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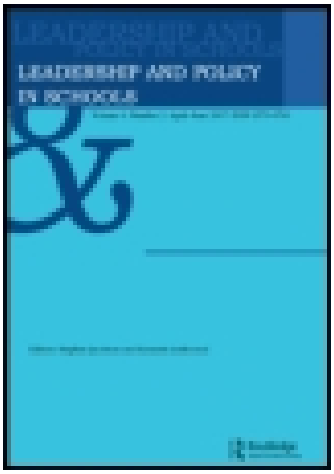

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School Principal Expertise: Putting Expert-Aspiring Principal Differences in Problem Solving Processes to the Test

James P. Spillane [a] , Kathryn Weitz White [a] & Jennifer L. Stephan [a]
[a] Northwestern University , Evanston, Illinois, USA
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School Principal Expertise: Putting Expert-Aspiring Principal Differences in Problem Solving Processes to the Test

JAMES P. SPILLANE, KATHRYN WEITZ WHITE, and JENNIFER L. STEPHAN
Northwestern University, Evanston, Illinois, USA

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This article reports on differences between expert and aspiring principals. Following the work of Leithwood and colleagues, we asked expert and aspiring principals to respond to ill-structured written problem scenarios. Our sample of 44 included 20 expert principals and 24 aspiring principals. The aspiring principals were from a cohort of participants in a professional development program for aspiring principals in a large Midwestern urban school district. Drawing from that same school district, the expert principals were selected based on an analysis of longitudinal teacher survey data and student achievement data. We found statistically significant differences between expert and aspiring principals on five problem-solving processes, three of which were in line with prior hypotheses generating research on principal expertise.

INTRODUCTION

Though organizational theorists have long recognized the pivotal role of expertise to the work of school leadership and management (Barnard, 1938), scholarship in educational administration has concentrated mostly on school leadership roles, functions, and structures. Until recently, leadership expertise has received short shrift in school administration scholarship (Knapp, Copland, & Talbert, 2003; Leithwood, Seashore-Louis, Anderson, & Wahlstrom, 2004). Still, as a field, we seem convinced that we understand what constitutes school leadership and management expertise and believe

Address correspondence to James P. Spillane, Distributed Leadership Principal Investigator, Northwestern University, School of Education and Social Policy, 2020 Campus Drive, Evanston, IL 60201, USA. E-mail: j-spillane@northwestern.edu

we can teach this material to aspiring and practicing principals, as witnessed by the myriad of school principal preparation and professional development programs. As criticisms about the quality of school principal preparation and staff development programs increase (Hess, 2005; Levine, 2005; McCarthy, 1999; Tucker & Codding, 2002), so does the need to generate an empirically robust knowledge base on school leadership and management expertise. Moreover, policymakers increasingly hold principals accountable for student achievement, but principals' ability to meet this challenge will ultimately depend on their expertise (Barth, 1986; Leithwood & Montgomery, 1984).

There have been some notable efforts to redress the inattention to leadership and management expertise over the past decade as scholars began to systematically examine principals' thinking about their work. Following the lead of cognitive psychologists, some scholars have focused on principals' mental scripts, working to identify what distinguishes expert from typical principals (Leithwood & Steinbach, 1990, 1995; Wassink, Sleegers, & Imants, 2003). "Increasingly those involved in research and training in educational leadership have acknowledged the need for better information on how expert school leaders think about what they do" (Hallinger, Leithwood, & Murphy, 1993, p. 72).

Building on earlier work, this article tests some hypothesized differences between expert and aspiring principals' problem solving strategies (Leithwood & Steinbach, 1990, 1995). While previous studies focused on differences between expert and typical principals, in this article we report on differences between expert and aspiring principals. Using findings from research by Ken Leithwood and his colleagues and others identifying differences between the problem-solving strategies of expert and typical principals, we investigate whether expert and aspiring principals employ different problem-solving processes.

Our article is organized like this: we begin by reviewing the theoretical and empirical anchors for our work and then describe our research methodology. Next, we present our findings with respect to differences between expert and aspiring school principal problem-solving strategies based on a study of 20 expert principals and 24 aspiring principals. We follow this with a discussion of our findings.

THEORETICAL AND EMPIRICAL ANCHORS

Our study is framed by theoretical work on expertise and empirical research on principals' problem-solving processes. In this section, we briefly consider the nature of expertise in cognitive science and then explore the empirical knowledge base on school principal expertise, paying particular attention to their problem solving—one dimension of expertise. Based on this review, we identify 22 problem-solving processes that differentiate

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expert and typical principals; these problem-solving differences served as the hypotheses that we tested in the study reported in this article.

