 50 principals per study, and a total sample of 649 principals.

The dataset used for analysis of internal validity of the PIMRS Teacher Form consisted of data collected in 13 independent PIMRS studies conducted between 2008 and 2012. In these 13 studies (see Table 5.2), respondents had completed the PIMRS Teacher Form. The sample size of teacher respondents in the 13 studies ranged from 95 to 1610, with a mean of 336 teachers per study. This represented a total sample of 4370 teachers rating 651 principals across different combinations of school levels (see Table 5.2).

5.3 Assessment of Internal Validity

As indicated in Chap. 4, the PIMRS instrument was initially examined with respect to several aspects of internal validity. Subsequent studies expanded, to varying degrees, on the author's initial assessment of the instrument's validity (e.g., Hallinger et al. 1994; Howe 1995; Jones 1987; Leitner 1994; O'Day 1983; Wotany 1999). This

Table 5.2 Data sources for studies using the PIMRS Teacher Form

Author	Year	Nation	N (teachers)	N (schools)	Level
Adam	2012	USA	128	9	Secondary
Carson	2013	USA	95	77	Secondary
Dale	2010	USA	177	36	Primary
Fancera	2009	USA	580	100	Secondary
Fulton	2009	USA	169	No code[a]	Secondary
Greb	2011	USA	107	31	Primary
Long	2008	USA	586	69	Secondary
Lyons	2010	USA	176	15	Secondary
Ponnusamy	2010	Malaysia	105	14	Primary
Shafeeu	2011	Malaysia	201	10	Primary/ Secondary
Shatzer	2009	USA	280	37	Primary
Wang	2011	China	156	23	Secondary

[a]'No code' indicates that the scholar who supplied the data set had not coded the data to indicate the sample size

chapter refines and extends findings reported in these earlier studies. More specifically, we examine the internal validity of PIMRS according to five approaches.

1. *Subscale content validation*: items making up each subscale of the instrument must be relevant to the critical requirements of the job and each item assigned to a subscale must achieve a minimum average agreement of 0.80 among a group of raters.
2. *School document analysis*: an analysis of school documents related to the instructional leadership behavior of the principals should yield profiles of the principals' instructional management performance similar to those obtained from the questionnaire.
3. *Subscale inter-correlation*: items within a subscale must inter-correlate more strongly with each other than with items comprising other subscales.
4. *Construct validity*: Rasch analysis explores the degree of alignment or 'fit' between the conceptual model of instructional leadership (e.g., in construct maps) and empirical data at the item level (e.g., in Wright Maps).
5. *Differential item function*: detects whether the character of the items differs for different groups of principals (e.g., primary and secondary schools principals) as a test of the invariance of item structure.

5.3.1 Subscale Content Validation

Content validation assesses the degree to which the items are appropriate measures of each subscale of the instrument. The procedures used to assess the content validity of the subscales followed those outlined by Latham and Wexley (1981,

Table 5.3 Average agreement on items among judges

Subscale name	Number of items	Average agreement (%)
Frames school goals	6	91
Communicates school goals	6	96
Supervises/evaluates instruction	11	80
Coordinates curriculum	7	80
Monitors student progress	8	88
Protects instructional time	5	85
Maintains high visibility	5	80
Provides incentives for teachers	4	100
Promotes professional development	10	80
Maintains academic standards	5	95
Provides incentives for learning	4	94
Total items	71	

pp. 62–63). Content validity was assessed by having persons knowledgeable in the domain of instructional leadership assign potential items from a randomly ordered list into a pre-determined set of functional categories. Latham and Wexley (1981) suggested that potential items should achieve at least 80 % agreement among the raters in order to be considered a valid measure for a functional category. In this case we use the term function and subscale synonymously.

In this study, the author recruited four experienced educational administrators as judges in content validation. The judges were all familiar with the instructional leadership functions of school principals (three principals and one vice principal), but had not been involved in the generation of the job behaviors. Each was each given a randomly ordered list of 93 potential items and a sheet of paper with eleven columns headed by the names of 11 functional categories (e.g., Frames School Goals, Monitors Student Progress). The judges were then asked to assign each item to the category in which they felt it belonged. If an item did not fit in any of the categories, it was left unassigned (Table 5.3).

After this process was completed, eighty-one items remained within the eleven functional categories. These items were reviewed with the participating superintendent. Ten of the items were discarded in order to balance the number of items across functional categories and reduce the overall length of the questionnaire. The eleven categories and their assigned items, seventy-one in total, formed the rating instrument. The 11 functional categories were then assigned to three dimensions by the judges with a 100 % level of agreement.

5.3.2 School Document Analysis

An additional test of the PIMRS instrument's validity was conducted through a comparison of data collected by the instrument with information related to the

principals' instructional leadership contained in school documents. The strength of this approach to content validation is that it offers an independent check on the perceptions collected by the rating instrument. The documents were used either to affirm or to call into question the validity of the questionnaire data on selected subscales.

Several types of school documents were collected and analyzed: school goal statements, school handbooks, principal newsletters, staff bulletin, staff meeting agendas and minutes, principal's written evaluations of teachers, and school site council minutes. The availability of these documents varied from school to school and there were not necessarily documents available for every subscale category. Consequently, in a few cases it was difficult to use the documents to validate the questionnaire data.

First, we sought to generate a list of the type of documents that could offer insight into the validity of the test categories. For some functions (e.g., Frames School Goals and Supervises and Evaluates Instruction), relevant documents existed. However, as suggested above, relevant documents were not available for all of the instructional leadership functions.

After identifying potentially relevant types of documents, the author gathered documents from the schools. Then the documents were scanned in order to determine how the data contained in them could be related to the various subscales. Subscales were then selected for inclusion in the analysis if the documents contained sufficient information related to the subscale's area of measurement. Sufficient documentary data existed for six of the eleven subscales: Frames School Goals, Communicates School Goals, Supervises and Evaluates Instruction, Monitors Student Progress, Promotes Professional Development, and Provides Incentives for Learning.

It should be noted that even in the case of these subscales, there was not always a one to one correspondence between the items comprising the questionnaire subscales and the information obtained from the documents. For example, informal processes for communicating school goals to teachers were not captured in the documents, although they are part of the subscale appraisal criteria.

The documents for each school were analyzed by the author on a subscale by subscale basis without prior knowledge of the principal's questionnaire ratings, thus minimizing rater bias. All documents from a school were scanned for information related to the each of the selected subscales. Each behavior or activity that corresponded to an item on the rating instrument was recorded along with the name and date of the source document. After all of the documentary data from a school had been scanned for a given subscale and the relevant behaviors or practices had been recorded, the researcher rated the principal on that subscale. A one to five scale similar to that used in the rating instrument was utilized for this analysis.

After each principal had been rated on the subscales included in the document analysis, these ratings were compared with the appraisals derived from the teacher questionnaire. First, each set of ratings (i.e., documentary and questionnaire) was put in rank order; then they were grouped into top and bottom thirds. These top and bottom groups of principals on the two sets of ratings were then compared in order to determine the extent to which the rankings based upon the teacher ratings

of the principals matched those resulting from the document analysis. The degree of fit between the two sets of ratings varied across the subscales. The results of the rank order comparison is discussed briefly for each of the subscales.

The Frames School Goals subscale was well covered by the available documentary data. The principals ranked one and two by the documentary analysis. The principal ranked third may have been overrated by his/her teachers in light of the documentary analysis. The instrument did not appear to discriminate as well at the bottom third, based upon the document analysis. Only one of the lowest rated principals by the questionnaire was ranked in the bottom third by the document analysis.

For the subscale, Communicates School Goals, school documents were only able to offer insight into the principal's use of formal settings and channels for communicating the school goals. The instrument's ratings of the principals were confirmed for principals in both the top and bottom thirds.

For the subscale, Monitors Student Progress, documentary evidence was fairly strong. The agreement between the ratings derived from the instrument and those from the documents is mixed for the top principals on this subscale, but is quite strong for those in the bottom third.

For the subscale, Supervises and Evaluates Instruction, there was strong documentary evidence on both the principals' performance in supervising classroom instruction and on evaluating teachers. Agreement between PIMRS ratings and the documents was perfect for the principals ranked in the top three. At the bottom of the ratings, the documents were less supportive. Only one of the three principals ranked in the lower third on the ratings was also ranked in this group on the document analysis.

For the subscale, Promotes Professional Development, documents obtained from the schools did not show very much variation in the behavior of the principals on this job function. This may be explained by the fact that most of the staff development in this district had been provided by or through the district office. This finding by the document analysis is congruent with the relatively low level of between-school variance detected by the PIMRS ratings.

For the subscale, Provides Incentives for Learning, there was very strong documentary evidence with which to compare the ratings. There was perfect agreement between the two sets of ratings for principals in the top third. At the bottom end there was also strong, though not perfect agreement.

The document analysis provided an independent check on the validity of the principals' performance ratings obtained with the instructional management rating scales. Although the strength of the validation varied across the six selected subscales, the document analysis generally supported the construct validity of those subscales.

5.3.3 Subscale Inter-correlation

This approach also provides an assessment of construct validity. It assesses the degree to which the persons being evaluated possess the quality or construct (i.e., instructional leadership) presumed to be reflected in the performance instrument (Latham and

Wexley 1981, p. 68). It does so by comparing the inter-correlation between each pair of subscales with each subscale's reliability coefficient. The purpose of this comparison is to examine the extent to which the subscales seem to be measuring different aspects of the principals' instructional leadership behavior. Latham and Wexley clarified this issue:

> To show construct validity of the appraisals, there should be agreement among knowledgeable observers of the employee's performance on each criterion. However, how employees are evaluated on one criterion (e.g., technical competence) should not correlate highly with low they are evaluated on another criterion (e.g., interpersonal skill). A high correlation among the different criteria is traditionally interpreted as evidence of halo error. That is, it is presumed that the raters are making one overall global rating without taking into account how each employee is really doing on the different aspects or dimensions of the job. The assumption underlying this argument is that it is unrealistic to think that everyone who is outstanding on one criterion measure is equally good on all aspects of a job. A performance appraisal system with construct validity should reflect these strengths and weaknesses (Latham and Wexley 1981, p. 69).

In theory, when measuring sub-dimensions of a common construct, the inter-correlation among subscales is expected be in the low to moderate range. This provides confidence that the subscales are measuring 'discrete job functions'. In addition, the inter-correlation between subscales measuring different job functions should be lower than the subscale reliability coefficients. This would indicate that items within a subscale correlate more strongly with each other than with groups of items in other subscales, thereby providing empirical as well as conceptual support for the subscale content.

In the initial study (Hallinger 1983), subscale reliability coefficients were larger than the inter-correlation coefficients in all cases. This suggested that the items grouped conceptually as subscales belong together and are measuring different job functions. It was also noted, however, that the inter-correlations of items among several of the subscales were above 0.60 (in both teacher and principal data). This suggested that several of the job functions and their corresponding subscales were closely related. In addition, all of the inter-correlation coefficients were statistically significant at the 0.01 level.

This pattern of results indicates that the correlations were not likely to have resulted from chance. This result is not surprising given the relatively narrow job area (i.e., instructional leadership) being appraised. For example, one would expect closely related job functions such a Frames School Goals and Communicates School Goals to be highly correlated. The fact that the inter-correlation between these two subscales is quite high (0.85) actually lends support to the conceptualization of the subscales and their associated dimensions. Overall this test suggested that the subscales were measuring conceptually related but distinct components of instructional leadership.

5.3.4 Rasch Analysis: PIMRS Principal Form

Following the application of these approaches, we employed Rasch analysis to gain additional insight into the construct validity of the PIMRS. In applying Rasch analysis, we analyzed the principal and teacher data separately. One of the advantages of Rasch modeling is that it generates a hypothetical unidimensional line in a construct map that

locates items and persons according to their difficulty and ability measures. The construct maps developed to guide these analyses are shown in Appendices C, D and E.

A second advantage of Rasch analysis is that the quality of each item can be tested by reference to an Item-fit index, termed the outfit mean square (outfit MNSQ). In instrument construction, we propose that items located in the same sub-scale assess the same latent trait or construct. This MNSQ statistic measures the fit of the observed data to the expectation of the Rasch model.

Thirdly, Rasch analysis allows for exploration of the Differential Item Function (DIF). This detects the bias of items toward different subgroups. DIF might, for example, examine item responses for principals based on school level, principal gender, principal ethnicity or socio-economic status of the school's student population. The results offer insight into the stability of the instrument's output when used under different conditions. If the data for all items fit the expected measurement model and no item evidences DIF bias, this provides further confirmation that the instrument has good construct validity.

5.3.4.1 Item Fit

The data set employed for Rasch analysis of the PIMRS Principal Form was comprised of 649 principals. This included 329 principals from primary schools and 320 principals from secondary schools. Information on item-fit statistics is presented in Table 5.4.

The first column, Sample Size, represents the number of valid responses on this item obtained from the population. Item difficulty refers to the 'degree of difficulty' for the principals to gain a higher score on the item.[2] Standard Error is the standard error of the estimate of the item parameter. Outfit MNSQ refers to the extent to which items in a subscale 'fit' the Rating Scale model. When an item has a good fit, the expected value of the MNSQ is 1. The closer the MNSQ score is to its expected value of 1, the better the item fit. In practice, for rating scales, a MNSQ values between 0.6 and 1.4 is considered reasonably good (Wright et al. 1994). The 'item-test correlation' refers to the correlation between the score of an item and the total score of all items. Moderate to high correlations are desirable (e.g., >0.50).

The MNSQ for all of the items in this dimension fell in the range between 0.6 and 1.4, thereby suggesting a good fit. The item-test correlations were above 0.5 for all of the items as well. In sum, the 10 items in the dimension, *Defines the School Mission* demonstrates a reasonable fit to the uni-dimensional assumption.

In Table 5.5, Item-fit statistics are presented for the 15 items in the dimension, *Manages the Instructional Program*. The order of items listed in Table 5.5 was sorted by their Outfit MNSQ from smallest to largest. All items fell in the range between 0.6 and 1.4 for the MNSQ statistic. Moreover, item-test correlations were above 0.5 for all items. These findings also indicate that items in this dimension demonstrated a reasonable fit with our measurement model.

[2]Item difficulty is a parameter ranging from infinite to minus infinite and mean to zero.

Table 5.4 Item-fit statistics for *Defines the School's Mission* (PIMRS Principal Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
I_FSG_05	648	Frame goals	−0.50	0.07	0.76	Acceptable	0.59
I_FSG_02	632	Frame goals	0.09	0.06	0.81	Good	0.63
II_CSG_07	648	Comm goals	−0.45	0.07	0.83	Good	0.60
I_FSG_01	648	Frame goals	−0.57	0.07	0.86	Good	0.59
I_FSG_04	645	Frame goals	−0.97	0.07	0.95	Good	0.56
II_CSG_08	647	Comm goals	−0.13	0.06	0.97	Good	0.62
I_FSG_03	647	Frame goals	0.10	0.06	1.10	Good	0.63
II_CSG_10	450	Comm goals	1.60	0.06	1.17	Good	0.75
II_CSG_06	647	Comm goals	−0.15	0.06	1.19	Good	0.62
II_CSG_09	648	Comm goals	0.99	0.06	1.40	Acceptable	0.69

Item-fit statistics for the dimension *Develops a Positive School Learning Climate* are presented in Table 5.6. Items No. 34 and 35 did not fit the model well, according to the pre-established criterion (0.6/1.4). Item 35 states "Tutor students or provide direct instruction to classes" and item 34 states "Cover classes for teachers until a late or substitute teacher arrives." These questions concern practices in which the principal engages in 'direct instructional leadership' with students (Nettles and Herrington 2007; Silva et al. 2011). The reason for the poor fit could be that principals engage in these behaviors quite infrequently. Nonetheless, the items were retained in the instrument due to the conceptual proposition that instructional leadership incorporates practices that 'should' impact teaching and learning in both direct and indirect fashion.

5.3.4.2 Comparison of the Construct and Wright Maps

As noted above, our analysis of construct validity included a comparison of the theoretically derived construct map and the empirically generated Wright Map for the three dimensions of the PIMRS. When correspondence between the two maps is high, we have additional reason to believe that the instrument is measuring the construct as intended by the test developers. As indicated in Fig. 5.1, the Wright Map shows the distribution of persons on the left and the distribution of item thresholds on the left for the dimension, *Defines the School Mission*. The higher

Table 5.5 Item-fit statistics for *Manages the Instructional Program* (PIMRS Principal Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
IV_CC_18	647	Coord curric	0.16	0.06	0.71	Acceptable	0.64
III_SEI_11	645	Super & eval	−0.31	0.06	0.79	Acceptable	0.61
V_MSP_22	647	Monitor prog	0.12	0.06	0.79	Acceptable	0.64
IV_CC_19	645	Coord curric	0.36	0.06	0.81	Good	0.65
V_MSP_23	645	Monitor prog	−0.24	0.06	0.88	Good	0.62
III_SEI_14	647	Super & eval	−0.28	0.06	0.92	Good	0.62
III_SEI_15	645	Super & eval	−0.27	0.06	0.96	Good	0.62
IV_CC_16	645	Coord curric	−0.42	0.06	0.98	Good	0.61
V_MSP_21	645	Monitor prog	0.41	0.06	1.01	Good	0.66
III_SEI_13	645	Super & eval	−0.12	0.06	1.02	Good	0.63
IV_CC_17	647	Coord curric	−0.61	0.06	1.09	Good	0.59
III_SEI_12	646	Super & eval	0.38	0.06	1.18	Good	0.65
IV_CC_20	646	Coord curric	0.31	0.06	1.28	Acceptable	0.65
V_MSP_24	647	Monitor prog	−0.2	0.06	1.37	Acceptable	0.62
V_MSP_25	449	Monitor prog	0.72	0.07	1.40	Acceptable	0.70

the location along the vertical Rasch scale, the more proficient the person is and the more 'difficult' it is for respondents to endorse the item.

In Fig. 5.1, the scale is in logit units. There are three categories: basic, proficient, and advanced, and they are classified with two cut-points: −1 and 1 logits. The person distribution is shown on the left and the item distribution us shown on the right. For each item, the label is something like II_CSG_10, and the digit beyond the dot (e.g., II_CSG_10.4) represents the location where the probability of endorsing the category and above [e.g., the fourth and fifth categories (frequently and almost always) in this case] is 0.5.

Comparison of the Wright Map in Fig. 5.1, and the construct map for *Defines the School Mission* (see Appendix C) revealed a high degree of alignment. For example, the statement "Principals can ensure that the importance of the school's goals is understood by discussing and reviewing them with staff" is considered

Table 5.6 Item-fit statistics for *Develops a Positive School Learning Climate* (PIMRS Principal Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
IX_PPD_42	645	Prof develop	−0.52	0.05	0.66	Acceptable	0.44
VIII_PIFT_39	646	Inc teachers	0.35	0.04	0.70	Acceptable	0.52
VIII_PIFT_36	648	Inc teachers	−0.10	0.05	0.73	Acceptable	0.48
IX_PPD_41	647	Prof develop	−0.69	0.06	0.75	Acceptable	0.42
X_PIFL_50	394	Inc learning	−0.19	0.07	0.81	Good	0.49
X_PIFL_49	647	Inc learning	0.42	0.04	0.82	Good	0.53
IX_PPD_44	648	Prof develop	−0.54	0.05	0.84	Good	0.44
IX_PPD_43	588	Prof develop	−0.42	0.06	0.85	Good	0.45
IX_PPD_45	645	Prof develop	0.07	0.05	0.87	Good	0.50
VI_PIT_30	589	Protect time	−0.10	0.05	0.88	Good	0.48
X_PIFL_48	646	Inc learning	0.59	0.04	0.90	Good	0.54
VII_MHV_32	648	High visibility	0.13	0.05	0.92	Good	0.50
VIII_PIFT_38	648	Inc teachers	0.73	0.04	0.95	Good	0.55
VIII_PIFT_37	648	Inc teachers	−0.17	0.05	0.97	Good	0.47
VI_PIT_29	646	Protect time	−0.50	0.05	0.98	Good	0.44
VIII_PIFT_40	591	Inc teachers	0.34	0.05	1.01	Good	0.52
X_PIFL_46	646	Inc learning	−0.52	0.05	1.07	Good	0.44
X_PIFL_47	647	Inc learning	0.12	0.05	1.10	Good	0.50
VII_MHV_31	647	High visibility	−0.22	0.05	1.10	Good	0.47
VI_PIT_27	646	Protect time	0.34	0.04	1.11	Good	0.52
VII_MHV_33	644	High visibility	−0.18	0.05	1.18	Good	0.47
VI_PIT_26	644	Protect time	−0.10	0.05	1.33	Acceptable	0.48
VI_PIT_28	645	Protect time	0.04	0.05	1.38	Acceptable	0.49
VII_MHV_34	**646**	**High visibility**	**0.30**	**0.05**	**1.48**	**Poor**	**0.52**
VII_MHV_35	**648**	**High visibility**	**0.82**	**0.04**	**2.09**	**Poor**	**0.56**

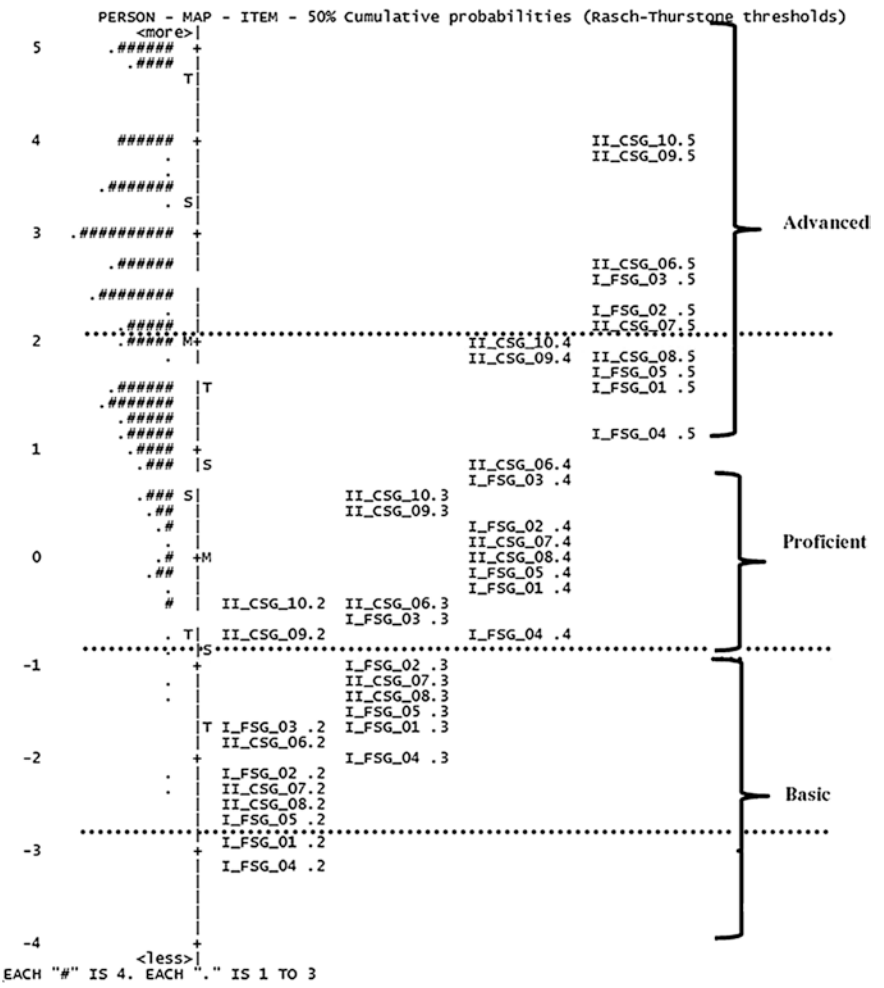

Fig. 5.1 Wright map for *Defines the School Mission* (PIMRS Principal Form)

'Advanced' in the construct map. The fifth threshold (i.e., almost always) of this corresponding item in the Wright map "Discuss the school's academic goals with teachers at faculty meetings" (II_CSG_07.5) is located in the 'Advanced' level, thereby suggesting alignment. In the construct map, the statement "Sometimes use data on student performance to frame the school's academic goals" is considered 'Proficient' and the fourth threshold of the corresponding item "Use data on student performance when developing the school's academic goals" (I_FSG_04.4) is located in the 'Proficient' level. In the construct map, the statement "The principal can define the school mission, but sometimes there may be conflicting academic or non-academic goals" is considered Basic. The second threshold (seldom) of the corresponding item "Develop goals that are easily understood and used by teachers in the school" (I_FSG_05.2) is located at the 'Basic' area.

In the second dimension (*Manages the Instructional Program*), agreement between the theoretical construct map (in Appendix D) and the empirical Wright map (Fig. 5.2) is also observable. For example, in the construct map, the statement "They provide instructional support to teachers and monitoring classroom instruction through numerous informal classroom visits" is considered 'Advanced'. The fifth threshold (Almost Always) of a corresponding item in the Wright map "Conduct informal observations in classrooms on a regular basis (informal

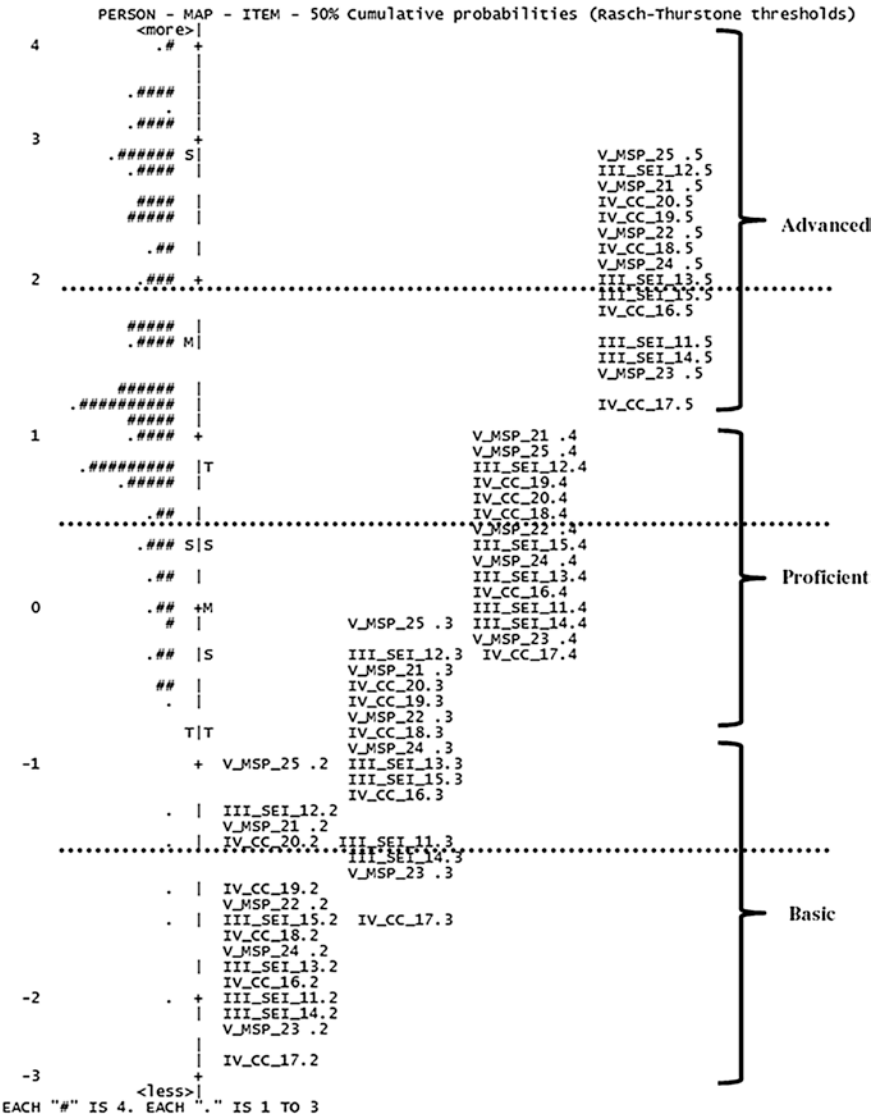

Fig. 5.2 Wright map for *Manages the Instructional Program* (PIMRS Principal Form)

observations are unscheduled, last at least 5 min, and may or may not involve written feedback or a formal conference)" (III_SEI_13.5) is located in the 'Advanced' level. In the construct map, the statement "They coordinate the classroom objectives of teachers with those of the school and evaluate classroom instruction" is considered 'Proficient' and the fourth threshold (Frequently) of the corresponding item in the Wright map "Monitor the classroom curriculum to see that it covers the school's curricular objectives" (IV_CC_18.4) is located in 'Proficient' level. In the construct map, the statement "They do not often review the curricular materials" is considered 'Basic' and the second threshold (Seldom) of the corresponding

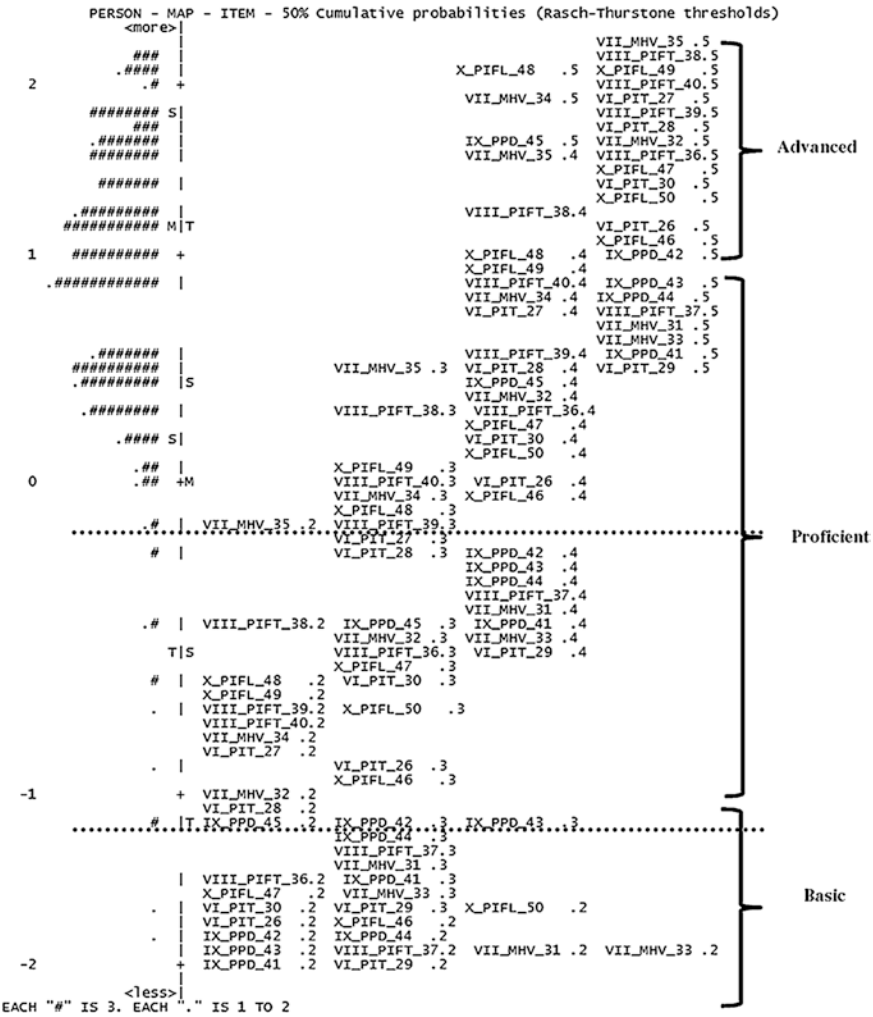

Fig. 5.3 Wright map for *Develops a Positive School Learning Climate* (PIMRS Principal Form)

item in the Wright map "Participate actively in the review of curricular materials" (IV_CC_20.2) is located in the lower part along the Rasch scale.

In the third dimension (*Develops a Positive School Learning Climate*), agreement between the theoretical construct map (see Appendix E) and the empirical Wright Map (see Fig. 5.3) is also observable, though there is some minor noise. This could be due to the fact that this dimension includes five functions as opposed to two and three for the first two dimensions. For example, the third threshold (Sometimes) of the item "Actively support the use in the classroom of skills acquired during in-service training" (IX_PPD_42.3) is considered 'Proficient' in the construct map, but is located in the 'Basic' level in the Wright map. The second threshold (Seldom) of the item "Tutor students or provide direct instruction to classes" (VII_MHV_35.2) is located in 'Proficient' level of the Wright Map but was proposed as 'Basic' in the construct map. This item has a poor fit with mean square error of 2.09 (see Table 5.6). Nonetheless, despite these discrepancies, the overall agreement between the construct map and the Wright map on this dimension is high enough to support construct validation.

5.3.4.3 Differential Item Function Analysis of the PIMRS Principal Form

Among the procedures employed in Rasch analysis, differential item function (DIF)analysis is used to determine whether items function identically across relevant sub-groups of the target population. For example, DIF analysis could be used to check whether item properties are stable across principals who work at different school levels, in different national contexts, or who differ in terms of their level of experience or gender. Within the conceptual framework of factor analysis, this property of test items is referred to as 'measurement invariance'. If the test demonstrates measurement invariance, then we can claim that its results tend to be stable across different groups and the conceptual structure of the instrument receives additional confirmation of practical validity.

We examined the difference in responses to the PIMRS according to the school level of principals (i.e., primary and secondary school levels). Our data set was the same as used with the Rasch analysis presented above. The Conquest software program was used to conduct the DIF analysis.

We began this procedure by scaling the principals' leadership 'ability' across school levels. Then we compared the item difficulty obtained from primary school principals with item difficulty of secondary school principals in order to evaluate the significance of DIF magnitude. If the difference in the item difficulty between the two levels of schools (referred to as DIF size) is more than two times the estimate of its standard error, then we conclude that the item has a statistically significant DIF (i.e., there is a significant difference in the functioning of the item at different school levels). In cases where numerous items evidence a statistically significant DIF, the test as a whole, or selected subscales, fails to achieve the goal of measurement invariance.

We note, however, that a large sample size tends to yield statistically significant results rather easily. To avoid this problem, item were judged as showing substantial DIF when the DIF size was larger than 0.5, thereby maintaining a relatively high standard in determining measurement invariance. The difference in the mean scores between different groups is called 'impact' in DIF analysis. As suggested, smaller measures of 'impact' are desirable, and interpreted as reflecting greater instrument stability across groups on the criterion of interest.

In *Defines the School Mission*, the results for primary school principals were roughly similar to principals in secondary schools. When we considered DIF results, 4 items yielded a statistically significant DIF, but only one item (No. 4) had a DIF larger than 0.5 (i.e., 0.56). For Item 4, the item difficulty for principals in primary schools is larger than for principals in secondary schools. This suggests that principals with identical leadership ability will endorse this item more easily if they are working in secondary schools. The content of this item was "Use data on student performance when developing the school's academic goals". We may infer that using student performance data for setting academic goals may be observed less frequently in primary schools than in secondary schools. Therefore, it was 'harder' for primary school principals to achieve a higher score on this particular item.

For the dimension, *Manages the Instructional Program*, the impact statistics were generally quite small (0.24). Results in secondary school were again slightly higher than in primary schools. Only one item (No. 24) showed a substantial DIF in this dimension (0.68): "Inform teachers of the school's performance results in written form (e.g., in a memo or newsletter)." The DIF analysis suggested that principals working in secondary schools were somewhat more likely to obtain a higher score on this item than their counterparts in primary schools.

Results for the dimension, *Develops a Positive School Learning Climate*, again followed a similar pattern. The impact measure was small (0.14) with a small advantage among secondary principals. Four items were detected as having significant DIF: items 33, 35, 45, and 46. Items 33 and 46 yielded slightly higher scores in secondary schools. Items 35 and No. 45 yielded slightly higher scores in primary schools as compared with secondary schools. Despite the statistically significant DIF scores, we further noted that the impact level was not very large. Moreover, this is the largest dimension on the test in terms of the number of items (i.e., 25 items).

After the DIF analysis, test developers may take several follow-up actions. First, we may explore potential reasons for the DIF results. Second, if DIF size is large (e.g., greater than 1), and the item is not crucial in terms of theoretical necessity, and there are many DIF-free items in the test, we can remove this item. Third, if the above two actions are not feasible and there are many DIF items in the test, we would typically advise against making test scores comparisons across groups. This is because the DIF results would suggest that different groups of participants use different perspectives to respond to particular items, thereby implying that the test results are qualitatively different across groups.

Table 5.7 Correlation and variance by dimension for principals in primary and secondary schools (PIMRS Principal Form)

School level	*Correlation*		
	D1 and D2	*D2 and D3*	*D1 and D3*
Primary	0.89	0.84	0.75
Secondary	0.82	0.84	0.72
School level	*Variance*		
	D1	*D2*	*D3*
Primary	0.79	1.66	0.59
Secondary	1.34	1.81	0.71

Note D1 refers to *Defines a School Mission*; D2 refers to *Manages the Instructional Program*; D3 refers to *Develops a Positive School Learning Climate*

In our DIF analysis of the PIMRS, we identified relatively few 'DIF items' (i.e., only 6 items) among the 50 items comprising the three PIMRS dimensions. Moreover, the DIF sizes were quite small. Therefore, we included all of the DIF items in the subsequent structure invariance analysis. If this analysis suggests that the structure of the PIMRS is stable across school levels, we can conclude that the DIF effect is essentially canceled out in the total score. Then we can claim that the concept of instructional leadership is being assessed in a stable fashion by the PIMRS across different school levels.

We began the structure invariance analysis by constructing an inter-dimension correlation matrix for principals according to their school level, primary or secondary school (see Table 5.7). Differences in the correlations between principals in the two groups on the three dimensions were very small, 0.062, 0.007, and 0.025. This demonstrates structure invariance, or stability of the dimension-level constructs, across these school levels.

At the same time, however, we noted that the score variances on the instructional leadership dimensions were generally larger among secondary school principals than primary school principals. This was especially the case with respect to the first dimension, *Defines a School Mission*. This suggests that principal performance on this dimension in secondary schools was more diverse than in primary schools. Nonetheless, the correlation across school levels was sufficient to confirm stability of the construct structure of the instrument.

5.3.5 Rasch Analysis: PIMRS Teacher Form

We conducted a comparable sequence of analyses to assess the internal validity of each of the three dimensions of the PIMRS Teacher Form using Rasch analysis. Comparison of the construct maps and Wright Maps for the three dimensions of the Teacher Form yielded quite similar results as those reported for the Principal Form. Therefore, we did not reproduce them here.

5.3.5.1 Item-Fit Analysis

The first tests conducted on the PIMRS Teacher Form concerned item fit. Item-fit in the teacher data was very good for the first dimension, *Defines the School Mission*. All items had an MNSQ in the range of 0.6–1.4 (See Table 5.8). This indicated a good fit among items within this dimension.

In *Manages the Instructional Program*, one item (No. 15) had a marginally poor fit (MNSQ = 1.45), as shown in Table 5.9. The content of this item was "Points out specific weaknesses in teacher instructional practices in post-observation feedback (e.g., in conferences or written evaluations)". It could be that this practice occurs quite infrequently and, somewhat surprisingly, does not fit as well as expected within the construct. We do note, however, that policy discourse and practices concerning teacher evaluation are changing both rapidly and radically (Hallinger et al. 2014; Murphy et al. 2013). Principals in many nations are under increased pressure to use teacher evaluation as a means of instructional improvement. In our view, this potentially item has a strong conceptual underpinning for inclusion in the instrument, despite its apparent 'misfit' with traditional practice.