Expertise

The constitution of expertise has been a central line of inquiry in the relatively new field of cognitive science. Scholars have explored the nature of expertise in domains as diverse as playing chess and physics. With expertise in a particular domain, we develop more content knowledge and modify our approach to processing problems we encounter.

Studies have shown that the problem-solving processes used by experts in domains such as physics and chess were similar to those processes used by principals (Leithwood & Stager, 1989; Leithwood & Steinbach, 1992), suggesting that experts across domains may use similar processes when solving problems particular to their domains. While expertise is domain sensitive, some general lessons can be gleaned from the cognitive science literature. First, interpretation is one strength of experts; experts work to understand and interpret the problems they encounter, asking questions to clarify and narrow the problem situation (Chi, Feltovich, & Glaser, 1981). Second, experts tend to be more reflective in their actions, better able to regulate their problem-solving processes compared with typical principals. This may be due to the fact that experts possess more relevant information than typical principals for the problems they encounter (Glaser & Chi, 1988; Leithwood & Stager, 1989). Third, experts tend to articulate more complex goals and are able to represent problems in more abstract terms than typical principals, which may help account for why experts are better able to sequence their activities into a planned approach for developing a solution (Glaser & Chi, 1988).

School Principals' Problem Solving Processes

Scholars have attended more closely to school leaders' expertise and cognition over the past few decades. A key dimension of this work centers on principals' problem solving processes, focusing on the role of problem solving in the principal's job (Allison, 1996; Hallinger, Leithwood, & Murphy, 1993; Hemphill, 1958). This work, chiefly in the hypotheses-generating mode, documents differences in problem-solving processes between "expert" school administrators and their more typical colleagues (Leithwood & Stager, 1989; Leither, Steinbach, & Raun, 1995). Expert problem solvers differ from their more typical colleagues on dimensions that include the nature of their goals, strategies they use to influence the work of schools and decision-making processes (Leithwood, Begley, & Cousins, 1992). Expert principals are better able to regulate their own problem-solving processes and are more sensitive to the task demands and social contexts within which tasks are to be solved

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(Leithwood & Steinbach, 1995). Building on this work, Bullock, James, and Jamieson (1997) found more domain-specific problem-solving processes, revealing differences in decision making, delegation, and interpersonal skills.

Reviewing the literature, we identified 22 problem-solving processes that prior work suggests distinguish expert from novice leaders. Our sample included individuals who were not yet principals, but given their varying degrees of previous experience, we have identified them as "aspiring" principals rather than "novice." In this article, we compare these aspiring principals to the expert principals in our study. These codes, their definitions, and examples of principal responses are found in Appendix A. Expert principals recount relevant anecdotes, identify and overcome constraints, focus on student program quality, gather data, keep parents informed, plan an approach to the problem, have a long-term outlook, and stress follow-up (Leithwood & Stager, 1989; Leithwood, Steinbach, & Raun, 1995). In addition, experts face conflict, delegate authority to staff, and analyze the scenario or problem by questioning assumptions or the structure of the scenario (Bullock, James, & Jamieson, 1997; Copland, 2003). Typical principals recount poor anecdotes, accept constraints or do not explain how to overcome constraint, avoid conflict, have staff- rather than student-oriented goals, make assumptions rather than gathering data, stress keeping parents happy, focus on feelings of others (i.e., staff, students, and parents), and focus on consequences for themselves (Bullock, James, & Jamieson, 1997; Leithwood & Stager, 1989; Leithwood, Steinbach, & Raun, 1995). The study reported in this article puts these problem-solving processes to the test by examining differences between expert and aspiring principals for twenty-two processes.

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METHODOLOGY

Subject Selection

Identifying expert principals is difficult. Some studies used nominations from district office administrators coupled with interviews that focused on measures of principal effectiveness to distinguish expert from typical principals (Leithwood & Stager, 1989). Other studies have relied on graduate students and university professors to rate the expertise of principals' responses (Allison & Allison, 1993). Considering that our goal was to test hypotheses about differences in problem solving processes of expert and aspiring principals, we sought more "objective" measures for identifying and selecting expert principals for our study.