In the third dimension, *Develops a Positive School Learning Climate*, most of the 25 items demonstrated an acceptable or good fit. The three exceptions were items 26, 28, and 34, which had MNSQ of 1.44, 1.47, and 1.55 respectively (see Table 5.10). These were considered a marginally poor fit since they were all slightly higher than the upper range standard of 1.40.

Table 5.8 Item-fit statistics for *Defines the School Mission* (PIMRS Teacher Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
II CSG 09	4273	Comm goals	0.88	0.02	1.37	Acceptable	0.79
II CSG 10	4199	Comm goals	1.06	0.02	1.30	Acceptable	0.80
I FSG_03	4290	Frame goals	0.73	0.02	1.24	Acceptable	0.79
I FSG 05	4281	Frame goals	0	0.03	0.98	Good	0.79
I FSG 04	4274	Frame goals	−0.77	0.03	0.93	Good	0.74
II CSG 06	4283	Comm goals	−0.29	0.03	0.89	Good	0.78
I FSG 01	4313	Frame goals	−0.67	0.03	0.88	Good	0.76
I FSG 02	4130	Frame goals	−0.32	0.03	0.80	Good	0.80
II CSG 07	4281	Comm goals	−0.54	0.03	0.77	Acceptable	0.78
II CSG 08	4237	Comm goals	−0.08	0.03	0.76	Acceptable	0.81

Table 5.9 Item-fit statistics for *Manages the Instructional Program* (PIMRS Teacher Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
III_SEI_15	**4157**	**Super & eval**	**−0.24**	**0.02**	**1.45**	**Poor**	**0.66**
V_MSP_25	4105	Monitor prog	0.44	0.02	1.27	Acceptable	0.74
V_MSP_24	4200	Monitor prog	−0.21	0.02	1.24	Acceptable	0.69
III_SEI_13	4183	Super & eval	0.46	0.02	1.19	Good	0.75
III_SEI_14	4192	Super & eval	−0.39	0.02	1.17	Good	0.68
III_SEI_11	4253	Super & eval	−0.13	0.02	1.13	Good	0.73
V_MSP_21	4180	Monitor prog	0.83	0.02	1.06	Good	0.78
IV_CC_16	4183	Coord curric	−0.13	0.02	1.02	Good	0.73
III_SEI_12	4215	Super & eval	0.15	0.02	0.97	Good	0.76
IV_CC_17	4205	Coord curric	−0.69	0.03	0.87	Good	0.70
IV_CC_20	4064	Coord curric	0.31	0.02	0.85	Good	0.79
V_MSP_23	4196	Monitor prog	−0.48	0.02	0.80	Good	0.73
V_MSP_22	4192	Monitor prog	0.18	0.02	0.76	Acceptable	0.79
IV_CC_19	4111	Coord curric	−0.15	0.02	0.66	Acceptable	0.78
IV_CC_18	4179	Coord curric	0.05	0.02	0.63	Acceptable	0.80

5.3.5.2 Differential Item Function Analysis of the PIMRS Teacher Form

In the first dimension, *Defines the School Mission*, the impact statistic was rather large (i.e., 1.03). This suggests that teachers in primary schools generally gave their principals a higher rating than teachers in secondary schools. Although there were four items showing statistically significant DIF between school levels, their DIF sizes were all smaller than 0.5.

For the second dimension, *Manages the Instructional Program*, the impact statistic was moderate (0.53). Item No. 2 showed a substantial DIF in this dimension (i.e., 0.58). The item was "Review student work products when evaluating classroom instruction." The DIF analysis suggested that teachers in secondary schools perceived their principals engaging in this practice more frequently than did teachers in primary schools.

Table 5.10 Item-fit statistics for *Develops a Positive School Learning Climate* (PIMRS Teacher Form)

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
VII_MHV_34	**4011**	**High visibility**	**1.11**	**0.02**	**1.55**	**Poor**	**0.67**
VI_PIT_28	**4052**	**Protect time**	**0.36**	**0.02**	**1.47**	**Poor**	**0.62**
VI_PIT_26	**4224**	**Protect time**	**−0.43**	**0.02**	**1.44**	**Poor**	**0.55**
X_PIFL_46	4164	Inc learning	−0.74	0.02	1.36	Acceptable	0.53
VII_MHV_35	3975	High visibility	1.39	0.02	1.35	Acceptable	0.72
VI_PIT_27	4202	Protect time	0.11	0.02	1.31	Acceptable	0.62
X_PIFL_47	4145	Inc learning	−0.19	0.02	1.30	Acceptable	0.60
VI_PIT_30	2635	Protect time	−0.2	0.02	1.07	Good	0.63
VII_MHV_33	4153	High visibility	−0.67	0.02	1.04	Good	0.58
X_PIFL_48	3962	Inc learning	0.24	0.02	0.98	Good	0.70
VII_MHV_31	4209	High visibility	−0.11	0.02	0.95	Good	0.66
VIII_PIFT_38	3789	Inc teachers	0.62	0.02	0.93	Good	0.74
VI_PIT_29	4199	Protect time	−0.81	0.02	0.93	Good	0.59
IX_PPD_44	4134	Prof develop	−0.24	0.02	0.92	Good	0.66
IX_PPD_45	4189	Prof develop	0.07	0.02	0.90	Good	0.69
VIII_PIFT_37	4146	Inc teachers	−0.1	0.02	0.86	Good	0.68
VIII_PIFT_40	2550	Inc teachers	0.51	0.02	0.85	Good	0.73
X_PIFL_49	3756	Inc learning	0.28	0.02	0.82	Good	0.73
VIII_PIFT_36	4193	Inc teachers	0.01	0.02	0.81	Good	0.69
VII_MHV_32	4183	High visibility	0.41	0.02	0.79	Acceptable	0.74
IX_PPD_43	2624	Prof develop	−0.55	0.03	0.79	Acceptable	0.65
VIII_PIFT_39	4021	Inc teachers	0.31	0.02	0.78	Acceptable	0.73
IX_PPD_41	4180	Prof develop	−0.61	0.02	0.78	Acceptable	0.64
IX_PPD_42	4155	Prof develop	−0.44	0.02	0.69	Acceptable	0.67
X_PIFL_50	2595	Inc learning	−0.32	0.02	0.66	Acceptable	0.70

Table 5.11 Correlation among PIMRS dimensions and variance by dimension for primary and secondary school principals (PIMRS Teacher Form)

School level	*Correlation*		
	D1 and D2	*D2 and D3*	*D1 and D3*
Primary	0.83	0.79	0.73
Secondary	0.87	0.88	0.79
School level	*Variance*		
	D1	*D2*	*D3*
Primary	0.49	0.54	0.58
Secondary	0.92	0.98	0.91

Note D1 refers to *Defines the School Mission*; D2 refers to *Manages the Instructional Program*; D3 refers to *Develops a Positive School Learning Climate*

For the third dimension, *Develops a Positive School Learning Climate*, the impact measure was very small (0.12). This indicates only a small difference in the mean scores obtained by primary and secondary schools from their teachers. Items 28 and 46 had a marginal DIF size of 0.52 and 0.53, respectively. Item 28 "Ensure that tardy and truant students suffer specific consequences for missing instructional time" also had a poor fit according to the MNSQ. It could be teachers in primary and secondary schools might have different views on the role of the principal in the application of this practice. Item 46 referred the practice, "Recognize students who do superior work with formal rewards such as an honor roll or mention in the principal's newsletter." The data suggest that the frequency of use of this practice among principals in primary schools was considerably higher than in secondary schools.

The inter-dimension correlation matrix (Table 5.11) shows little difference in the correlations between school levels. The variances in scores for principals in secondary schools again tended to be larger than in primary schools. This suggests that ratings of principals in secondary schools were more diverse than in primary schools. In general, however, the correlations were quite stable across school levels, and followed similar pattern to the findings reported for the PIMRS Principal Form. Thus, these analyses of the PIMRS Teacher Form further confirm the internal validity of the instrument.

5.4 External Validity

Thus far in this chapter we have focused on results related to the internal validity of the PIMRS scales. Tests of internal validity analyze the degree of alignment between the theorized construct with empirical results obtained from the measurement instrument's use in practice. Tests of 'external validity' also rely on empirical comparisons, but in this case they compare results from the scale with alternate measures of related constructs.

In general, tests of external validity are aimed at determining the extent of generalizability of construct measurement (Campbell and Fiske 1959). Our studies

of the external validity of the PIMRS scales are in progress, and the full results are not yet available for presentation in this book. Therefore, in this section of the chapter we limit our remarks to an overview of the direction that our analyses of external validity are taking and a preliminary overview of results where available.

5.4.1 Validation Through Correlation with Other Leadership Instruments

Our approach to assessment of external validity has been informed by validation frameworks developed by Campbell and Fiske (1959) and Campbell and Stanley (1966). In a general sense, these investigations compare the composite dimensions of the PIMRS with results yielded by other instruments. Assessment of the "concurrent or criterion validity", for example, compares results from the PIMRS against those obtained from the Leadership Practices Inventory (LPI; Kouzes and Posner 2002) and the Multifactor Leadership Questionnaire (MLQ; Avolio and Bass 1994; Bass 1985). The LPI and MLQ scales have been used extensively by researchers to examine the constructs of transformational leadership (i.e., LPI and MLQ) and transactional leadership (MLQ), both in general organizations (e.g., Carless 2001; Leslie and Fleenor 1998) and in schools (see Leithwood and Jantzi 2005; Leithwood and Sun 2012).

We were indeed fortunate to be able to identify several studies that had directly compared results from the PIMRS with scores obtained from either the LPI or the MLQ (e.g., Dale 2010; Greb 2011; Prater 2004; Shatzer 2009; Sheppard 1996; Tang 1997). Moreover, we were able to obtain raw data from several of the authors, thereby facilitating the application of advanced statistical procedures designed to shed light on external validity of the PIMRS. We are currently engaged in reanalyzing data drawn from two of these studies (e.g., Dale 2010; Greb 2011) assess.

In conducting these analyses, we began by analyzing the nature of the constructs measured by the 'criterion instruments' (i.e., the LPI and MLQ). More specifically we inquired into the relationship of the composite constructs with those measured by the PIMRS. Then we made a series of 'theoretically justified predictions' concerning the pattern of relationships that should result when the instruments (e.g., PIMRS and LPI) are employed in concert. For example, if the PIMRS and LPI were administered to the same set of respondents, we predict a strong positive correlation between the PIMRS dimension, Defining a School Mission, and the LPI dimension, Inspiring a Shared Vision. In contrast, we would predict a much weaker correlation between the PIMRS dimension, Defines a School Mission, and the LPI dimension, Enabling People to Act. Based on this type of 'theoretical analysis' we generated a table identifying the predicted relationships among the sub-scales comprising the PIMRS with those of the LPI and MLQ.

In the next step we compare the empirical pattern of results between instruments on a construct by construct basis. More specifically, we analyze the correlations between sub-scales of the PIMRS with subscales of each of the 'criterion

instruments'. This yields a correlation matrix that can be used to assess the extent to which subscale relationships predicted from theory are supported empirically. If most of the empirical correlations with the criterion instrument correspond with our theoretical predictions, we can assert that the PIMRS is measuring a unique leadership construct. In such a case, we would conclude that the scale meets a standard of concurrent or criterion validity (Campbell and Stanley 1966).

However, criterion validity represents but one aspect of external validity. Thus, it is also common for test developers to inquire into the 'convergent and divergent validity' of instruments (e.g., see Goldring et al. 2012). These procedures extend the initial test of concurrent validity through a more comprehensive set of analytical procedures.

In our examination of convergent and divergent validity we have been guided by the 'multi-trait multi-method approach' (MTMM) proposed by Campbell and Fiske (1959) and further elaborated by Campbell and Stanley (1966). The MTMM approach also involves analyzing the correlation between the PIMRS instrument and its composite constructs with other leadership instruments but through a different set of more comprehensive tests. The results of the MTMM procedures 'should' point to a similar direction as those obtained in the study of concurrent validity. If they do, then the PIMRS also demonstrates 'convergent and divergent validity'.

MTMM procedures involve building a correlation matrix among multiple sets of measurements of traits (e.g., different leadership approaches) as assessed by different respondent groups (e.g., teachers and principals). The matrix includes four kinds of correlation: monotrait-monomethod, monotrait-heteromethod, heterotrait-monomethod, and heterotrait-heteromethod.

In our application of the MTMM approach, we have focused on three 'traits': instructional leadership (PIMRS), transformational leadership (from the MLQ), transactional leadership (from the MLQ). Again relying on secondary data, we have incorporated two 'measurement methods': principal self-assessment and teacher ratings of the principal. The cross-table of correlations is then analyzed in order to determine the extent to which theoretical predictions are borne out by the empirical data. Analysis of the four kinds of correlations, therefore, sheds light on the convergent validity and the divergent validity of the scale, as well as on potential method bias.

Our studies of the external validity (i.e., concurrent, convergent, divergent) of the PIMRS are in progress. Thus far, the preliminary pattern of results support the proposition that the PIMRS meets expected standards of concurrent, convergent and divergent validity. However, we will refrain from asserting this claim until the data are ready for peer review.

5.4.2 Validation Through Assessment of Impact on Criterion Variables

Another approach to external validation lies in determining the relationship between results from the PIMRS and criterion variables that are subject to the influence of instructional leadership (e.g., student achievement, organizational learning, school

climate). The reader is reminded that the initial interest in instructional leadership among both practitioners and scholars derived from the 'proposition' that this leadership approach could be linked with higher levels of school quality and student learning outcomes (e.g., see Bossert et al. 1982; Bridges 1967; Erickson 1979; Hallinger and Heck 1996, 1998; Leithwood and Montgomery 1986; Lipham 1961). Thus, insight into the external validity of the PIMRS instrument should also incorporate a systematic assessment of the direction of results obtained in studies that have examined the relationship between the PIMRS and these criterion variables. If the results support a moderate or strong relationship, then the instrument can be regarded as offering insight into a style of leadership which, if strengthened, can be expected to result in a positive impact on desirable features of the school organization.

As discussed in Chaps. 1 and 2, recent meta-analyses have fueled a developing consensus around the conclusion that instructional leadership provides a stronger 'explanation' for the school-level processes associated with improvements in student learning outcomes than other leadership models (e.g., transactional, transformational, strategic).

Taking these findings as background, we recently launched an additional study of external validity aimed at synthesizing the results of PIMRS studies that have examined the relationship between the PIMRS constructs and student achievement. To date, we have identified 72 PIMRS studies that directly investigated the relationship between instructional leadership and either student achievement (e.g., Anderson 2006; Fancera 2009; Johnson 2005; Jones 1987; Leitner 1990, 1994) or school effectiveness (e.g., Adams 2002; Maciel 2005; Orange 1990; Schoch 1992). We plan to use a combination of research synthesis and meta-analysis in order to examine the pattern of results across these studies as a means of shedding light on another aspect of the external validity of the PIMRS. We expect to be able to report these results within the next two years.

5.5 Conclusion

In this chapter, we adopted the taxonomy of test validation proposed by Lissitz and Samuelsen (2007) to guide our studies of the validity of the PIMRS. This taxonomy approaches the assessment of validity based on different sources of evidence as well as from both theoretical and empirical perspectives. It proposes a systematic set of procedures intended to assess both the internal and external validity of a rating instrument.

We devoted the bulk of the chapter to presenting results from a comprehensive set of tests designed to shed light on the 'internal validity' of the PIMRS. These tests affirmed the internal validity of the PIMRS using five separate procedures. 'Content validity' was supported through three different procedures: judgments by school professionals, school document analysis, and analysis of inter-correlations among subscales. These tests supported the internal structure of the PIMRS.

Internal validity was further assessed using Rasch analysis, an approach that analyzes the test's structure at the item level. The results of Rasch analysis indicate that most of the items comprising the three dimensions of the PIMRS 'fit' the uni-dimensional assumption that was set as the criterion for assessing adequacy of subscale structure. In addition, our application of differential item function (DIF) across principals working at the primary and secondary levels found substantial stability in empirical results (i.e., measurement invariance). This indicates that the scores of primary and secondary school principals did not differ substantially or consistently on most of the items comprising the PIMRS. This implies that scores from obtained from the instrument can be equated for principals across school levels.

This series of validation tests encompassing multiple sources of evidence and both theoretical and empirical perspectives complement the reliability results presented in Chap. 4. Taken together, we conclude that the PIMRS meets commonly applied standards of reliability and internal validity (American Educational Research Association 1999; Lang and Heiss 1998; Lissitz and Samuelsen 2007). Tests of external validity are ongoing. Although preliminary results are promising, we wish to delay making claims of external validity until the results can be presented in full.

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Chapter 6
Developing a PIMRS Teacher Short Form

Given the widespread continuing use of the PIMRS around the world, the authors recently engaged in an effort to create a short version of the PIMRS Teacher Form. A shortened form enables greater efficiency in data collection. Efficiency would be especially appreciated in cases where the PIMRS is being administered to a large number of teachers, and when the scale is being used in combination with other scales yielding a long survey instrument. In this chapter we describe the procedures employed for creating the PIMRS Teacher Short Form, as well as the measurement properties of the resulting instrument. We describe the nature of the output derived from the PIMRS Teacher Short Form as well as how to equate results obtained from the two different Teacher Forms of the PIMRS. Finally, we discuss relevant decision criteria for determining if and when the PIMRS Teacher Short Form is suitable for the user's purposes.

6.1 Introduction

The utility of rating scales can be assessed in terms of both efficiency and effectiveness of data collection. In Chaps. 4 and 5 we focused on assessments of the 'effectiveness' of the PIMRS as a tool for collecting data on principal instructional leadership. 'Effectiveness' refers to the extent to which the scale yields an accurate (i.e., reliable) measure of the construct (i.e., instructional leadership) according to the manner in which it was conceptualized (i.e., validity). In contrast, 'efficiency' refers to the relative effort required to obtain a comparable result with the instrument. In the case of a survey instrument, efficiency can be defined as collecting the highest quality data with the least number of items. Fewer items require less time for respondents to complete the survey. Benefits accrue from collecting 'optimal data' (i.e., reliable and valid) in less time and with less effort from respondents. With this in mind, the authors undertook research designed to reduce the length of the teacher form of the scale.

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Although the standard forms of the PIMRS are not long by survey standards (i.e., 50 items), instruments used in leadership research are often employed in concert with complementary scales that measure moderating and mediating constructs as well as dependent variables (Baron and Kenny 1986; Hallinger and Heck 1996; Leithwood et al. 2006). A shorter instrument would increase efficiency in data collection, thereby reducing an impediment (i.e., time) to collecting data from teachers. A shorter survey could even potentially improve the instrument's effectiveness, by increasing the quality of teacher responses (Gay 1992). These represent useful goals as long as the shortened version of the instrument continues to meet high standards of reliability, validity, and utility.

Our effort focused solely upon the PIMRS Teacher Form. Our rationale was based on the need to maintain reliability and validity of the shortened scale. We highlight the fact that when the PIMRS Teacher Form is employed, it is usually administered either to the full school faculty or a reasonable sample thereof. In contrast, the PIMRS Principal and Supervisor Forms are usually completed by a single source (i.e., the Principal, a Supervisor). Results presented in prior chapters with respect to the PIMRS Principal Form further suggested that fewer items could threaten its capacity to yield high quality data. Consequently, we decided not to pursue the development of a PIMRS Principal or Supervisor Short Form.