Using longitudinal teacher survey data at a large Midwestern urban school district from which we drew our sample, we distinguished expert and typical principals based on a combination of leadership and organizational

measures. School response rates for the survey were approximately 75% over the three time points we used in this study. Using prior research, we identified three leadership and seven organizational measures as indicators of improving schools. The leadership measures we used were teacher-principal trust, principal leadership, and instructional leadership (Bryk & Schneider, 2002; Hallinger & Heck, 1998; Purkey & Smith, 1983). Our organizational measures included reflective inquiry, focus on student learning, collective responsibility, peer collaboration, innovation, school commitment, and support for change (Bryk & Driscoll, 1985; Newman & Wehlage, 1995; see Appendix B).

Analyzing the data over three time points (1997, 1999, and 2001), we identified schools that showed increases in the leadership and organizational measures relative to other schools during the tenure of the principal. We labeled these principals as experts. We labeled principals whose schools had flat or slightly declining performance over time as typical. To control for districtwide gains, we calculated changes in leadership and organizational measures over time in *N*-tiles ($N = 113$) in order to capture their movement relative to the other schools in the district. We then matched the expert and typical principal groups so that our sample was similar in terms of the ethnic and socioeconomic characteristics of the student population. Schools with high student mobility were excluded from the study because the more the student body changes from the first of the year to the time of testing the less likely it is that academic performance is related to that particular school's leadership. Our sample of expert principals then is based on measures of school leadership and organizational conditions devised from teacher survey data.

We used school standardized test results as confirmatory evidence for our sampling strategy. While the schools of both expert and typical principals started well below the district average on the Iowa Test of Basic Skills reading and math tests, schools of expert principals were much closer to the district average compared with the schools of typical principals at the end of the five-year period. In this article, we use data from the 20 expert principals in our sample.

We identified aspiring principals by selecting one cohort of participants in a training program for aspiring principals in the same large Midwestern urban school district. The program was designed to provide participants with the certification necessary to be principals. We administered the scenarios to this cohort during the first week of the program.

The Sample

The sample consists of 44 principals, 20 experts, and 24 aspiring principals. The principals in the study were primarily female and over half were African-American (see Table 1).

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TABLE 1 Comparisons of Expert and Aspiring Principals.

	Aggregate (N=44)		Expert (N = 20)		Aspiring (N = 24)	
	Count	% of Total (1)	Count	% of Total (2)	Count	% of Total (3)
Gender						
Men	13	30%	7	35%	6	25%
Women	31	70%	13	65%	18	75%
Total	44	100%	20	100%	24	100%
Race						
African-American	23	52%	5	25%	18	75%
Caucasian	13	30%	8	40%	5	21%
Latino/a	8	18%	7	35%	1	4%
Total	44	100%	20	100%	24	100%
Most recent job experience						
Principal	20	45%	20	100%	0	0%
Assistant principal	8	18%	0	0%	8	33%
Teacher	5	11%	0	0%	5	21%
Reading specialist	3	7%	0	0%	3	13%
Other	8	18%	0	0%	8	33%
Total	44	100%	20	100%	24	100%
Experience as assistant principal or principal						
No	14	32%	0	0%	14	58%
Yes	30	68%	20	100%	10	42%
Total	44	100%	20	100%	24	100%
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Years of teaching experience[†]	12.8	7.5	12.7	6.5	12.8	8.3

[†]Three expert principals were missing data on teaching experience.

Principals had an average of 13 years of experience as a teacher with the range of teaching experience across principals extending from zero to 30 years. Columns (2) and (3) present results disaggregated by expert and aspiring principals. There are no significant differences by gender between expert and aspiring principals (X^2 = 0.52, p-value = 0.47). There are significant differences by race (X^2 = 12.28, p-value = 0.00; p-value for Fisher's Exact test = 0.002), with the vast majority of aspiring principals (75%) being African-American and only one Latino/a aspiring principal. While the most recent job experience for experts, is, by definition, that of a principal, several aspiring principals also have had experience in school administration. Thirty-three percent of aspiring principals reported assistant principal as their most recent job experience. One additional aspiring principal reported having some experience as an assistant principal, although not in her most recent job, while a second aspiring principal reported being a principal, but again not in her most recent job. On average, expert and aspiring principals have nearly the same years of teaching experience, 12.7 for experts compared to 12.8 for aspiring

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principals; a t-test indicates no statistically significant difference (t = 0.053, p-value = 0.96).