6.2 Method

In this section we outline the procedures used to reduce the length of the PIMRS Teacher Form. This research and development process entailed the use of secondary data (see Hallinger and Wang 2014). Therefore, prior to discussing the steps in instrument development, we briefly discuss the data that were used for the analyses reported in this study.

6.2.1 Data Sources

In order to reduce the length of the PIMRS Teacher Standard Form, we had two choices. We could either collect new data or reanalyze data collected in previous studies. In either case, we would require 'item-level data' in order to conduct the necessary analyses. We were fortunate to be able to locate and obtain data collected in 13 independent studies conducted between 2008 and 2012, each of which had used the PIMRS Teacher Form (see Table 6.1).

The sample size of teacher respondents in the 13 studies ranged from 95 to 1610, with a mean of 336 teachers per study. This represented a total sample of 4370 teachers rating 651 principals. Respondents included teachers in both primary and secondary schools. This dataset was employed in the tests used to assess the reliability and internal validity of the PIMRS Teacher Short Form.

Table 6.1 Data sources for developing a PIMRS Teacher Short Form

Author	Year	Nation	N teachers	N schools	School level
Adam	2012	USA	128	9	Secondary
Carson	2013	USA	95	77	Secondary
Dale	2010	USA	177	36	Primary
Fancera	2009	USA	580	100	Secondary
Fulton	2009	USA	169	No code	Secondary
Goldring	2012	USA	1610	58	Primary/secondary
Greb	2011	USA	107	31	Primary
Long	2008	USA	586	69	Secondary
Lyons	2010	USA	176	15	Secondary
Ponnusamy	2010	Malay	105	14	Primary
Shafeeu	2011	Malay	201	10	Primary/secondary
Shatzer	2009	USA	280	37	Primary
Wang	2011	China	156	23	Secondary

6.2.2 Data Analysis

Any effort to reduce the length of an established instrument must be evaluated against several criteria. Reduction in the number of items should minimize response bias while maintaining high reliability, validity, and comparability with results obtained from the longer form of the instrument. These three criteria were applied in the current study.

An important decision concerned the 'levels' of scale measurement that we would support in the short form of the instrument. As noted earlier, the PIMRS Teacher Standard Form can yield 'scale scores' for the full scale, three dimensions, and 10 functions. We decided, for reasons of utility and measurement quality, that instrument revision should seek to support measurement of the full scale and the three dimensions (i.e., *Defines the School Mission, Manages the Instructional Program*, *Develops a Positive School Learning Climate*). In terms of the most common uses of the PIMRS (i.e., research and principal evaluation), obtaining a profile based on the three dimensions was deemed suitable and sufficient. Moreover, it would be difficult to measure the 10 function-level subscales with a sufficiently high level of data quality using substantially fewer items. That is, the PIMRS Teacher Short Form should yield stable scores that represent the same latent traits measured by the PIMRS Teacher Form.

6.2.2.1 Rasch Analysis

Rasch analysis (1960) is widely used in psychological measurement. Rasch analysis can provide a confirmation of measurement models, thereby offering insight into the internal validity of an instrument. More specifically, through Rasch

analysis we can check the model-data fit for each item and then select items of higher quality from the existing pool of items. Data output from Rasch analysis also offers an indication of whether items are relatively easier or more difficult. This allows the developer to create an instrument that will adequately differentiate the responses of respondents (i.e., teachers in this study). The item selection strategy used in developing a PIMRS Teacher Short Form entailed the use of three indices derived through Rasch analysis in concert with the WINSTEPS software program (Linacre 2005).

The first index was item difficulty. In the Rasch rating scale model (Andrich 1978), the probability of person n endorsing score j at item i is divided into the person's ability θ_n, item difficulty δ_i, and step parameter τ_k (in common to all the items) for each score k. The relationship among these variables is written as:

$$P_{nij} = \frac{\exp(\sum_{k=0}^{j}(\theta_n - \delta_i - \tau_k))}{\sum_{m=0}^{J}\exp(\sum_{k=0}^{m}(\theta_n - \delta_i - \tau_k))}, \tag{6.1}$$

where $J + 1$ is the number of categories in the item, and the term of $(\theta_n - \delta_i - \tau_k)$ is equal to zero if $k = 0$. In our study, the persons are teachers; θ represents the rating given by a teacher to his or her principal; the higher the value of θ, the higher the rating; δ represents the item's threshold, the higher the value of δ, the more difficult it is for a principal to receive a high score on that item.

In other words, 'higher item difficulty' implies that teachers less frequently award a higher score to their principal on those items. An optimal test design includes items that represent a wide range of item difficulty. This means the instrument is capable of assessing low, moderate and high levels of task performance. Therefore, the first strategy is to ensure that all levels of difficulty were maintained when the number of items was reduced.

Item difficulty can be identified by examining the pattern of actual scores among a sample of principals. A Wright Map (Wright and Master 1982) displays the distribution of item difficulty in relation to the distribution of teachers' ratings of their respective principals along a vertical line from the highest difficulty at the top to the lowest difficulty at the bottom of the map. The distribution of teachers' ratings of their principals is shown along the left hand side of the line and the distribution of item difficulty on the right hand side. The mean item difficulty is located at the zero point on the vertical line.

Using a Wright Map, we can clearly identify the distribution of items along these two parameters. The map also profiles the number of items and teachers located on each level of each of the two parameters. This information provides insight into how the item distribution of the scale (e.g., each dimension) changes according to the inclusion of different 'sets' of items. The optimal result is achieved when the item and rater (i.e., teachers) means, and the variance and shape of the distributions are similar.

The second index used in assessing item quality is the item-fit statistic 'outfit mean square' (outfit MNSQ). In instrument construction, we propose that items located in the same dimension or sub-scale are assessing the same latent trait (e.g., *Defines the School Mission*). This MNSQ measures the fit of the observed data to the expectation of the Rasch model. Wright et al. (1994) recommended that scale items demonstrate an 'acceptable fit' if their OUTFIT MNSQ falls within the range of 0.6–1.4, and a 'very good fit' if they fall in a range from 0.8 to 1.2. With this in mind, the second strategy employed in item selection is to eliminate items with a MNSQ level that falls outside the range between 0.6 and 1.4. The next step involves inspection of items in order to maximize the number that fall within the 0.8–1.2 range.

The third index used in item selection is 'item-test correlation'. This statistic refers to the correlation between the item score and the total score of the corresponding scale dimension. Items with a low item-test correlation (e.g., <0.2) are generally eliminated from the scale (Linacre 2005). Our goal with respect to application of item-test correlation to development of the PIMRS Teacher Short Form was twofold. First all items should attain an item-test correlation above 0.2. Second, a majority of items should yield an item-test correlation higher than 0.5.

The above steps refer to the analysis of statistical results with respect to specific items and scales. Although these represent fundamental steps in development of a high quality short form of the PIMRS, it was also necessary to examine the 'content distribution' of items. For example, although the PIMRS Teacher Short Form would not be designed to yield 'function-level' scores, the new version of the instrument should continue to maintain a representative selection of items drawn from the 10 function-level subscales. Therefore an additional step aimed at maintaining the 'content validity' of the three dimensions was incorporated into our procedures. More specifically, at the point of scanning the data on item-fit and difficulty, we also attended to the distribution of items across function-level subscales and used this as an additional criterion in item selection.

6.2.2.2 Confirmatory Factor Analysis

After calibrating item difficulty through Rasch analysis, we also examined the structure of the conceptual framework through confirmatory factor analysis (CFA). CFA assesses the extent to which empirical data fit with the PIMRS conceptual framework (e.g., the three dimensions of the PIMRS). CFA has become a standard approach for examining the internal validity of tests. In this study, we used several fit indices to determine how well the data fit the conceptual framework. These included the goodness of fit index, Tucker Lewis index, root mean square error of approximation, and standardized root mean square residual. CFA was applied to the 22 items comprising the PIMRS Teacher Short Form.

6.2.2.3 Reliability Analysis

Following these procedures, we retested the resulting scale to ensure that the PIMRS Teacher Short Form would still meet a high standard of reliability. We used the Gen Theory test of reliability discussed in Chap. 3 for this purpose. The reliability test was used to produce a total instrument reliability coefficient as well as coefficients for each of the three dimensions. Since the revised instrument could potentially be used for multiple purposes (i.e., research, needs assessment, personnel evaluation), we sought reliability coefficients above 0.90.

6.2.2.4 Comparability Analysis

The last criterion used to assess the measurement properties of the PIMRS Teacher Short Form was comparability between results obtained from the PIMRS Teacher Standard Form and the Short Form. Two analyses were conducted. The first tested the correlation in raw scores between the Standard Form and Short Form on the whole scale as well as the three dimensions. A correlation that approaches 1.0 would indicate a high level of comparability.

The second test of comparability analyzed differences in Rasch measures between the two forms on each dimension. A zero difference would indicate a high level of comparability. More specifically, let $\hat{\theta}_{n,\,\text{standard}}$ and $\hat{\theta}_{n,\,\text{short}}$ be the Rasch measures for teacher n on the standard and short forms, respectively; and $SE(\hat{\theta}_{n,\,\text{standard}})$ and $SE(\hat{\theta}_{n,\,\text{short}})$ be their standard errors, respectively. Under the null hypothesis of no difference between forms, the following statistic should approximate the standard normal distribution. When the 0.05 nominal level was used for significance, it was expected on average approximately 5 % of teachers would have a statistically significant difference.

$$\frac{\hat{\theta}_{n,\,\text{standard}} - \hat{\theta}_{n,\,\text{short}}}{\sqrt{\text{SE}(\hat{\theta}_{n,\,\text{standard}})^2 + \text{SE}(\hat{\theta}_{n,\,\text{short}})^2}} \sim Z. \tag{6.2}$$

The above analytical procedures represent a comprehensive approach to designing a shortened version of the PIMRS Teacher Form. As noted above, they were applied to existing data in our effort to develop the PIMRS Teacher Short Form.

6.3 Results

In this section of the chapter we describe results of our effort to produce a PIMRS Teacher Short Form. The presentation of results covers the four main criteria outlined in the previous section with respect to item selection, reliability, validity and comparability between forms of the instrument.

6.3.1 Item Selection

According to the MNSQ statistics, most of the 10 items comprising the first dimension, *Defines the School Mission*, had a good fit. Items in bold font in Table 6.2 (i.e., items 08, 09, 10, 03, 07) were likely candidates for item reduction based on lower quality fit. The item-test correlation of the remaining items was above 0.5. Considering the criterion of optimal content coverage, we selected item No. 08 instead of No. 02.

The Wright Map shown in Appendix F shows the distribution of these 10 items based on their difficulty. The bold items indicate likely candidates for item reduction for the PIMRS Teacher Short Form. We noted that the distribution of person ability (i.e., the teacher rating of principals) appears to be somewhat higher than item difficulty. Although not optimal, this could be due to the fact most principals engage proactively in mission-building and goal-setting in their schools. This data trend did not cause us to change our item selection.

Table 6.3 shows the relevant statistics for *Manages the Instructional Program*. All items had MNSQ between 0.8 and 1.2 and item-test correlations exceeding 0.5. The boldface items (i.e., 15, 25, 24, 18, 19, 22, 13, 14) were likely candidates for item reduction. The Wright Map in Appendix G shows the distribution of item difficulty for the 15 items. After eliminating these, the remaining set was comprised of a good distribution of items in terms of difficulty.

In the third dimension, *Develops a Positive School Learning Climate,* the boldfaced items highlighted in Table 6.4 (i.e., 34, 28, 26, 46, 35, 27, 47, 50, 42, 41, 39, 43, 32, 36 in Table 6.4) were the most likely candidates for elimination. We also eliminated item 30 after reviewing the distribution of item content coverage. After this process of item reduction, a total of 10 items remained in this dimension. These 10 items demonstrated high item-test correlations and adequately covered the five leadership functions within this dimension (see Table 6.4).

Table 6.2 Item-fit statistics for *Defines the School's Mission*

Item label	Sample size	Function label	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
II CSG 09	**4273**	**Comm Goals**	**0.88**	**0.02**	**1.37**	**Acceptable**	**0.79**
II CSG 10	**4199**	**Comm Goals**	**1.06**	**0.02**	**1.30**	**Acceptable**	**0.80**
I FSG_03	**4290**	**Frame Goals**	**0.73**	**0.02**	**1.24**	**Acceptable**	**0.79**
I FSG 05	4281	Frame Goals	0	0.03	0.98	Good	0.79
I FSG 04	4274	Frame Goals	−0.77	0.03	0.93	Good	0.74
II CSG 06	4283	Comm Goals	−0.29	0.03	0.89	Good	0.78
I FSG 01	4313	Frame Goals	−0.67	0.03	0.88	Good	0.76
I FSG 02	**4130**	**Frame Goals**	**−0.32**	**0.03**	**0.80**	**Good**	**0.80**
II CSG 07	**4281**	**Comm Goals**	**−0.54**	**0.03**	**0.77**	**Acceptable**	**0.78**
II CSG 08	4237	Comm Goals	−0.08	0.03	0.76	Acceptable	0.81

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Note Bold font items were eliminated based on a combination of difficulty, fit and correlation criteria

Table 6.3 Item-fit statistics for *Manages the Instructional Program*

Item label	Sample size	Function labels	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
III_SEI_15	**4157**	**Super & Eval**	**−0.24**	**0.02**	**1.45**	**Poor**	**0.66**
V_MSP_25	**4105**	**Monitor Prog**	**0.44**	**0.02**	**1.27**	**Acceptable**	**0.74**
V_MSP_24	**4200**	**Monitor Prog**	**−0.21**	**0.02**	**1.24**	**Acceptable**	**0.69**
III_SEI_13	**4183**	**Super & Eval**	**0.46**	**0.02**	**1.19**	**Good**	**0.75**
III_SEI_14	**4192**	**Super & Eval**	**−0.39**	**0.02**	**1.17**	**Good**	**0.68**
III_SEI_11	4253	Super & Eval	−0.13	0.02	1.13	Good	0.73
V_MSP_21	4180	Monitor Prog	0.83	0.02	1.06	Good	0.78
IV_CC_16	4183	Coord Curric	−0.13	0.02	1.02	Good	0.73
III_SEI_12	4215	Super & Eval	0.15	0.02	0.97	Good	0.76
IV_CC_17	4205	Coord Curric	−0.69	0.03	0.87	Good	0.70
IV_CC_20	4064	Coord Curric	0.31	0.02	0.85	Good	0.79
V_MSP_23	4196	Monitor Prog	−0.48	0.02	0.80	Good	0.73
V_MSP_22	**4192**	**Monitor Prog**	**0.18**	**0.02**	**0.76**	**Acceptable**	**0.79**
IV_CC_19	**4111**	**Coord Curric**	**−0.15**	**0.02**	**0.66**	**Acceptable**	**0.78**
IV_CC_18	**4179**	**Coord Curric**	**0.05**	**0.02**	**0.63**	**Acceptable**	**0.80**

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Note Bold font items were eliminated based on a combination of difficulty, fit and correlation criteria

Appendix H displays the Wright Map for the third dimension. Based on the MNSQ index, the two items with the highest difficulty (items No. 34 and 35) demonstrated a marginally good fit (see Appendix H). Therefore, taking these multiple criteria into consideration, we decided to eliminate these two items in order to maintain better psychometric integrity for this dimension.

These steps yielded a prototype of the PIMRS Teacher Short Form consisting of 22 items measuring the three dimensions of the PIMRS framework. This included five items in *Defines the School Mission*, seven items in *Manages the Instructional Program*, and 10 items in *Develops a Positive School Learning Climate*. While the data analysis procedures described above indicated that the items ‘fit’ with the three

Table 6.4 Item-fit statistics for *Develops a Positive School Learning Climate*

Item label	Sample size	Function labels	Item difficulty	Standard error	Outfit MNSQ	Goodness of fit	Item-test correlation
VII_MHV_34	**4011**	**High Visibility**	**1.11**	**0.02**	**1.55**	**Poor**	**0.67**
VI_PIT_28	**4052**	**Protect Time**	**0.36**	**0.02**	**1.47**	**Poor**	**0.62**
VI_PIT_26	**4224**	**Protect Time**	**−0.43**	**0.02**	**1.44**	**Poor**	**0.55**
X_PIFL_46	**4164**	**Inc Learning**	**−0.74**	**0.02**	**1.36**	**Acceptable**	**0.53**
VII_MHV_35	**3975**	**High Visibility**	**1.39**	**0.02**	**1.35**	**Acceptable**	**0.72**
VI_PIT_27	**4202**	**Protect Time**	**0.11**	**0.02**	**1.31**	**Acceptable**	**0.62**
X_PIFL_47	**4145**	**Inc Learning**	**−0.19**	**0.02**	**1.30**	**Acceptable**	**0.60**
VI_PIT_30	**2635**	**Protect Time**	**−0.2**	**0.02**	**1.07**	**Good**	**0.63**
VII_MHV_33	4153	High Visibility	−0.67	0.02	1.04	Good	0.58
X_PIFL_48	3962	Inc Learning	0.24	0.02	0.98	Good	0.70
VII_MHV_31	4209	High Visibility	−0.11	0.02	0.95	Good	0.66
VIII_PIFT_38	3789	Inc Teachers	0.62	0.02	0.93	Good	0.74
VI_PIT_29	4199	Protect Time	−0.81	0.02	0.93	Good	0.59
IX_PPD_44	4134	Prof Develop	−0.24	0.02	0.92	Good	0.66
IX_PPD_45	4189	Prof Develop	0.07	0.02	0.90	Good	0.69
VIII_PIFT_37	4146	Inc Teachers	−0.1	0.02	0.86	Good	0.68
VIII_PIFT_40	2550	Inc Teachers	0.51	0.02	0.85	Good	0.73
X_PIFL_49	3756	Inc Learning	0.28	0.02	0.82	Good	0.73
VIII_PIFT_36	**4193**	**Inc Teachers**	**0.01**	**0.02**	**0.81**	**Good**	**0.69**
VII_MHV_32	**4183**	**High Visibility**	**0.41**	**0.02**	**0.79**	**Acceptable**	**0.74**
IX_PPD_43	**2624**	**Prof Develop**	**−0.55**	**0.03**	**0.79**	**Acceptable**	**0.65**
VIII_PIFT_39	**4021**	**Inc Teachers**	**0.31**	**0.02**	**0.78**	**Acceptable**	**0.73**
IX_PPD_41	**4180**	**Prof Develop**	**−0.61**	**0.02**	**0.78**	**Acceptable**	**0.64**
IX_PPD_42	**4155**	**Prof Develop**	**−0.44**	**0.02**	**0.69**	**Acceptable**	**0.67**
X_PIFL_50	**2595**	**Inc Learning**	**−0.32**	**0.02**	**0.66**	**Acceptable**	**0.70**

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Note Bold font items were eliminated based on a combination of difficulty, fit and correlation criteria

conceptual dimensions of the scale, it remained to verify that the instrument continued to meet desirable standards of reliability and comparability.

6.3.2 Reliability Results

Next we ran the Gen Theory test of internal consistency described in Chap. 4 to determine if the prototype instrument was reliable for the total scale (i.e., 22 items) as well as the three dimensions. The reliability results were 0.943 for the whole scale, 0.935 for *Defines the School Mission*, 0.901 for *Manages the Instructional Program*, and 0.912 for *Develops a Positive School Learning Climate*. These findings confirm that the PIMRS Teacher Short Form meets the reliability standards applied for instruments used in research, needs assessment, and personnel evaluation.

6.3.3 Validity Results

Tests of the validity of the prototype PIMRS Teacher Short Form were limited to internal validity. All factor loadings were above 0.7. The fit indices were as follows: goodness of fit index = 0.965, root mean square error of approximation = 0.088. Together these indicate a good fit between the data and the conceptual framework. The results further suggest that the dimensions measure related but different conceptual constructs subsumed under the construct of instructional leadership.