Data Collection

Expert and aspiring principals were interviewed and (among other things) asked to respond to six written scenarios (see Appendix C). We modeled the scenarios on the work of Ken Leithwood and his colleagues with two exceptions. First, we did *not* treat "ill-structured" as a subjective property of a problem determined by the school principal, whereas Leithwood and his colleagues asked school principals to order problems in terms of difficulty for them to solve, classifying the most difficult as ill-structured. Instead, we wrote scenarios that would require school principals to structure the problem before being able to come up with a solution. The vast majority of real-world problems are ill-structured (Frederiksen, 1984). While acknowledging the limitations in this approach, it did allow us to compare the responses of all principals to the same scenarios. In future work, we will also incorporate the strategy of having principals' rank the scenarios in terms of difficulty. Second, we focused four of the six scenarios on problems related to classroom instruction in mathematics and language arts. Experts responded to all six scenarios, but we were partially missing data for two aspiring principals: one aspiring principal responded to the first four scenarios while the other responded to the first three.

Qualitative Data Analysis

All of the audio-taped recordings of principals' interviews were transcribed. A set of cognitive processes and strategies were selected from previous research on principal expertise and developed into codes (Berliner, 1986; Bullock, James, & Jamieson, 1997; Copland, 2003; Leithwood, 1994; Leithwood & Stager, 1989; Leithwood, Steinbach, & Raun, 1995). We developed a manual that outlined the definition of each code, rules for assigning a particular code as well as examples of both the presence and absence of a code. Through this process, a shared understanding of each code was developed among the research team. To determine interrater reliability, a random selection of 40 responses (~15% of the total) was chosen. This sample was independently coded by two raters and a kappa was calculated for each code. Cohen's kappa is an appropriate way to assess interrater reliability of categorical variables because it goes beyond simple percentage of agreement to adjust for agreement due to chance. For eight codes, the kappa is above 0.90, another ten are above 0.70, and four were between 0.57 and 0.65 (see Appendix A). Once an acceptable kappa was achieved, each scenario (stripped of any identifying information) was read and scored for the presence or absence of each code, one code at a time, for each of the 22 codes.

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Quantitative Data Analysis

For principals who responded to each of the six scenarios, the dataset consists of six observations per principal. Two aspiring principals, however, did not respond to all six scenarios. One responded to four scenarios while the other responded to three, so they have four and three observations in the dataset, respectively. The total sample size is 259. Since each principal accounts for multiple observations, the observations are not independent. This design can be thought of as responses nested within principals. We account for this dependency in the analyses using corrected test statistics and standard errors, as described below. The 22 problem-solving processes correspond to 22 separate variables taking the value of 1 or 0, depending on whether a principal used a particular code in responding to a scenario or not.

To investigate the relationship between principal expertise and the use of problem-solving processes, we compared the rates at which experts and aspiring principals used problem-solving processes in their responses, first using chi-square tests and then using logistic regressions that include statistical controls for race, gender, and years of teaching experience.

Study Limitations

There are at least five limitations from a methodological angle. First, our approach to school leadership expertise is individualistic, centered on the school principal. However, by taking this approach, we are unable to examine leadership expertise as a distributed phenomenon. By relying on teacher surveys to identify experts ignores the fact that school leaders, other than the school principal, may account for improvement in school leadership and other organizational measures over time. For example, an assistant principal or curriculum specialist rather than the school principal may be the key provider of leadership for instruction in the building. Similarly, individuals with no formal leadership designation may be critical to leadership in the school. Second, we do not have information on whether the teachers who were surveyed at time one, in a particular school, were the same teachers surveyed at time two and time three, at that school. Hence, it is possible that the teachers at a school changed over time with teachers who were more or less favorable to the school principal. Third, the relatively small sample size may limit the power to detect some true differences between expert and aspiring principals. Although there are 259 observations, there is some dependence among them (accounted for in the analysis) because they are clustered in 44 principals. We do find some significant differences, suggesting that there is adequate power, at least to detect larger differences, and we are careful to not interpret nonfindings as evidence of no statistical differences. Future studies could be designed with greater power to detect smaller differences. Fourth, we did not ask principals to

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rank the difficulty of each scenario. Thus, while we attempted to present "ill-structured problems," we do not have data that indicates they truly were perceived as such by both expert and aspiring principals. Due to the subjective nature of a problem's difficulty, it might be that one or more of the scenarios were actually quite common in an expert principal's experience. Finally, only a limited set of background characteristics was collected for the principals. While the regression analysis statistically controls for the available background characteristics, it is possible that an unmeasured variable could explain differences in the use of problem-solving processes that we attributed to expertise.