In the PIMRS Teacher Form, the correlation among the three dimensions were 0.91 (between dimensions 1 and 2), 0.83 (between dimensions 1 and 3), and 0.91 (between dimensions 2 and 3). In the PIMRS Teacher Short Form, they were 0.90, 0.81, and 0.89, respectively. These very small differences in dimension-level correlations between the two forms indicate that the factor structure remained stable after the elimination of items.

6.3.4 Comparability of Results Between PIMRS Teacher Forms

Analysis of comparability between the two PIMRS Teacher Forms sought to ensure that users could employ either form confident of obtaining a similar pattern of results, if not the same exact scores. The correlation of raw scores between the PIMRS Teacher Form and PIMRS Teacher Short Form was 0.94 for the first dimension, 0.97 for the second dimension, 0.97 for the third dimension, and 0.99 for the whole PIMRS scale. This very high pattern of correlation of raw scores between the two forms demonstrates comparability between the two forms.

We then used Eq. 6.2 described in the Methods section to check for difference in the Rasch measures between the PIMRS Teacher Form and the Teacher Short Form. We found that, on average, scores obtained from 3.7 %, 2.1 % and 3.6 % of teachers had a statistically significant difference at the 0.05 nominal level on the three dimensions, respectively. This represents a very small percentage of respondents for whom the results would differ significantly and fell within an expected range (i.e., within 5 %). In short, both analyses supported a conclusion of high comparability between the two forms.

We wish to emphasize that because the test lengths of the PIMRS Teacher Form and Short Form are very different, raw scores obtained from the two forms cannot be compared directly. That is, the number of items on each dimension differs for each of the two forms. Thus, the two forms will yield different score levels simply based on differences in length. There may be cases when the user wishes to compare his/her results to those of other studies, or where a school district wants to compare current results obtained from the PIMRS Teacher Short Form with earlier results obtained from the PIMRS Teacher Form. This would require a means of equating scores obtained from these two different forms of the PIMRS.

To resolve this problem, we employed a set of test equating techniques (Kollen and Brennan 2004) to create a table for converting or comparing raw scores from the two tests (see Table 6.5). Using this table, raw scores from the two forms can be equated in cases where users wished to compare scores obtained from the two different forms. For example, for the first dimension, a raw dimension level score of 10 on the PIMRS Teacher Short Form was approximately equivalent to a raw

Table 6.5 Conversion table for the PIMRS Teacher Short Form

Defines the School Mission		Manages the Instructional Program		Develops a Positive School Learning Climate			
Short form dimension score	Teacher form dimension score	Short form dimension score	Teacher form dimension score	Short form dimension score	Standard form dimension score	Short form dimension score	Teacher form dimension score
5	10	7	15	10	26	39	97
6	12	8	17	11	28	40	99
7	13	9	19	12	30	41	102
8	15	10	21	13	32	42	104
9	16	11	23	14	35	43	107
10	18	12	25	15	38	44	109
11	20	13	27	16	40	45	112
12	22	14	30	17	43	46	114
13	24	15	32	18	45	47	117
14	26	16	34	19	48	48	120
15	28	17	36	20	50	49	122
16	30	18	38	21	53	50	124
17	32	19	40	22	55		
18	34	20	43	23	58		
19	36	21	45	24	60		
20	38	22	47	25	63		
21	40	23	49	26	65		
22	42	24	51	27	67		
23	45	25	53	28	70		
24	47	26	56	29	72		
25	49	27	58	30	75		
		28	60	31	77		
		29	62	32	80		
		30	64	33	82		
		31	66	34	84		
		32	69	35	87		
		33	71	36	89		
		34	73	37	92		
		35	74	38	94		

score of 18 in the PIMRS Teacher Standard Form (see Table 6.5). Details of the procedures used in developing the conversion table as well as the table itself are available in the PIMRS Technical Report (Hallinger and Wang 2014).

6.4 Conclusion

This chapter reported the results of a research and development study aimed at creating a shortened version of the PIMRS Teacher Form. Although the PIMRS has a long track record of use in empirical research on leadership for learning, a recent review of PIMRS studies (Hallinger 2011) found that many researchers have chosen to rely solely upon the Principal Form for data collection. Since many principals do not wish to burden teachers with long surveys, the authors wished to see if it was possible to create a PIMRS Teacher Short Form that was capable of yielding comparable data at a similar level of quality.

This R&D project reduced the PIMRS Teacher Form from 50 to 22 items. The resulting PIMRS Teacher Short Form is capable of producing a full-scale score as well as scores for three dimensions of instructional leadership: *Defines the School Mission*, *Manages the Instructional Program*, *Develops a Positive School Learning Climate*. Using a Gen Theory test, our results confirmed that the PIMRS Teacher Short Form continues to yield data that meet high standards of reliability (i.e., above 0.90) for the three dimensions as well as the full scale. Rasch analysis and confirmatory factor analysis further confirmed that the PIMRS Teacher Short Form continued to maintain high levels of internal validity. Finally, we found that raw scores from these two forms of the PIMRS were highly correlated for the three dimensions (0.94. 0.97, 0.97) and the full scale (0.99) indicating comparability of results. We noted, however, that different forms of the same instrument comprised of different numbers of items never yield exactly the same scores. Therefore, we developed a conversion table that equates raw scores obtained from the two forms of the PIMRS teacher scale on both the full scale and three dimensions.

These results confirm that the PIMRS Teacher Short Form meets our previously stated criteria of reliability, validity and comparability. The resulting instrument reduces the time needed for teachers to complete the scale by more than half, to about 10 min. Future researchers who use the PIMRS in combination with other instruments can be confident that the PIMRS Teacher Short Form is a more efficient yet equally effective instrument for data collection when compared with the longer PIMRS Teacher Form.

At the same time, we wish to take note of several limitations that attend use of the PIMRS Teacher Short Form. First, as discussed earlier, this instrument revision effort was limited to development of a shortened version of the PIMRS Teacher Form. The PIMRS Principal and Supervisor Forms are only available in the full 50 item version of the instrument. Measurements that rely on single raters typically require a larger item pool in order to achieve a high level of reliability (Gay

1992). Based upon this principle, as well as the results of our earlier reliability study (Hallinger et al. 2013), we have no intention to undertake development of a short form of the PIMRS Principal or Supervisor instruments.

A second limitation flows from our decision not to maintain the capacity of the PIMRS Teacher Short Form to yield data on the 10 instructional leadership functions that are measured in the PIMRS Teacher Form. Users for whom detailed information on the 10 leadership functions is deemed critical would, therefore, still wish to use the Standard Form. For example, in situations where detailed teacher feedback to principals is used for developmental purposes, users may wish to continue using the PIMRS Teacher Form.

Finally, this instrument revision study did not extend to the measurement of external validity of the PIMRS Teacher Short Form. Our tests of validity were restricted to features of the scale's internal validity (e.g., content and construct validity). Further establishing the external validity of the Teacher Short Form remains a target for future research.

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Chapter 7
Using the PIMRS in Future Research on Leadership and Learning

This chapter extends findings published in a systematic review of PIMRS research conducted between 1983 and 2010 (Hallinger 2011a). We highlight key conclusions that emerged from the review concerning research topics and methods that have engaged the attention of scholars studying leadership for learning with the PIMRS over the past three decades. Then we discuss implications of these findings and present recommendations for future research. The chapter includes a table (Appendix K) that illustrates the relevant elements of studies of leadership for learning which researchers can employ as a tool for planning their studies.

As discussed in earlier chapters, the PIMRS was initially developed in response to an articulated need for research-informed instrumentation capable of contributing to a program of research on leadership and learning in schools (Bossert et al. 1982; Bridges 1982; Hallinger and Murphy 1985). Our analysis of research conducted with the PIMRS has yielded a number of implications for researchers who choose to employ this instrument in future studies of school leadership and learning. We close the book, by highlighting topical and methodological trends in prior PIMRS research and identifying issues that appear relevant to improving the quality of future studies that employ the PIMRS.

7.1 Use of the PIMRS in Research on Leadership and Learning

In 2011, Hallinger published a review of research conducted with the PIMRS over the preceding 30 years (Hallinger 2011a). This review provided an in-depth examination of the topics, research designs, and methods used by scholars in 135 PIMRS studies. It should be noted that since the publication of the aforementioned

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
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review in 2011, an additional 125 journal articles, conference papers and graduate theses centering on the PIMRS have been located (see reference list).[1]

The review found that even as topical interests in educational leadership waxed and waned over the course of this 30-year period, scholarly interest in instructional leadership and use of the PIMRS remained consistently strong (Hallinger 2011a). This empirical examination affirmed that instructional leadership has not only become firmly entrenched in the firmament of policy and professional practice, but also gained currency as a central construct in the eyes of scholars studying school leadership (Hallinger 2011a). This is notable in that predictions made during the 1980s (e.g., Cuban 1988) suggested that the 'shelf-life' of instructional leadership would be rather short. Indeed, the data indicate unequivocally that in 2015 instructional leadership appears even more influential and relevant to the practice of school leadership than during the effective schools era of the 1980s (e.g., see Goff et al. 2014; Hallinger 2011a; Hallinger and Lee 2013, 2014; Heck and Hallinger 2014; Lee et al. 2012a, b, 2014; Leithwood et al. 2010a, b; Marks and Printy 2003; Nettles and Herrington 2007; Neumerski 2012; Rigby 2014; Robinson et al. 2008; Schoen and Fusarelli 2008; Sebastian and Allensworth 2012; Silva et al. 2011; Walker and Ko 2011; Walker et al. 2014).

Moreover, the empirical trend of PIMRS use among scholars further suggests that interest in this construct is spreading throughout the world. For example, during the period from 1983 to 2000 only 11 of the 98 studies that employed the PIMRS were conducted outside of the USA [i.e., Philippines (4), Thailand (3), Taiwan (3), Hong Kong (1), Cameroon (1)]. In contrast, 33 PIMRS research studies were conducted in countries other than the USA between 2000 and 2014. This subset comprised about 30 % of the total number of PIMRS studies conducted during this latter period. The range of countries represented in this subset was geographically diverse and included scholars located in Asia, South America, Europe and Africa.[2]

It should further be noted that these figures under-report the actual extent of use of the PIMRS outside of the USA. In many countries theses and dissertations are not made available through a central digital database, nor are they contributed to digital collections such as Proquest's™ *Dissertations Express*. Indeed, during second half of 2014 alone the author received new requests for use of the PIMRS from researchers located in Bangladesh, Bhutan, Chile, China, Ethiopia, Germany, Indonesia, Jamaica, Kenya, Malaysia, Mexico, Nepal, Nigeria, Pakistan, Philippines, Saudi Arabia, South Africa, Thailand, Turkey, United Arab Emirates, Vietnam, and the West Indies. Thus, we see the distinct possibility of gaining a more diverse empirically-grounded understanding of how instructional leadership is practiced internationally from this global corpus of studies in the future.

In the context of these trends, evidence presented in this book suggests that the PIMRS instrument continues to be a relevant tool for providing reliable and valid data on principal instructional leadership in a global context (see also Hallinger and

[1]Content from this chapter is based, in part, on Hallinger (2011a).

[2]Malaysia (15 studies), mainland China (3), Thailand (2), Taiwan (1), Ethiopia (1), Mexico (1), Portugal (1), New Zealand (1), Vietnam (1), Zambia (1), Philippines (1), Maldives (1), Israel (1), India (1), Turkey (1), and Indonesia (1).

Lee 2013, 2014; Hallinger et al. 2013). It also highlights the importance of continuing to assess the validity and reliability of the instrument as it is used by researchers in cultural contexts that differ in significant ways from the USA. Thus, we conclude that the PIMRS can play a *potentially useful role* in future empirical research on instructional leadership. We qualify this assertion because the power of any research tool is only realized when researchers apply the tool in concert with suitable conceptual models, research designs, and methods (Hallinger 2011a; Heck and Hallinger 1999a, b, 2005). In the following sections, we summarize findings from the above-mentioned review of research (Hallinger 2011a), and outline directions for future research with respect to topics, conceptual models, research designs and methods.

7.2 Current State-of the-Art and Future Directions of PIMRS Research

7.2.1 Conceptual Features of PIMRS Studies

Our discussion of recommendations of conceptual models for use in a program of research on leadership for learning incorporates two levels of analysis. First, we briefly review how leadership for learning has been conceptualized. This discussion highlights the conceptualization of instructional leadership in relation to other leadership models employed in studies of leadership and learning such as transformational leadership (Leithwood 1994; Leithwood and Jantzi 2005; Leithwood and Sun 2012). The second level of conceptual analysis considers how leadership is framed in relation to other variables in studies of leadership, student learning and school improvement. For example, the Bossert et al. (1982) model illustrated in Chap. 2 framed instructional leadership as influencing student learning through two key mediating variables. Recent scholarship (Hallinger and Heck 2011a, 2011b; Heck and Hallinger 2014; Leithwood et al. 2010a, b; Neumerski 2012; Rigby 2014) has extended the Bossert model. Here we reexamine issues that bear upon the researcher's explicit selection and definition of an over-arching conceptual model for the study.

7.2.1.1 Conceptualizing Leadership for Learning

As noted in Chap. 1, during the 1990s a paradigm war pitted instructional leadership against transformational leadership. During the 1990s, Leithwood's (1994; Leithwood and Jantzi 1999, 2000, 2005; Leithwood and Sun 2012) conceptualization of transformational school leadership was framed as a potentially more powerful model for describing how school leaders achieve positive effects on school outcomes. This led to a perception that instructional leadership was 'on the wane' in terms of its influence on theory, research and practice (see Hallinger 2003).

Over time, however, this 'debate' has largely been resolved through programmatic empirical studies conducted by a variety of researchers (Day et al. 2010; Hallinger et al. 1996; Hallinger and Heck 1996a, b, 2010, 2011b; Heck and Hallinger 2009,

2011a, b, 2014; Heck et al. 1990; Leithwood et al. 2010a, b; Marks and Printy 2003; Robinson et al. 2008; Witziers et al. 2003). The PIMRS instrument has also been employed in studies that have sought to compare patterns of instructional leadership practice with transformational and transactional leadership as alternative conceptual models of leadership practice (Adkins 1990; Carr 2011; Dale 2010; Marin 2013; Prater 2004; Shatzer 2009; Tang 1997). The studies as a group affirm the proposition that the conceptual models of instructional leadership and transformational leadership incorporate dimensions that are both distinct and overlapping.

A recent empirical comparison of the two models was conducted by Robinson and colleagues (2008) in a meta-analytic study that compared the effects of instructional and transformational leadership on student learning. After quantitatively integrating the findings of numerous studies, the authors concluded that instructional leadership offered a more potent explanation of the means by which leaders impact learning in schools. Although the methodology of this highly cited study has attracted some criticism (e.g., Scheerens 2012), the findings from this review have been widely cited. Thus, this and other synthetic reviews of research have increasingly concluded that successful school leadership must incorporate a dimension focusing on instructional leadership (e.g., see Leithwood et al. 2006, 2008, 2010a, b).

After reading this literature carefully, we tend to emphasize the overlapping features of these theoretical models rather than argue for the efficacy of one model versus the other. Thus, recent conceptual models of leadership and learning used in research often include aspects of both instructional and transformational leadership. Moreover, empirical studies conducted by respected scholars increasingly employ multi-model measures in their data collection procedures (e.g., see Day et al. 2010; Goldring et al. 2009; Hallinger and Heck 2011a; Hallinger et al. 2014; Hallinger, Lee, and Ko 2014; Heck and Hallinger 2014; Leithwood et al. 2010a, b; Walker and Ko 2011; Walker et al. 2014).

Another conceptual issue that deserves mention concerns the source of instructional leadership. Over the past decade global discourse in this field has evidenced a distinct shift towards recognizing the importance of distributing roles and responsibilities for school leadership among a broader set of key administrators and teacher leaders (Barth 1990; Gronn 2002; Lambert 2002; Spillane 2006). Paradoxically, the latest thinking suggests that the drive to develop distributed leadership in schools neither diminishes nor comes at the expense of the principal's responsibilities for leadership. Indeed, scholars and policymakers alike assert that principal leadership remains a key source of support for building leadership capacity among other formal and informal leaders in the school and its community (e.g., Lambert 2002; Murphy 2005, 2007a; Stricherz 2001). As Mayrowetz and colleagues observed: "[P]rincipals occupy the critical space in the teacher leadership equation and center stage in the work redesign required to bring distributed leadership to life in schools" (Mayrowetz et al. 2008, p. 177).

Nonetheless, conceptualizing instructional leadership as a 'shared responsibility' also has implications for measurement. As noted in this volume, the PIMRS has been used primarily, though not solely, as a tool for assessing instructional leadership performed by the principal (e.g., see Bauer 2013; Howard-Schwind

2010; Wilson 2005). Yet in most contexts, the results of the PIMRS may only yield a partial picture of the true scope of instructional leadership that is exercised in practice. It is possible to address this by changing the questions in the scale from a focus on the principal to a focus on collective effort (e.g., see Heck and Hallinger 2009). We encourage future researchers interested in studying shared instructional leadership to experiment with this approach. Of course, additional studies of the instrument will be required to examine differences in the nature of data yielded by the PIMRS when used in this way. This implies the need for additional reliability and validation studies when the instrument is used in this fashion.

7.2.1.2 Conceptualizing School Leadership Effects

In Chap. 2 we discussed the use of conceptual models used for studying leadership and learning (see also, Bossert et al. 1982; Hallinger and Heck 1996a, b; Leithwood et al. 2010a, b; Neumerski 2012; Pitner 1988; Rigby 2014; Sebastian and Allensworth 2012). Our review of PIMRS studies found that that the frequency of studies employing 'direct effects' models (see Fig. 2.1) was consistently strong throughout the past three decades. The reader will recall that direct effect studies examine the relationship between two variables, for example the effects of variable A (e.g., instructional leadership) on variable B (e.g., student achievement). In recent years, some scholars (e.g., Nettles and Herrington 2007; Silva et al. 2011) have argued that the high stakes context for school leadership found in various nations (e.g., USA, UK, Hong Kong, Singapore) *demands* that school leaders take *direct actions* to impact student learning. They suggest that defining a clear mission, managing instruction and developing the school climate are *insufficient* in schools that face government takeovers due to poor performance in student learning outcomes.

With this rationale in mind, they have continued to apply a direct effects conceptualization of principal leadership that emphasizes principal interactions with students (e.g., Silva et al. 2011). As one example of this approach, Silva and colleagues studied the implementation of a direct effects model of instructional leadership using an experimental research design. The experimental treatment consisted of the principal coaching students at risk of failing with the goal of increasing their focus and motivation to achieve. In the opinion of the authors, the findings from this study were based on an inadequate sample which led to inconsistent results. At a minimum, the results of the Silva et al. (2011) study require substantiation through additional research. Indeed, to this author, the most interesting fascinating aspect of this study could be their use of an experimental design in examining the relevant relationships. The authors offer a useful alternative research design that could be applied in future PIMRS studies.[3]

[3]This recommendation refers to the general research design that was employed by the researchers. We remain critical of both the conceptual model and the features of the methodology used to implement the research design (e.g., sampling).

More generally, however, we continue to assert that direct effects conceptualizations represent a 'dry well' in studies that seek to explore the effects of school leadership on learning. There is, in our opinion, no theoretical basis to suggest that the behaviors or actions of principals *directly influence the school-wide achievement of students.* Most theories of leadership and learning propose that leadership operates through the organization of the school and the practices of teachers (e.g., Bossert et al. 1982; Hallinger and Heck 1996a, b, 1998; Heck and Hallinger 2011, 2014; Leithwood et al. 2010a, b; Rigby 2014; Sammons et al. 2014; Scheerens 2012; Sebastian and Allensworth 2012; Witziers et al. 2003). Empirically, direct effects studies are poorly equipped to test for this type of indirect relationship and have yielded a consistent long-term pattern of weak or no effects of leadership on learning (Bridges 1982; Haller 1979; Hallinger and Heck 1996a, b; Leithwood et al. 2006, 2010a, b; Scheerens 2012; Witziers et al. 2003). Therefore, we join other scholars in asserting that the direct effects model holds very limited potential for advancing our understanding of key leadership-related processes.

Because leadership is enacted in complex organizational settings, reviewers have recommended that scholars employ conceptual models that are capable of portraying these 'multivariate relationships' (Bossert et al. 1982; Bridges 1982; Hallinger and Heck 1996a, b; Witziers et al. 2003). When employing mediated effects models of leadership and learning, the researcher begins by theorizing about the means or paths through which leadership is linked to learning (see Hallinger and Heck 1996a, b, 1998; Leithwood et al. 2010a, b; Scheerens 2012; Witziers et al. 2003).

We wish to draw readers' attention, in particular, to the efforts of Heck and Hallinger (2009, 2010, 2011, 2014; Hallinger and Heck 2010, 2011a, 2011b) and Leithwood to define and test the 'paths' through which leadership works to influence student learning (see Leithwood et al. 2006, 2010a, b). Our review of PIMRS studies did find an increased used of mediated-effects frameworks during the final period of the review, 2000–2011 (e.g., Calvert 2013; Fancera 2009; Fulton 2009; Geiselman 2004; Meek 1999; Shatzer 2009; Wang 2011). Unfortunately, the total number of mediated effects studies using the PIMRS remains rather small relative to the size of the full corpus of studies. Therefore, they have yet to generate a substantial accumulation of findings.

Similarly, when seeking to understand the impact of leadership on 'school improvement', appropriate models and methods are required (see Heck and Hallinger 2014). For example, when studying change in the school over time, reciprocal effects conceptual models and longitudinal research designs become highly relevant (Hallinger and Heck 1998, 2011a, b; Heck and Hallinger 2011, 2014). Yet, we did not locate any studies in the PIMRS corpus that had employed these particular approaches (Hallinger 2011a), and no more than a handful in the entire educational leadership literature (e.g., Bowers and White 2014; Goff et al. 2014; Hallinger and Heck 2011a, b; Heck and Hallinger 2011, 2014; Mulford and Silins 2009; Rowan and Denk 1984; Sammons et al. 2014; Sleegers et al. 2014; Thoonen et al. 2012). Employing the PIMRS instrument within studies that employ these multivariate conceptualizations of leadership and learning remains an important goal for future PIMRS research.

7.2.2 Topical Features and Future Directions of PIMRS Studies

Our review of PIMRS studies found a concentration of studies around a rather large number of independent and dependent variables. Independent variables were typically conceptualized as antecedents that influenced the principal's exercise of instructional leadership (e.g., Gaziel et al. 2012; Groff 2002; Jennings 2013; McCabe 1993). Antecedents reflected both personal characteristics of the principal as well as features of the school's organization (see Fig. 2.1). Personal characteristics of the principal that have been studied include principal gender (Babcock 1991; Collins 1998; Cunningham 2004; Geiselman 2004; Groff 2002; Hallinger 1983; Howell 1989; Nogay 1995; Nogay and Beebe 1995; Schoch 1992; Trout 1985; van Pelt 1993; Wells 1993), race (Collins 1998; Nogay 1995; Schoch 1992), years of administrative experience (Groff 2002; Schoch 1992; van Pelt 1993; Wells 1993), years of teaching experience (Delano 1985; Groff 2002), instructional knowledge (Calvert 2013; Lehl 1989), leader authenticity (Meyer 1990), principal self-efficacy (Dale 2010; Dale and Phillips 2011; Keith 1989; Ruzieska 1989), cognitive style (Goldring et al. 2012; Sawyer 1997), and emotional intelligence (Goldring et al. 2012; Munroe 2009).

Scholars have also studied the impact of organizational and cultural context variables on the exercise of principal instructional leadership using the PIMRS. Organizational factors include school level (Groff 2002), school size (Anderson 2006; Grier 1988; Groff 2002; Howell 1989; Schoch 1992; van Pelt 1993; Wells 1993), and various other organizational context features (Boothe 2014; Howe 1995; Kincaid 2006; Kroeze 1992; Mann 1988; McCier 2003; McDonald 2012; Palmer 2000; Parker 1990; Roudebush 1996; Sheppard 1993; Singleton 2006; Staples 2005; Tomasetti 2007; Zeanah 1986). Analysis of how organizational conditions shape the principal's exercise of instructional remains a potentially important line of inquiry (Belchetz and Leithwood 2007; Goldring et al. 2008; Hallinger and Murphy 1986).

For example, scholars have long proposed differences in the manner in which instructional leadership is practiced across elementary, middle and secondary schools (see Bossert et al. 1982). Although relatively few studies have been designed to explicitly study differences in instructional across different school levels, quite a few studies have collected multi-level (school) data (e.g., Dunn 2010; Gallon 1998; Hallinger and Lee 2013; Hart 2006; Shafeeu 2011; Sheppard 1993; Wong 2010). We further note that dozens of PIMRS studies have been conducted at the elementary (Babcock 1991; Boothe 2014; Carr 2011; Greb 2011; Munroe 2009), middle (Minus 2010), and secondary school (Anderson 2006; Carson 2013; Long 2008, Lyons 2010; Nogay 1995; Peariso 2011; Todd 2006) levels. Again, the use of a common instrument across a body of studies offers an opportunity to build knowledge by using quantitative review methods to integrate findings from independent studies.

The cultural contexts in which the PIMRS has been employed beyond the USA include Bhutan (Pelzang 2014; Sonam 2014), Cameroon (Wotany 1999), Canada (Sheppard 1993, 1996), China (Chen 2010; Wang 2011), Ethiopia (Ali 2012),

Guam (San Nicolas 2003), Hong Kong (Chan 1992; Chan and Cheng 1993), Israel (Gaziel et al. 2012; Hamed 2013), India (Dupont 2009), Indonesia (Salleh and Hatta 2011; Syarwan 2012), Maldives (Shafeeu 2011), Mexico (Aviles 2009), Malaysia (Abdullah and Kassim 2011, 2012; Daud and Basiron 2011; Hung and Ponnusamy 2010; Kassim and Abdullah 2011; Noor and Audryanah 2007; Nyau 2010; Ponnusamy 2010; Wafir 2011; Walat 2014; Wong 2010), Netherlands (van de Grift and Houteen 1999), New Zealand (Brown and Chai 2012), Philippines (Apolonia 1998; Saavedra 1987; Salvador 1999; Yogere 1996), Portugal (Rodrigues 2012), Taiwan (Chi 1997; Tang 1997; Yang 1996), Thailand (Hallinger and Lee 2013, 2014; Hallinger et al. 1994; Poovatanikul 1993; Ratchaneeladdajit 1997; Taraseina 1993), Turkey (Bellibas and Bulut 2014; Özdemir 2012), West Indies (Boothe Smith 2014; Trotman 2013), and Zambia (Michelo 2013). Despite the diverse contexts in which the PIMRS has been employed, we note that few of the studies have either sought to examine PIMRS data across different national settings using a cross-cultural framework (see Hart 2006). Given the existence of this 'international database' linked to a common instrument, we suggest that there is ample opportunity here to gain insights into variations in the practice of instructional leadership across cultures. Quantitatively-oriented, analytical reviews (see Hallinger 2013a, b) of these studies represent a timely set of future projects.

As noted above, the conceptual models used to frame studies of the impact of principal instructional leadership have included both internal organizational conditions as well as 'distal' school outcomes. Internal organizational factors that have been conceptualized as *dependent variables* that are *influenced by* principal instructional leadership include school climate (Lord 2001; Sheppard 1993; Skiptunas 1990; Walat 2014; Wilson 2005) School, school culture (Campbell 1999; Dupont 2009; Leitner 1990; Reid 1989; Smith 2012), teacher commitment (Pelzang 2014; Ponnusamy 2010; Sheppard 1993), teacher involvement in professional development (Wafir 2011), teacher stress and/or job satisfaction (Apolonia 1998; Courtney 1987; Dilworth 1987; MacNeil 1992; Pelzang 2014; Shatzer 2009; Özdemir 2012; Trotman 2013), teacher locus of control (Duryea 1988; Greb 2011), teacher collective efficacy (Dale 2010; Clark 2009; Fancera 2009; Horton 2013; Keith 1989; Maslyk 2012; Noor and Audryanah 2007; Reddick 2014; Lubbers 1988), and teaching practices (Abdullah and Wahab 2007; Abdullah and Kassim 2012; Delano 1985; Holyfield 2010; McCray 2014; Peariso 2011; Watkins 1992). Studies of the impact of principal instructional leadership on distal outcomes of the school have generally focused on two variables: school effectiveness (Adams 2002; Anderson 2010; Benoit 1990; Brown 1991a, b; Cantu 1994; Cheatham 2010; Gibson 2005; Grier 1988; Hunter 1994; Johnson 2005, 2006; Lyons 2010; Maciel 2005; Mercer 2004; Orange 1990; Otten 1990; Samuels 2013; Schoch 1992; Sinha 2009; Werner 1991) and student achievement (Adam 2012; Anderson 2006; Aste 2009; Balsamo 2004; Buzek 2004; Calvert 2013; Carson 2013; Gjelaj Merturi 2010; Hunter 1994; Jones 1987; Krug 1986; Mallory 2003; Meek 1999; O'Day 1983; O'Donnell 2002; Reddick 2014; Shatzer 2009; Stroud 1989; van de Grift and Houteen 1999; Wang 2011; Waters 2005).

As noted in the prior section of this chapter, the PIMRS has also been employed as a tool for understanding the exercise of instructional leadership by

'middle-level school leaders' (Atkinson 2013; Bauer 2013; Howard-Schwind 2010; Wilson 2005). These studies have focused on assistant principals and as well as supervisors. Notably these studies have emerged only since the turn of the millennium with rising interest in shared and distributed leadership. This represents a particularly useful topical trend that should be encouraged.

Principal preparation and professional development aimed at enhancing the capacity of principals to exercise instructional leadership more effectively has also been the focus of scholars who have used the PIMRS (e.g., Augustine 1998; Diego 2013; Dunn 2010; Freshour 1990; Grande 2012; Mcilavain 1986; Michelo 2013; Moffit 2007; Rogers 2005). Additional quantitative and mixed methods studies that employ the PIMRS as a tool for measuring the intermediate outcomes of school leadership preparation, training and professional development programs are recommended. In this regard, we suggest that studies in the broader educational leadership literature could serve as stronger models with respect to research design than the existing PIMRS studies that we have reviewed (e.g., see Goff et al. 2014; Leithwood et al. 2003; Maag Merki 2014; Silva et al. 2011).

Elsewhere the author (Hallinger 2011a, 2013, Hallinger et al. 2014) has highlighted the relationship between the scope of empirical work conducted in a field and the impact of research reviews in field of study. Research conducted with the PIMRS represents one of the largest bodies of work conducted in educational leadership with a single measurement instrument. As such, we anticipate that it will become increasingly fruitful during the coming years to conduct research syntheses and meta-analyses of findings from PIMRS studies that have focused on similar research questions, and/or which collected data on similar variables (e.g., see Gough 2007; Hallinger 2013a, b; Lipsey and Wilson 2001). We offer two additional examples from current work in which we are engaged, but whose results are not yet ready for publication.

The first research synthesis concerns the impact of principal instructional leadership on student achievement and school effectiveness. We were able to identify 53 studies—of widely varying quality—that have examined these relationships. In the first set of studies, researchers have examined the relationship between principal instructional leadership, using PIMRS data, and student achievement results. PIMRS researchers have examined this relationship through both direct (e.g., Adam 2012; Buzek 2004; Jones 1987; O'Day 1983; Shatzer 2009) and mediated effects (e.g., Dale 2010; Fancera 2009; Greb 2011; Leitner 1990; Maciel 2005; Todd 2006) models. In the 'principal effectiveness' studies, researchers have examined the nature of variation in principal instructional leadership across different categories of schools (e.g., Benoit 1990; Brown 1991; Fulton 2009; Harris 2002; McCarthy 2009; Meek 1999; Schoch 1992; Stroud 1989). For example, a researcher might compare the PIMRS scores of principals in high achieving and lowing schools serving low SES students (e.g., Harris 2002; Jennings 2013; Johnson 2005).

We note that the research designs associated with each of these lines of inquiry make assumptions that imply different requirements in terms of sample size and data analysis (e.g., see Scheerens 2012). Analysis of a subset of drawn from the body of PIMRS studies is also complicated by the fact that scholars have analyzed their data and reported results at different scale levels (e.g., three dimensions or 10 functions).

When we have access to original data, we can reanalyze them at a common level of analysis. However when extracting data from written reports, this is not possible. We are currently examining these studies to determine whether it will be possible to use meta-analytic methods to quantitatively integrate the findings, or whether we will need to rely on other methods of research synthesis (e.g., see Gough 2007; Hallinger, 2013a, b; Hallinger and Wang 2014; Lipsey and Wilson 2001).

Our second line of research review is focusing on the impact of principal gender on the exercise of instructional leadership. In contrast to the student achievement studies, here we frame instructional leadership as a dependent variable and seek to understand if, how and why practice varies among male and female principals. This line of inquiry is of interest due to a historical trend of research findings which suggest that female principals tend, on average, to be more active instructional leaders (e.g., Adkinson 1981; Eagly et al. 1992; Gross and Herriot 1965; Gross and Trask 1976; Hallinger 1983, 2011a; Nogay 1995; Nogay and Beebe 1995). Our meta-analysis of 40 datasets taken from 28 studies has affirmed that female principals tend to exercise more active instructional leadership than male principals. The effects detected within this body of studies are small but statistically significant and meaningful. Nonetheless, thus far, we have been unable to establish causal explanations for these gender differences in approaches to instructional leadership. We believe that exploration of findings across PIMRS studies on this topic has potential to move our understanding of this topic forward.

7.2.3 Methodological Features of PIMRS Studies

A number of research design and methodological implications follow from the discussion of conceptual models and topics. When compared with experimental, quasi-experimental, and longitudinal research designs, cross-sectional surveys are limited in their ability to shed light on the causal relationships that interest applied researchers (Bridges 1982; Haller 1979; Hallinger 2011a; Heck and Hallinger 2005). Nonetheless, research in educational leadership and management has long been dominated by cross-sectional survey research (see Bridges 1982; Campbell 1979; Haller 1979; Hallinger and Heck 1996a, b; Murphy et al. 2007b). This applies to research conducted with the PIMRS (Hallinger 2011a). With the exception of a few case studies, the research design of choice among PIMRS users has been the cross-sectional survey.

More complex theoretical conceptualizations of leadership and learning, however, require the use of causal inference techniques capable of analyzing a wider variety of theoretical relationships in multilevel organizational settings (Griffin 1997; Heck and Hallinger 1999a, b, 2005; Kline 2011; Marsh and Craven 2006). These include experimental (e.g., Goldring 2010; Silva et al. 2011), quasi-experimental (e.g., Hallinger et al. 2013), and longitudinal research designs (e.g., Brown and Chai 2012; Hallinger and Heck 2011a, b; Heck and Hallinger 2009, 2010, 2014; Mulford and Silins 2009). There has been almost no use of the PIMRS

in experimental, quasi-experimental, or longitudinal research designs where researchers were seeking to study leadership and learning. This oversight suggests an important challenge for future research in our field.

When researchers do use the PIMRS in 'simple cross-sectional surveys' it would also be useful to consider enhancing the variety of output by employing mixed method designs (Caracelli and Greene 1993; Creswell 2008). Mixed methods research designs provide a variety of different ways of guiding, validating and extending the results of cross-sectional surveys (Creswell 2008). While the same methodological requirements apply to the design of the cross-sectional portion of the study, the addition of a qualitative component offers potential for filling in gaps in understanding among the variables being studied. Since many master and doctoral students are interested in problems of leadership practice, complementing PIMRS data with qualitative data represents a useful approach to gaining deeper insights into practice. Thus, we strongly support an increased use of these designs in future PIMRS studies. This seems especially relevant in doctoral dissertations where students are conducting research with limited resources but want to find results that are 'meaningful' for practice.

Our earlier comments concerning the use of more sophisticated conceptual models also have implications for research methods. For example, the sample sizes of studies that we observed in the PIMRS corpus place constraints on the capacity of individual studies to find significant effects of leadership on learning. It should be noted that even an optimistic reading of the general literature in this field would characterize school leadership effects as 'relatively small in magnitude' (e.g., Hallinger and Heck 1996a, b; Heck and Hallinger 2005, 2014; Leithwood et al. 2006; Robinson et al. 2008; Scheerens 2014; Witziers et al. 2003). Thus, from a methodological perspective the researcher requires a reasonably large data set of schools (i.e., principals and teachers) in order to detect significant effects of leadership on student learning. Yet, among the 135 doctoral studies reviewed by the author in 2011 (Hallinger 2011a), only a small percentage worked with a sample size exceeding 50 schools.

Sample composition is also relevant in our consideration of study design. As noted in this volume, the PIMRS can be administered to principals and/or teachers. While both forms meet required standards of reliability and internal validity, too many studies have relied solely upon the principal form due to the relative ease of data collection. The author believes that this is a mistake which has also limited the realization of positive findings. It would be highly preferable to use either the PIMRS Teacher Form alone, or the PIMRS Teacher Form in concert with the PIMRS Principal Form when studying the effects of instructional leadership on other dependent and mediating variables of interest. Thus, in the author's opinion, sample size and composition have placed unnecessary constraints on the potential of the PIMRS corpus of studies for knowledge accumulation.

At the same time, our review (Hallinger 2011a) did note demonstrable improvements in the use of more sophisticated statistical methods within the corpus of PIMRS studies over time (e.g., Bridges 1982; Erickson 1967; Haller 1979; Hallinger and Heck 1996a, b). When viewing the entire 30 years period of the

review improvements included a reduced reliance on descriptive statistics and an increased use of bivariate tests without controls. Even more encouraging, was a trend, noted since 2000, of the more frequent use of statistical methods capable of shedding light on multivariate relationships among variables (e.g., multiple regression, structural equation modeling, HLM). These types of statistical methods are necessary when testing mediated effects models and would hopefully become even more commonly applied in future studies.

Progress in testing conceptual models (including those with mediating effects) that incorporate reciprocal causation has been hindered by several methodological challenges. In models of reciprocal interaction there is an explicit assumption that behavioral adaptation unfolds over time (Griffin 1997; Hallinger and Heck 1996a, b; Marsh and Craven 2006; Tate 2008). Ogawa and Bossert (1995) succinctly summarize the case for using longitudinal data in studies that seek to examine the effects of leadership on the organization:

> [S]tudies of leadership must have as their unit of analysis the organization. Data on the network of interactions that occur in organizations must be compiled over time. . . The importance of the dimension of time must be emphasized. If leadership involves influencing organizational structures, then time is important. Only time will tell if attempts at leadership affect organizational solidarity. Also, the time that is required for such effects to occur and the duration of the persistence of the effects may be important variables. (pp. 239–240)

Longitudinal data that describe change in organizational processes over time are, however, difficult to obtain, especially on a scale sufficient to assess the effects of leadership across comparable organizational units. Moreover, until recently, the field lacked analytical tools capable of modeling reciprocal effects over time (Griffin 1997; Hallinger and Heck 2011a; Heck and Hallinger 2005, 2009; Marsh and Craven 2006; Podsakoff 1994; Tate 2008). This problem is particularly relevant in educational organizations, where studying leadership effects on school improvement requires the use of multilevel modeling (Hallinger and Heck 1996a, b, 2011b; Heck and Hallinger 2005, 2014; Hill and Rowe 1996). Despite these challenges, however, we cannot overstate the important role of longitudinal research designs in leadership research where progress has both theoretical implications and practical utility (Bowers and White 2014; Goff et al. 2014; Griffin 1997; Hallinger and Heck 2010, 2011a, b; Heck and Hallinger 2005, 2009, 2011, 2014; Ogawa and Bossert, 1995; Sammons et al. 2014; Sleegers et al. 2014; Tate 2008).