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RESULTS

Before examining differences between expert and aspiring principals, we briefly considered which problem-solving processes principals used most frequently. Then we used chi-square tests and logistic regression to analyze the relationship between usage of problem solving processes and principal expertise.

Prevalence of Different Problem Solving Processes

Before testing whether expert and aspiring principals respond differently, it is interesting to note how frequently these codes were found in principal responses generally. Codes that are used very infrequently may be difficult to predict empirically and practically may have little importance. Appendix D shows the rates at which principals used each of the 22 problem-solving processes. Because just 3% of responses involved a poor anecdote, this code was not considered for further analysis.

Expert-Aspiring Principal Differences

To investigate whether expert and aspiring principals differ in their usage of problem solving processes, we first conducted 21 chi-square tests comparing expert and aspiring principals across each of the processes. Table 2 presents the results. Columns (1) and (2) show the rate at which aspiring and expert principals used each problem solving process.[1] Column (3) gives the unadjusted *p*-values from a chi-square test of the hypothesis that there was no difference between expert and aspiring principals in whether a process was used or not. The chi-square test was used because it does not make assumptions about the distribution of the variables and the Rao-Scott correction accounts for dependency among observations. Because of the large number of tests conducted, the *p*-values in Column (3) may indicate a difference between expert and aspiring principals even when no real difference exists

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TABLE 2 Rates of Using Problem Solving Processes. Differences Between Expert and Aspiring Principals.

	Chi-square Test				Logistic Regression			
	Unadjusted Mean		p-value		Adjusted Mean		p-value	
	Aspiring (1)	Expert (2)	Unadjusted (3)	Bonferroni Adjusted (4)	Aspiring (5)	Expert (6)	Unadjusted (7)	Bonferroni Adjusted (8)
Local vs. global solution	0.01	0.52	0.00	0.00	0.01	0.44	0.00	0.00
Relevant anecdote	0.12	0.48	0.00	0.00	0.11	0.46	0.00	0.00
Analyzes scenario	0.06	0.23	0.00	0.02	0.05	0.22	0.00	0.02
Assumptions	0.11	0.30	0.00	0.02	0.09	0.31	0.00	0.04
Long term outlook	0.23	0.09	0.00	0.03	0.23	0.09	0.00	0.06
Stresses follow up	0.12	0.23	0.01	0.29	0.12	0.23	0.01	0.21
Overcomes constraint	0.19	0.31	0.02	0.38	0.21	0.27	0.26	1.00
Consequences for self	0.19	0.29	0.02	0.40	0.20	0.28	0.19	1.00
Student vs. staff oriented goals	0.29	0.43	0.02	0.47	0.28	0.44	0.01	0.23
Informs parents	0.17	0.27	0.03	0.60	0.17	0.28	0.02	0.44
Avoids conflict	0.13	0.04	0.03	0.67	0.12	0.04	0.01	0.21
Pleases parents	0.09	0.14	0.10	1.00	0.09	0.13	0.15	1.00
Gathers data	0.42	0.35	0.28	1.00	0.40	0.37	0.55	1.00
Bring in development	0.17	0.21	0.36	1.00	0.17	0.20	0.56	1.00
Perceives constraints	0.13	0.18	0.43	1.00	0.14	0.13	0.97	1.00
Concerned feelings	0.41	0.36	0.50	1.00	0.37	0.39	0.83	1.00
Internal development	0.32	0.29	0.51	1.00	0.32	0.28	0.37	1.00
Faces conflict	0.12	0.15	0.56	1.00	0.13	0.13	0.99	1.00
External development	0.25	0.23	0.57	1.00	0.26	0.21	0.36	1.00
Delegates/empowers staff	0.23	0.24	0.81	1.00	0.25	0.20	0.20	1.00
Plans approach	0.47	0.48	0.83	1.00	0.48	0.47	0.81	1.00
Control variables	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Adjusted means for logistic regression based on predicted response rate evaluated at means of covariates.
Unadjusted p-value is the p-value of the marginal effect of expert. Chi-square test and logistic regression account for clustering.
Control variables include race, gender, years of teaching, and a dummy variable to indicate whether years of teaching is missing.