Scholars have noted since the 1960s that most research in our field is conducted by doctoral students (Agusto 2009; Archbald 2008; Boyan 1988; Bridges 1982; Haller 1979; Hallinger 2011a; Hoffer et al. 2005). Doctoral students must fashion research studies that take into account various limitations (e.g., time, resources) that impact their choice of research conceptualizations and designs. Studying the effects of leadership on student achievement requires access to data that meet stringent requirements (see Hallinger 2011a; Hallinger and Heck 2011b) that go beyond what most doctoral students are able to collect within the context of their dissertation studies. Compromises on the quality of student achievement data often mean that students spend significant amounts of time collecting and

analyzing massive amounts of data that cannot be used to reliably predict relationships. The result is that numerous studies are conducted on leadership and learning without contributing significantly to knowledge (Bridges 1982; Campbell 1979; Haller 1979; Hallinger 2011a; Heck and Hallinger 2005; Leithwood 2006; Murphy et al. 2007b).

One potential solution to the design dilemmas faced by doctoral researchers, in particular is to conduct doctoral studies in the context of funded projects conducted by faculty members. This solution ensures that students will have access to higher quality, more comprehensive data that enables them to apply more sophisticated conceptual models and statistical methods. We recognize that this may run counter to norms in some institutions that require students to collect their own data in doctoral dissertations. However, we strongly assert that the quality test of a doctoral study should be the potential to contribute to knowledge. It should not be based on the procedural steps in conducting a study that cannot contribute to knowledge because of weak data.

We close this discussion of research designs and methods with a recommendation for scholars to be more attentive to the validation of the PIMRS instrument when using it in different cultural contexts. During the early years of its use, several scholars were explicit in undertaking validation studies of the PIMRS in the course of their substantive investigations (e.g., Hallinger 1983; Howe 1995; Jones 1987; Leitner 1990; Taraseina 1993; Wotany 1999). This reflected the need to substantiate the boundaries of the instrument's reliability and validity. The current volume has further substantiated and updated the reliability and validity of the PIMRS. Nonetheless, as discussed in Chaps. 4 and 5, additional research is needed in order to examine the validity of the PIMRS across different cultural contexts. Validation studies of this nature should be conducted when the PIMRS is used in cultural or organizational contexts where such an examination has yet to be conducted. Guidance for how to carry out such studies has been provided in Chaps. 4 and 5. All PIMRS studies, but validation studies in particular, are further advised to analyze data at multiple levels (i.e., full score, dimensions, functions).

Depending upon the norms of a given institution, a validation study could stand on its own as a doctoral dissertation, or be conducted in concert with reporting results related to a 'substantive' research question. In the authors' opinion, a validation study would incorporate the following components:

- Discussion of the translation and back translation procedures,
- Testing reliability of the PIMRS Principal Form using Cronbach's *alpha* test and the PIMRS teacher Form using the Gen Theory test (see Chap. 4),
- Analyzing the internal validity of the PIMRS forms modeled after the methods included in Chap. 5.[4]

[4]Current validation studies using these methods are underway for Spanish (Latin American) and Turkish language forms of the instrument.

7.2.4 Recommendations for Improving Research Quality

More than 90 % of studies that have used the PIMRS were conducted in the context of graduate student research. In our view, this feature of the research represents a type of 'contextual constraint' that must be considered when setting out to undertake a study of school leadership. Specifically, graduate students undertake their studies with some combination of the following contextual constraints:

- Total time constraint with respect to completion of their study in a limited period of time;
- Ongoing time constraint in terms of focusing on the research process since the modal graduate student in educational administration is a part-time professional student;
- Knowledge limitations with respect to research training that have specific implications for methodological skills and capacity;
- Supervisory constraints since many dissertation supervisors are not active scholars themselves;
- Research support constraints since relatively few departments of educational leadership, globally, can be said to have the characteristics of strong research cultures.

Indeed the 2011 review of research studies that had used the PIMRS (Hallinger 2011a) found that graduate student research in educational leadership tends to evidence a number of consistent weaknesses. These include selection of idiosyncratic topics of relatively low practical and theoretical value, lack of theoretical frameworks that inform the relationship among selected variables, inadequate sample sizes, and use of weak statistical methods. With these persistent weaknesses in mind, Appendix K presents some basic information that could inform the formulation of future studies of instructional leadership conducted with the PIMRS.

The information contained in Appendix K is intended as a form of practical advice concerning the construction of a study employing the PIMRS to study some aspect(s) of leadership for learning. The table in Appendix K can be interpreted as follows.

- Column A begins with defining the broad purpose of the study in measurable terms.
- Column B specifies the key variables and relationships that address the purpose defined in Column A.
- Column C identifies the type of research design often associated with empirical tests of the specified variables. Note that more than one research design can be employed to study a particular research question. For example, if one were intending to study the effects of a training program on the instructional leadership of principals, the preferred research design would be either experimental or quasi-experimental. However, researchers employing convenience data could also examine program impact through a correlational, qualitative, or mixed methods research design, though the results would not be as conclusive.
- Column D describes the general kind of statistical model that is used to analyze relationships (i.e., univariate, bivariate, multivariate) for the different studies.

- Columns E and F offer *general guidelines* on the minimum sample size required in order to test the statistical models specified in the previous columns. Note that these are *minimum requirements* and that the actual sample requirements will vary according to the number of variables being measures (e.g., in multivariate studies).
- Columns G and H identify the statistical tests that would typically be used in examining the associated models.
- Column I identifies the common statistics that will be reported from these tests,
- Column J identifies studies that have studied these topics using related though not necessarily the exact same research designs and statistical tests.

The value of Appendix K lies in guiding the researcher to take into account the full set features that contribute to quality research. As noted above, past reviews have found that researchers often fail to address one or more of these elements in their research (Hallinger 2011a; Pedhazur and Schmelkin 1991). The information in Appendix K can be used in several ways to inform the development of quality research studies in this domain.

Prior to using the table, researchers would begin by defining the focus of their research and transforming that focus into researchable questions and possibly hypotheses. Even at this initial stage, Appendix K could serve a useful purpose by providing an indication to the researcher of the technical requirements for carrying out a study with their particular focus and approach. For example, Appendix K illustrates the different technical requirements (e.g., sample, statistical tests) associated with examining the effects of gender on principal instructional leadership (i.e., Row 2) as opposed to studying the relationship between gender, principal instructional leadership and collective efficacy of teachers or student achievement.

After defining the proposed research questions, the table can be employed as a tool in planning the specific elements and steps to be carried out in the study. The table foreshadows the decisions that will need to be made in conducting the different types of studies. Note, however, that the table neither includes the full set of *general research foci* (i.e., Column A) that could be addressed, nor the full set of variables (i.e., Column B) associated with each of those research foci.

7.3 Conclusion

This book is located within the intellectual lineage of research that has sought to understand how school principals contribute to learning in schools (Bossert et al. 1982; Bridges 1967; Erickson 1979; Gross and Herriot 1965; Hallinger and Heck 1996a, b, 1998, 2010; Heck et al. 1990; Heck and Hallinger 2014; Leithwood and Montgomery 1986; Leithwood et al. 2006, 2008, 2010a, b; Lipham 1981; Pitner 1988; Robinson et al. 2008; Witziers et al. 2003). Scholars now largely concur that significant progress has been made in understanding the nature of leadership effects on school improvement and student learning (Hallinger 2011a, b, 2014;

Leithwood et al. 2006; Robinson et al. 2008; Sleegers et al. 2014). Leithwood and his colleagues recently summed up this position:

> School leaders are capable of having significant positive effects on student learning and other important outcomes… Indeed, enough evidence is now at hand to justify claims about significant leadership effects on students that the focus of attention for many leadership researchers has moved on to include questions about how those effects occur. (Leithwood et al. 2010a, b, p. 1)

The authors have noted, with some dismay, that despite the large number of PIMRS studies conducted to date, knowledge accumulation remains circumscribed. We have offered our observations as to the causes for this as well as suggestions on how to proceed more productively. Thus, as research with the PIMRS continues, we hope to see increased quality in the conduct of individual studies and evidence of further knowledge accumulation.

Only if there is improvement in the overall conceptualization and design of studies (Heck and Hallinger 2005) will the potential of this program of research on learning with the PIMRS be realized. Then we will begin to see more progress on understanding the nature of the paths that link instructional leadership and student learning. To the extent that this scenario unfolds, scholars will be able to undertake substantive reviews of topics embedded in the PIMRS corpus of research using both systematic review and meta-analytic methods (see Hallinger 2013a, b).

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Appendix A
Meta-Analysis of Reliability Results for the PIMRS Principal Form

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Author	Year	Data source	Nation	School level	N (P)	Whole scale	Create mission	Man instn	Develop climate	Frame goals	Comm goals	Sup & eval	Coord curric	Mon prog	Highly visible	Incent tchers	Prof deve	Incent lrning	Inst time
Anderson	2006	Extract	USA	Sec	190	–	0.90	0.92	0.87	–	–	–	–	–	–	–	–	–	–
Babcock	1991	Extract	USA	Pri	213	–	–	–	–	0.82	0.75	0.69	0.72	0.64	0.65	0.66	0.76	0.68	0.76
Carson	2012	Extract	USA	Sec	77	0.91	0.79	0.87	0.80	0.68	0.71	0.73	0.81	0.75	0.51	0.47	0.79	0.68	0.66
Dunn	2010	Extract	USA	Pri/Sec	128	0.94	–	–	–	0.86	0.86	0.57	0.88	0.85	0.79	0.86	0.86	0.85	0.60
Goldring	2012	Raw	USA	Pri/Sec	58	0.96	0.84	0.93	0.92	0.79	0.74	0.83	0.83	0.85	0.70	0.77	0.81	0.75	0.72
Greb	2011	Raw	USA	Pri	31	0.85	0.80	0.83	0.59	0.80	0.76	0.88	0.75	0.65	0.68	0.65	0.61	0.67	0.61
Hallinger	2013	Raw	Thai	Pri/Sec	1195	0.96	0.88	0.91	0.94	–	–	–	–	–	–	–	–	–	–
Long	2008	Raw	USA	Sec	67	0.99	0.95	0.97	0.97	0.92	0.88	0.93	0.92	0.92	0.90	0.92	0.92	0.91	0.90
Lyons	2010	Raw	USA	Sec	15	0.91	0.84	0.88	0.77	0.64	0.79	0.24	0.86	0.82	0.54	0.70	0.26	0.68	0.70
Minus	2010	Extract	USA	Mid	62	–	–	–	–	0.81	0.77	0.81	0.71	0.80	0.75	0.48	0.73	0.80	0.75
Munro	2009	Raw	USA	Pri	35	0.93	0.80	0.88	0.85	0.63	0.74	0.77	0.74	0.81	0.62	0.66	0.78	0.74	0.78
Nogay	1995	Extract	USA	Sec	61	0.93	–	–	–	0.86	0.83	0.60	0.83	0.72	0.67	0.74	0.72	0.71	0.72
Peariso	2011	Extract	USA	Sec	36	–	–	–	–	0.63	0.62	0.56	0.67	0.73	0.58	0.56	0.62	0.72	0.79
Todd	2006	Raw	USA	Sec	122	0.97	0.92	0.94	0.94	0.93	0.81	0.88	0.88	0.87	0.87	0.51	0.90	0.86	0.88
Wang	2011	Raw	China	Sec	23	0.98	0.90	0.91	0.96	0.88	0.84	0.85	0.80	0.92	0.88	0.82	0.80	0.92	0.80
Wong	2010	Raw	Malay	Pri/Sec	195	0.94	0.83	0.88	0.90	0.77	0.74	0.77	0.77	0.82	0.82	0.64	0.77	0.76	0.84
Summary statistics					**2508**	**0.96**	**0.88**	**0.91**	**0.93**	**0.85**	**0.79**	**0.80**	**0.83**	**0.82**	**0.78**	**0.74**	**0.82**	**0.80**	**0.80**

Note These analyses include all data sets comprised of 15 or more principals. All calculations are based upon Cronbach's *alpha* test of internal consistency. "Extract" refers to *alpha* coefficients extracted from research reports. "Raw" refers to our own analysis of data from secondary data sets

Appendix B
Meta-Analysis of Reliability Results for the PIMRS Teacher Form

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Variable		Whole scale	Create mission	Man instn	Devel climate	Frame goals	Comm goals	Sup & eval	Coord curric	Mon prog	High visible	Incent tchers	Prof deve	Incent lrng	Inst time	N tchrs	N schls	Tchrs per schl	N studies
Gen theory reliability (from raw data)																			
Culture	USA	0.99	0.98	0.98	0.98	0.96	0.96	0.94	0.95	0.95	0.91	0.95	0.93	0.93	0.91	394	45	10	8
	Asia	0.99	0.96	0.96	0.99	0.93	0.94	0.92	0.92	0.93	0.94	0.96	0.95	0.97	0.94	154	16	15	3
Level	Primary	0.99	0.98	0.98	0.99	0.97	0.97	0.94	0.97	0.96	0.93	0.96	0.96	0.96	0.94	339	29	11	6
	Secondary	0.99	0.95	0.97	0.98	0.91	0.93	0.94	0.93	0.92	0.91	0.96	0.92	0.90	0.91	263	40	13	6
Cronbach's *alpha* reliability (from extracted data)																			
Culture	USA	0.97	0.90	0.92	0.94	0.90	0.88	0.87	0.89	0.88	0.83	0.83	0.87	0.91	0.86	296	38	8	9
	Asia	0.98	–	–	–	0.90	0.88	0.85	0.88	0.87	0.80	0.81	0.88	0.86	0.86	277	45	6	4
Level	Primary	0.97	0.90	0.92	0.94	0.91	0.89	0.87	0.89	0.87	0.82	0.84	0.90	0.88	0.87	357	41	9	16
	Secondary	0.98	–	–	–	0.92	0.90	0.88	0.91	0.84	0.86	0.86	0.91	0.88	0.91	225	5	45	1

Appendix C
Construct Map for the Dimension, *Defines the School Mission*

Higher Level

Level	Definition	Response items
Advanced	The principal defines a clear school mission that focuses on student academic achievement, is visible in the life of the school, supported by staff, and influences school-level decisions.	The principal works with staff to ensure that the school has a clear mission focused on academic progress of its students. Principal ensures that school goals are widely known, understood, and visible in the daily life of the school through the frequent use of multiple communication channels. Principal frequently incorporates data on past/current student performance in formulating and assessing progress on goals.
Proficient	The principal defines clear school goals that are known and supported by teachers but is less active and consistent in making the mission visible and influential in driving school decisions.	The principal defines an explicit statement of a school mission. School mission and academic goals have been communicated to staff and community and are sometimes visible in the schools. Data on student performance is sometimes used to frame and assess progress on school goals. Goals are sometimes used to drive decisions related to curriculum, instruction, and school improvement.
Basic	The principal has set school goals but they may lack academic focus. Communication of goals is less visible, and only occasionally influences school decision-making.	The principal sets school goals but may not achieve a clear school mission due to conflicting academic or non-academic goals. The principal sometimes communicates the school goals but may fail to achieve staff support. In general, goals are only sometimes visible in the school and less frequently used to guide decisions or assess school-wide progress.

Lower Level

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Appendix D
Construct Map for the Dimension, *Manages the Instructional Program*

Higher Level

Level	Definition	Response Items
Advanced	The principal is visibly engaged in using multiple strategies to develop the quality of teaching and learning and ensure that assessments of student learning progress drive curriculum and instructional decision-making.	Principal provides focused instructional support to teachers and ensures that teachers are meeting a high standard of performance. The principal ensures that the curriculum is well aligned to school learning objectives and assessments, and maintains an ongoing awareness of student progress within and across classrooms and grades within the school.
Proficient	The principal demonstrates concern for developing the quality of teaching and learning in school but is less visible and active in leading school-wide efforts to drive academic performance forward.	Principal sometimes engages in activities aimed at direct instructional development with teachers and in using tests and other performance measures to assess progress toward school goals. The principal is moderately involved in coordinating the curriculum across grades and subjects and ensuring that goals for student progress at the classroom and school levels drive decisions in curriculum and instruction.
Basic	The principal demonstrates limited or inconsistent engagement with teachers in efforts to directly improve the quality of teaching and learning at either the classroom or school-wide level.	Principal infrequently or inconsistently engages in activities with teachers that are aimed at direct instructional development. The principal is seldom involved in ensuring coordination of the curriculum across grades/subjects or visible in using tests or other performance measures to assess progress toward school goals. Offers limited direction in ensuring that goals for student progress at the classroom and school levels drive decisions in curriculum and instruction.

Lower Level

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Appendix E
Construct Map for the Dimension, *Develops a Positive School Learning Climate*

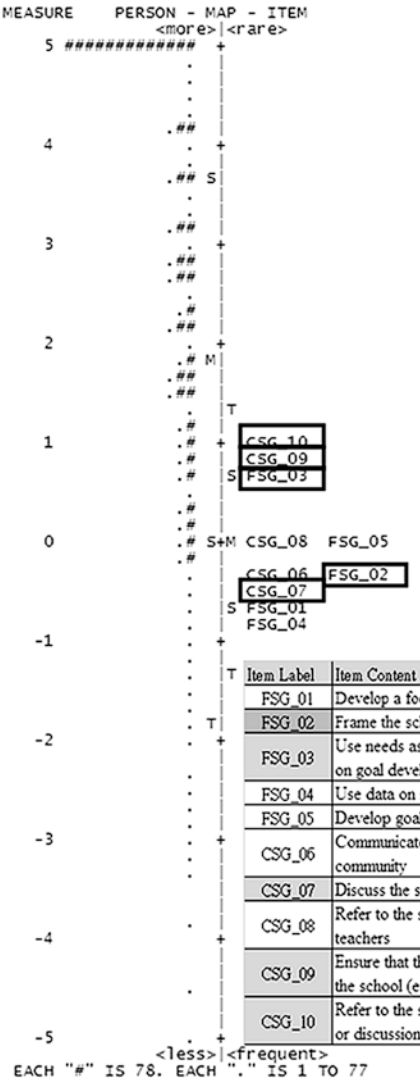
Higher Level

Level	Definition	Response Items
Advanced	The principal is actively engaged in the use of multiple strategies aimed at developing a school learning climate that conveys high expectations and standards for teachers and students, fosters an academic press for student learning, and supports continuous improvement of teaching practice.	The principal visibly models values and practices that contribute to a positive learning climate and support the continuous improvement of teaching and learning in school. Principal is able to create an 'academic press' through communicating high standards and expectations for teachers and students. Provides tangible support to teachers through policies and practices that value teaching and learning in the school. The principal uses both formal and informal ways of motivating teachers and students, and gains the participation of the whole staff in important inservice activities.
Proficient	The principal is moderately engaged in the use of multiple strategies aimed at developing a school learning climate that conveys high expectations and standards for teachers and students, fosters an academic press for student learning, and supports continuous improvement of teaching practice.	The principal models values and practices that contribute to a positive learning climate and support the continuous improvement of teaching and learning in school. Principal is less consistent in enacting coherent strategies that create an 'academic press' in the school. Sometimes provides support to teachers through policies and practices that value teaching and learning in the school. The principal seeks to motivate teachers and students, but the implementation of strategies is somewhat inconsistent. Selection of professional development activities for teachers is implicitly linked to school goals. The principal encourages staff to participate in inservice development but may be less visible in participating him/herself.
Basic	The principal may articulate a concern for the school's learning climate but fails to actively model high expectations and consistently enact strategies that create academic press and support the continuous improvement of teaching and learning.	The principal does not explicitly model a commitment to developing a positive learning climate and the continuous improvement of teaching and learning in school. Principal actions aimed at creating an 'academic press' in the school are inconsistent and lack coherence. Principal only demonstrates occasional attention to policies and practices that value teaching and learning in the school. Personal efforts to motivate teachers and students are occasional and rewards are seldom integrated into the school's policies. The principal is not proactive in identifying, selecting or implementing professional development as a strategy for school improvement.