(the multiple testing problem). Column (4) adjusts the *p*-values from column (3) for the large number of tests conducted using the Bonferonni adjustment.[2]

Based on the adjusted *p*-values, expert principals differed from aspiring principals across five processes: local vs. global solution, relevant anecdote, analyzes scenario, assumptions, and long-term outlook. For three of the five problem-solving processes, the direction was in line with prior hypotheses generating research on principal expertise. Experts differed most from aspiring principals with respect to having a local solution; experts used a local solution as distinct from a global one in 52% of responses compared to just 1% for aspiring principals. Differences between expert and aspiring principals were also great with respect to using a relevant anecdote; experts used a relevant anecdote in 48% of their responses, whereas aspiring principals used one in only 12% of their responses. This might be expected considering that only one of the 24 aspiring principals in our sample had any experience as a principal. Still, over 40% of aspiring principals had experience as a principal or assistant principal. In addition, expert principals were more likely than aspiring principals to engage in analyzing the scenario by questioning, critiquing, or disagreeing with the structure of the scenario: experts analyzed the scenario in 23% of responses compared to just 6% for aspiring principals, a difference of 17 percentage points.

Two of the statistically significant differences between expert and aspiring principals in our study, however, are in the opposite direction to what we hypothesized based on our review of the principal problem-solving literature. In contrast to earlier work, we found that experts were more likely to make an assumption. While aspiring principals made assumptions about the problem 11% of the time, expert principals made them 30% of the time. Even more surprising, experts were less likely to have a long-term outlook compared with aspiring principals. While aspiring principals attended to the long-term implications or direction of the situation in 23% of cases, experts only did so in 9% of cases.

To check the robustness of these conclusions to other covariates, we estimated 21 logistic regression models using the available background characteristics. Each model predicted a different problem-solving process based on race, gender, years of teaching experience, a dummy variable coded one if years of teaching experience was missing (this applied to 18 of 259 cases), and whether the observation corresponded to an expert or aspiring principal. Columns (5)–(8) of Table 2 present results from these models. The logistic regressions adjust standard errors for the clustering of scenarios within principals. The adjusted mean response rates in columns (5) and (6) show the predicted probability, evaluated at the means of other covariates, of aspiring and expert principals, respectively, using the corresponding problem-solving process. Column (7) and (8) present *p*-values for the marginal effect of being an expert principal. The *p*-values in column (7) are unadjusted, while those in column (8) are adjusted for the large

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number of tests conducted using the Bonferonni adjustment. Qualitatively, the results are quite similar (detailed regression output is available from the authors upon request). The only exception is that the adjusted *p*-value for long-term outlook becomes borderline statistically significant, falling from 0.03 without regression controls to 0.06.

DISCUSSION

Putting the problem-solving processes of expert and typical school principals to the test in a study of 44 expert and aspiring principals, we found some distinct differences between expert and aspiring principals in their problem-solving processes. Our results support some of the expert problem-solving processes identified by Leithwood and associates and other scholars working on school principal cognition. In general, interpretation and reflecting on action problem-solving processes were supported by our analysis. However, our analysis does not provide consistent support for processes related to complex goals, solution processes, and task demands in context. When faced with an ill-structured problem, expert responses more often involved "analyzes the scenario" and makes "assumptions" than aspiring principal responses (a difference of over 15 percentage points in each case).[3] Both of these codes tap into how a principal *interprets* the problem. "Analyzes the scenario" focuses on whether the respondent dissects the scenario before attempting to resolve the problem. Makes "assumptions" is another form of interpreting the scenario because these responses cued the researchers into the principal's prior understanding of how the system works. These assumptions were coded when they limited how the principal could address the scenario. Alternatively, it could be that experts do not perceive these scenarios to be ill-structured but rather routine and thus quickly narrow the problem with a broad generalization.[4] Perhaps perceiving more of the scenarios as routine, expert principals in our sample were more likely to make assumptions. Gathering information about how principals perceived the difficulty of the scenarios in future work would enable us to investigate this issue.