Lower Level

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Appendix F
Wright Map for *Defines the School Mission* (PIMRS Teacher Short Form)

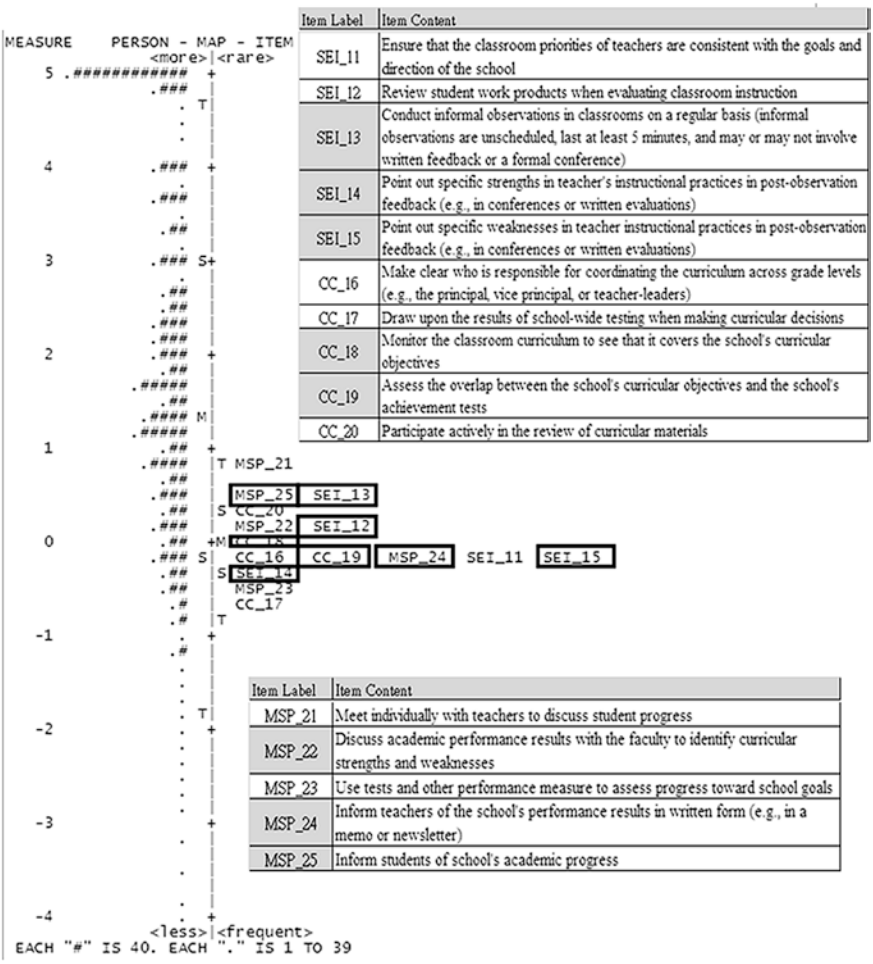


Item Label	Item Content
FSG_01	Develop a focused set of annual school-wide goals
FSG_02	Frame the school's goals in terms of staff responsibilities for meeting them
FSG_03	Use needs assessment or other formal and informal methods to secure staff input on goal development
FSG_04	Use data on student performance when developing the school's academic goals
FSG_05	Develop goals that are easily understood and used by teachers in the school
CSG_06	Communicate the school's mission effectively to members of the school community
CSG_07	Discuss the school's academic goals with teachers at faculty meetings
CSG_08	Refer to the school's academic goals when making curricular decisions with teachers
CSG_09	Ensure that the school's academic goals are reflected in highly visible displays in the school (e.g., posters or bulletin boards emphasizing academic progress)
CSG_10	Refer to the school's goals or mission in forums with students (e.g., in assemblies or discussions)

Note Item Label includes the name of Function and item number. FSG = Frame the School Goals, CSG = Communicate the School Goals

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Appendix G
Wright Map for *Manages the Instructional Program* (PIMRS Teacher Short Form)



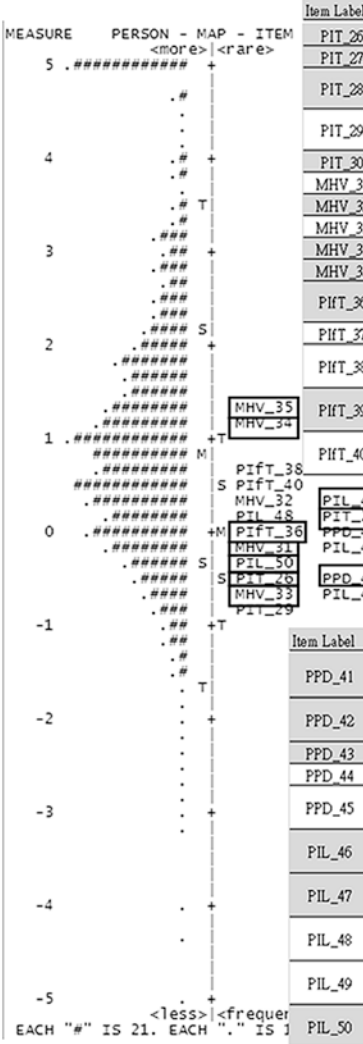
Item Label	Item Content
SEI_11	Ensure that the classroom priorities of teachers are consistent with the goals and direction of the school
SEI_12	Review student work products when evaluating classroom instruction
SEI_13	Conduct informal observations in classrooms on a regular basis (informal observations are unscheduled, last at least 5 minutes, and may or may not involve written feedback or a formal conference)
SEI_14	Point out specific strengths in teacher's instructional practices in post-observation feedback (e.g., in conferences or written evaluations)
SEI_15	Point out specific weaknesses in teacher instructional practices in post-observation feedback (e.g., in conferences or written evaluations)
CC_16	Make clear who is responsible for coordinating the curriculum across grade levels (e.g., the principal, vice principal, or teacher-leaders)
CC_17	Draw upon the results of school-wide testing when making curricular decisions
CC_18	Monitor the classroom curriculum to see that it covers the school's curricular objectives
CC_19	Assess the overlap between the school's curricular objectives and the school's achievement tests
CC_20	Participate actively in the review of curricular materials

Item Label	Item Content
MSP_21	Meet individually with teachers to discuss student progress
MSP_22	Discuss academic performance results with the faculty to identify curricular strengths and weaknesses
MSP_23	Use tests and other performance measure to assess progress toward school goals
MSP_24	Inform teachers of the school's performance results in written form (e.g., in a memo or newsletter)
MSP_25	Inform students of school's academic progress

P. Hallinger and W.-C. Wang, *Assessing Instructional Leadership with the Principal Instructional Management Rating Scale*,
DOI 10.1007/978-3-319-15533-3

Note Item Label includes the name of Function and item number: SEI = Supervise and Evaluate Instruction, CC = Coordinate the Curriculum, MSP = Monitor Student Progress

Appendix H
Wright Map for *Develops a Positive School Learning Climate* (PIMRS Teacher Short Form)



Item Label	Item Content
PIT_26	Limit interruptions of instructional time by public address announcements
PIT_27	Ensure that students are not called to the office during instructional time
PIT_28	Ensure that tardy and truant students suffer specific consequences for missing instructional time
PIT_29	Encourage teachers to use instructional time for teaching and practicing new skills and concepts
PIT_30	Limit the intrusion of extra- and co-curricular activities on instructional time
MHV_31	Take time to talk informally with students and teachers during recess and breaks
MHV_32	Visit classrooms to discuss school issues with teachers and students
MHV_33	Attend/participate in extra- and co-curricular activities
MHV_34	Cover classes for teachers until a late or substitute teacher arrives
MHV_35	Tutor students or provide direct instruction to classes
PIfT_36	Reinforce superior performance by teachers in staff meetings, newsletters, and/or memos
PIfT_37	Compliment teachers privately for their efforts or performance
PIfT_38	Acknowledge teachers' exceptional performance by writing memos for their personnel files
PIfT_39	Reward special efforts by teachers with opportunities for professional recognition
PIfT_40	Create professional growth opportunities for teachers as a reward for special contributions to the school

Item Label	Item Content
PPD_41	Ensure that inservice activities attended by staff are consistent with the school's goals
PPD_42	Actively support the use in the classroom of skills acquired during inservice training
PPD_43	Obtain the participation of the whole staff in important inservice activities
PPD_44	Lead or attend teacher inservice activities concerned with instruction
PPD_45	Set aside time at faculty meetings for teachers to share ideas or information from inservice activities
PIL_46	Recognize students who do superior work with formal rewards such as an honor roll or mention in the principal's newsletter
PIL_47	Use assemblies to honor students for academic accomplishments or for behavior or citizenship
PIL_48	Recognize superior student achievement or improvement by seeing in the office the students with their work
PIL_49	Contact parents to communicate improved or exemplary student performance or contributions
PIL_50	Support teachers actively in their recognition and/or reward of student contributions to and accomplishments in class

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Note Item Label includes the name of Function and item number. PIT = Protect Instructional Time, MHV = Maintain High Visibility, PIfT = Provide Incentives for Teachers, PPD = Promote Professional Development, PIL = Provide Incentives for Learning

Appendix I
SPSS Syntax for Conducting Cronbach's *Alpha* Test of Reliability for PIMRS Principal Form

```
RELIABILITY
/VARIABLES = I_01 I_02 I_03 I_04 I_05 II_06 II_07 II_08 II_09 II_10 III_11
III_12 III_13 III_14 III_15 IV_16 IV_17 IV_18 IV_19 IV_20 V_21 V_22 V_23
V_24 V_25 VI_26 VI_27 VI_28 VI_29 VI_30 VII_31 VII_32 VII_33 VII_34
VII_35 VIII_36 VIII_37 VIII_38 VIII_39 VIII_40 IX_41 IX_42 IX_43 IX_44
IX_45 X_46 X_47 X_48 X_49 X_50
/SCALE('ALL VARIABLES') ALL
/MODEL = ALPHA.
```

Note After the syntax "/VARIABLES=", the variables denoting the name of items were written. For example, the variables from "I_01" to "X_50" are the names of the 50 items in PIMRS

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Appendix J
SPSS Syntax for Conducting the Gen Theory Test of Reliability for the PIMRS Teacher Forms

```
GLM I_01 I_02 I_03 I_04 I_05 II_06 II_07 II_08 II_09 II_10 III_11 III_12 III_13
III_14 III_15 IV_16 IV_17 IV_18 IV_19 IV_20 V_21 V_22 V_23 V_24 V_25 VI_26
VI_27 VI_28 VI_29 VI_30 VII_31 VII_32 VII_33 VII_34 VII_35 VIII_36 VIII_37
VIII_38 VIII_39 VIII_40 IX_41 IX_42 IX_43 IX_44 IX_45 X_46 X_47 X_48
X_49 X_50 BY School_CODE
/WSFACTOR = items 50 Polynomial
/METHOD = SSTYPE(3)
/CRITERIA = ALPHA(.05)
/WSDESIGN = items
/DESIGN = School_CODE.
```

In the above syntax, "School_CODE" was the variable indicated the names or the serial numbers of schools. The variables from "I_01" to "X_50" are the names of the PIMRS items. After administering the above syntax, we can obtain the results including the tables shown in the Appendix K below as an example, where the elements were used in the following procedure. The calculation for the Gen Reliability also needs the formula (5) in Chap. 4 which is written here again

$$\widehat{\rho}_{\mathrm{p}} = \frac{[MS_{\mathrm{p}} - MS_{\mathrm{p\times t}} - MS_{\mathrm{p\times i}} + MS_{\mathrm{e}}]}{[MS_{\mathrm{p}} - MS_{\mathrm{p\times t}} - MS_{\mathrm{p\times i}} + MS_{\mathrm{e}}] + MS_{\mathrm{e}}}$$

where $\widehat{\rho}_{\mathrm{p}}$ denotes Gen Reliability. The materials in this formula (e.g. MS_{p}, $MS_{\mathrm{p\times t}}$, $MS_{\mathrm{p\times i}}$, and MS_{e}) for calculation of $\widehat{\rho}_{\mathrm{p}}$ can be found in Appendix B. See Appendix B, Mean Square of "items × School" and "Error(items)" in Within-Subject Table represent $MS_{\mathrm{p\times i}}$ and MS_{e} in the formula separately, and Mean Square of "School_CODE" and "Error" in Between-Subject Table represent MS_{p} and $MS_{\mathrm{p\times t}}$, respectively. Therefore, in this example, we can obtain the values of materials, $MS_{\mathrm{p\times i}} = 0.831$, $MS_{\mathrm{e}} = 0.559$, $MS_{\mathrm{p}} = 19.142$, and $MS_{\mathrm{p\times t}} = 11.241$. Finally we calculated the Gen Reliability in this case as:

$$\widehat{\rho}_{\mathrm{p}} = \frac{[19.142 - 11.241 - 0.831 + 0.559]}{[19.142 - 11.241 - 0.831 + 0.559] + 0.559} = 0.932$$

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Tests of within-subjects effects						
Measure: MEASURE_1						
Source		Type III sum of squares	df	Mean square	F	Sig.
Items	Sphericity Assumed	762.573	49	15.563	27.820	0
	Greenhouse-Geisser	762.573	16.961	44.960	27.820	0
	Huynh-Feldt	762.573	49.000	15.563	27.820	0
	Lower-bound	762.573	1.000	762.573	27.820	0
Items * School_CODE	Sphericity Assumed	1140.169	1372	0.831	1.486	0
	Greenhouse-Geisser	1140.169	474.912	2.401	1.486	0
	Huynh-Feldt	1140.169	1372.000	0.831	1.486	0
	Lower-bound	1140.169	28.000	40.720	1.486	0.124
Error(items)	Sphericity Assumed	1096.438	1960	0.559		
	Greenhouse-Geisser	1096.438	678.446	1.616		
	Huynh-Feldt	1096.438	1960.000	0.559		
	Lower-bound	1096.438	40.000	27.411		

Tests of between-subjects effects					
Measure: MEASURE_1 Transformed Variable: Average					
Source	Type III sum of squares	df	Mean square	F	Sig.
Intercept	41591.012	1	41591.012	3699.898	0.000
Error	535.98	28	19.142	1.703	0.060
School_CODE	449.645	40	11.241		

Appendix K
Planning Tool for Studies of Instructional Leadership

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	A	B	C	D	E	F	G	H	I	J
	Research Foci: the general purpose of the study is to describe and/or analyze	Possible variables and variables relationships	Research design	Statistical model	Min sample tchers school	Minimum sample principals	Basic analysis	Advanced analysis	Statistics	Exemplar studies
1	Instructional leadership profile of a group of principals	PIMRS dimensions or functions	Post-hoc cross-sectional	Univariate	15–30	1	Cross Tab	–	Descriptive	Hallinger and Muiphy (1985)
2	Antecedent variable effects on principal instructional leadership	Effect of principal gender and/or prior teaching experience on IL dimensions or functions	Post-hoc cross-sectional	Bivariate	None	30	Cross Tab, T-test	Regression	Descriptive, p value, betas	Babcock (1991), Cunningham (1987), Gaziel et al. (2012), Marin (2013), McCabe (1993), Wang (2011)
3	School context variable effects on on instructional leadership	Effect of school size or school level on IL dim's or functions	Post-hoc cross-sectional	Bivariate	None	30	ANOVA	Regression	Descriptive, ANOVA table or multilevel table, betas,	Heck (1993), Schoch (1992)

	A	B	C	D	E	F	G	H	I	J
	Research Foci: the general purpose of the study is to describe and/or analyze	Possible variables and variables relationships	Research design	Statistical model	Min sample tchers school	Minimum sample principals	Basic analysis	Advanced analysis	Statistics	Exemplar studies
4	Antecendent effect on IL on outcome variable	Gender effects on principal IL on student achievement	Post-hoc cross-sectional	Multi-variate	None	10–20 times no. of parameters	Path Analysis	SEM	Descriptive, model data fit, coefficients in model, effect	Geiselman (2004), Munroe (2009)
5	Impact of training program on principal instructional leadership	Pre and post measures of instructional leadership	Longitudinal quasi/experimental	Bivariate	15–30	1	Repeated Measures ANOVA	Growth modeling		Bowers and White (2014), Goff et al. (2014), Maag Merk (2014)
6	Instructional leader-ship effects on school conditions or student learning	Effect of IL on teacher commit-ment or school climate	Post-hoc cross-sectional	Bivariate	15–30	1	Correlation	Regression	Descriptive, correla-tion and regression coefficient, test and effect size	Jones (1987), Leithwood and Jantzi (1999), MacNeil (1992), Meek (1999), O'Day (1984)

	A	B	C	D	E	F	G	H	I	J
	Research Foci: the general purpose of the study is to describe and/or analyze	Possible variables and variables relationships	Research design	Statistical model	Min sample tchers school	Minimum sample principals	Basic analysis	Advanced analysis	Statistics	Exemplar studies
7	Instructional leadership effects on different types of schools	Compare IL ratings of principals in high vs low performing schools	Cross-sectional, contrasting groups	Bivariate	None	30	T-test, ANOVA	–	Descriptive, effect size	Hallinger and Heck (2011b)
8	Impact of treatment on principal instructional leadership on student achievment	Impact of coaching on principal instructional leadership on student achievment	Longitudinal quasi/experimental	Multivariate	None	30	Repeated Measures MANOVA	SEM	Descriptive, effect size, model coefficients	Silva et al. (2011)
9	Effect of IL on school conditions on student learning	IL effects on school capacity on student achievement	Post-hoc cross-sectional	Multivariate	None	10–20 times no. of parameters	Path Analysis	SEM	Descriptive, model data fit, coefficients in model, effect	Dale (2010), Fancera (2009), Hallinger and Heck (2010), Krüger et al. (2007), Leithwood and Jantzi (2000), Leitner (1994), Marks and Printy (2003)

	A	B	C	D	E	F	G	H	I	J
	Research Foci: the general purpose of the study is to describe and/or analyze	Possible variables and variables relationships	Research design	Statistical model	Min sample tchers school	Minimum sample principals	Basic analysis	Advanced analysis	Statistics	Exemplar studies
10	Antecedent and/or context effects on IL on school conditions on student learning	Effect of principal gender on IL on school capacity on student learning	Post-hoc cross-sectional	Multivariate	None	10–20 times no. of parameters	Path Analysis	SEM	Descriptive, coefficient, test and effect size	Hallinger et al. (1996), Heck and Hallinger (2009), Heck et al. (1990), Leithwood et al. (2010), Shatzer (2009)
11	Effect of change in instructional leadership on change in school conditions on change in student learning	Effect of change in instructional leadership on change in school capacity or classroom practices on change in student learning	Post-hoc longitudinal	Multivariate	10 min	10–20 times no. of parameters	Path Analysis	Multi-level SEM	Descriptive, regression coefficient, effect size	Heck and Hallinger (2009, 2010, 2014), Sammons et al. (2014), Sleegers et al. (2014), Thoonen et al. (2012)
12	Reciprocal effects of instructional leadership, and school conditions and student learning	Interactions between IL, school capacity (or teacher practices) and student achievement	Post-hoc longitudinal	Multivariate	10	10–20 times no. of parameters	Path Analysis	Multi-level SEM	Descriptive, regression coefficient, and effect size	Heck and Hallinger (2011)

Appendix L
PIMRS Reference List 1983–2015

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