Two of the codes—"relevant anecdote" and "local vs. global solution"—designed to test how often principals "reflect on action" suggest that experts use these strategies much more often than aspiring principals (a difference of over 35 percentage points in each case). Relevant anecdote refers to the principal using her own previous experience to inform her response to the current problem. Expert principals, by definition, should have more relevant personal experience to draw upon. Our blind tests confirm that expert responses use prior experiences more often to address a problem, in 48% of responses compared to just 12% of aspiring principals' responses. Perhaps for similar reasons, expert principals situate the problem scenario in their

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local context more often: 52% of expert responses use a "local vs. global solution" compared to just 1% of aspiring principals' responses. The code "local vs. global solution" asked whether the principal's response was appropriate for any school context, or if there were particulars in the response that made it specific to that principal's local school. Interestingly, expert principals, who have a range of experiences, do not give more global responses than aspiring principals. Taken together, these findings suggest that in problem solving, experts are more likely than aspiring principals to engage in *reflecting on action*.

We also found statistically significant differences between expert and aspiring principals in their "long-term outlook." Experts in our study were less likely than aspiring principals to describe a goal that went beyond direct results for a timeframe longer than a semester. One might speculate that aspiring principals have more idealized, long-term goals, whereas an expert values completion of short-term goals.

While these differences provide support for prior research on principal problem solving, our analyses also urge us to reflect on some of the hypothesized differences between expert and aspiring principal problem solving processes. Although interpreting a nonsignificant finding is always problematic, it may be particularly so in this case because of the relatively small sample size (n = 259) and consequent low power. Nevertheless, it is interesting to simply note some exceptions to our initial hypotheses. For example, "delegates or empowers the staff" has long been held as a strategy used by expert principals and transformative leaders (Avolio & Bass, 1988; Leithwood, 1994; Purkey & Smith, 1983). Yet we found that the responses of expert and aspiring principals differed in their usage of "delegates or empowers staff" by just one percentage point. Similarly, for codes related to *solution processes* such as "plans approach" and "gathers data," we found very small absolute and statistically insignificant differences, one percentage point and seven percentage points respectively, between expert and aspiring principals' responses. This suggests that expert and aspiring principals were similarly likely to outline a sequence of steps to achieve a goal, and to seek out specific forms of information to assist in the resolution of the problem. Such small differences are suggestive, though certainly not conclusive, that expert and aspiring principals have similar problem-solving processes with respect to delegating and empowering, planning their approach, and gathering data. Future work should reconsider these differences based on studies with more observations.

CONCLUSION

In this article, we have attempted to press on what constitutes school principal expertise by focusing on one dimension—"problem-solving processes."

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Rather than attempt to generate new problem-solving processes, we have instead focused on testing some hypotheses generated by earlier work that focused on comparing expert and typical principals. In this article, we compared expert with aspiring principals. We believe that an important area of inquiry in the field of school principal expertise involves building on existing research by testing hypothesized differences between expert, aspiring, and typical principals.

Our work advances understanding of differences in problem-solving expertise between expert and aspiring principals. Building on prior hypotheses generating work, our study suggests that expert principals are better able to *interpret problems* or *to reflect on their own actions* compared with aspiring principals, as reflected in statistically significant differences between our expert and aspiring principal samples on instances of "analyzes the scenario" and use of "relevant anecdote." Still, we urge caution in interpreting our findings. This is a single study with a relatively small sample size—20 expert principals and 24 aspiring principals contributing a total of 259 observations. In addition, an unmeasured variable could account for differences in responses here attributed to differences in expertise. More hypothesis-testing studies are necessary before we can make robust and valid claims with respect to what distinguishes expert from aspiring principals.

In arguing for more theory-testing work, we must consider equally compelling ways of making progress on what constitutes school principal expertise. First, more theory-building and hypothesis-generating work is necessary in the domain of problem solving and in the broader field of school principal expertise. For example, we believe that work which attempts to *map* principals' schema rather than simply identifying discrete processes is critical (Wassink, Sleegers, & Imants, 2003). Second, much of the work on problem solving has focused on the school principal, with no attention to other school leaders. Adopting a distributed perspective on expertise suggests that examining the problem-solving processes of other school leaders (e.g., assistant principal, literacy coach) both individually and collectively is important for tapping into school leadership and management expertise (Spillane, 2006). Third, theoretical and empirical scholarship on the relationship between principals' expertise and their practice is scarce and thin (Symlie & Bennett, 2006). There is a need for scholarship that examines the relations between principals' (and other school leaders') expertise and their actual practice as school leaders and managers. Fourth, another area that merits attention concerns whether it is possible to teach expert problem-solving processes to aspiring principals. In other words, can leadership and management expertise be developed and what are the most effective ways of developing it?

Defining the nature of school principal expertise is an urgent challenge for the field of educational administration. Research on the effectiveness of preservice preparation, induction, and professional development programs is

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virtually nonexistent (Smylie & Bennett, 2006). Most studies of school leader professional development programs rely on weak proxies for effectiveness—participants' satisfaction (McCarthy, 1999). Without empirically robust knowledge about the nature of school principal expertise in particular, it is difficult for the field to respond to criticism and work to improve the quality of both preservice and in-service programs. Silence and defensiveness are poor antidotes for criticism regardless of its motivation. As a field we should rise to the challenge.

NOTES

1. The rate is the mean of each problem solving process across observations, which is equivalent to the percentage of observations coded as 1.

2. Since power is a concern in this analysis, we considered alternative adjustments such as the Šidák-Holm adjustment, which is less conservative than the Bonferroni (Westfall & Young 1993), and adjustments using resampling techniques that account for both dependence among dependent variables and the binary distribution of the data. There were no qualitative differences, however, among these adjustments. We chose to present the Bonferroni adjustment because it is the most well-known and simple.

3. Discussion results are based on columns (1)–(4) of Table 2, which present unadjusted mean differences and *p*-values from chi-square tests.

4. We thank Ken Leithwood for bringing this interpretation to our attention.

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Appendix A. Problem solving codes: sources, definitions, examples, and inter-rater reliability kappa scores.

Expert Problem-Solving Processes			Kappa
Analyzes scenario[c,d,e]	Questions, critiques or disagrees with scenario	*"Well, this kind of thing would never happen here because we monitor the teachers so before it came to that point, I would be aware."*	0.775
Bring in development[g]	Provides outside experts for in-school training	*"We have a partnership with the University of Chicago; called the Study Program. We have a mentor, a trainer that comes in and demonstrates lessons in the classrooms and the teacher watches"*	1.000
Delegates/ empowers staff[c,f]	Transfers authority or responsibility to teachers	*"It is really important that the staff be able to make their own decisions, and I let them—I don't need to write 'approved' on every letter. They make the decisions—if it requires a signature, you sign it. Does it always go smoothly, is it always what I would have done—no, but then you reflect on that and how to more effectively work together."*	0.646
External development[g]	Sends staff out of the school for training	*"Because there are many resources out there; there are professional developments and there are seminars for math. . . . providing teachers the opportunity to go to these seminars"*	0.744
Faces conflict[c]	Confronts conflict and learns from conflict	*"If she does not comply with, you know, with the help that's provided and she does not comply, still continues not to comply then we would move toward this affecting her—letting her know that this would effect her evaluation"*	0.701
Gathers data[a]	Seeks specific information to derive solution	*"Prior to going in I would have done research to present to them. I would find information that I need and you know present my plan to them for addressing the needs here."*	0.827
Internal development[f,g]	Uses permanent staff members for training others	*"Do you need some peer mentoring? "*	0.741
Local vs. global solution	Uses explicit references to current situation or population and not generalized solutions	*"If I have a fifth grader and he's not achieving at the norm but I've move that kid a year or whatever on test scores, that is a big achievement. And I see it all the time. And that's one of the things that I started, about 17 years ago, developed a rate of progress kind of thing. So these teachers can see—okay, how many of my kids are at grade level."*	0.775

(*Continued*)

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Appendix A. (*Continued*)

Expert Problem-Solving Processes			Kappa
Long term outlook[b,g]	Takes action that lays foundation for different future outcome	*"And once we take it to the higher order, once the teachers become more proficient, the students in turn should improve their scores and perform at a higher level."*	0.743
Overcomes constraint[a,b,f]	Details how to eradicate obstacles to the solution	*"To be very honest sometimes you semi-ignore what the district is saying and you do what is best for your community and your parents and your children."*	0.572
Informs parents[a,f]	Stresses informing the parents	*"And making sure that the parents in the community knew my main concerns."*	0.901
Plans approach [a,b]	Orders steps to achieving a solution	*"First of all, get them to have an understanding what the reading initiative is . . . then if we know why we're doing it, which is definitely to improve the students' reading scores, but the why also says why is this the best way to do it. We have to implement all of this. Knowing about the strategies and implementing . . . that makes the difference…there's the support and the networking."*	0.911
Relevant anecdote[a,b]	Details successful experiences similar to scenario	*"And I would tell them I came to Chicago Public, I didn't know anything about mathematics and computers and I would tell them that I had to do my own research, I had to go to others for help, I had to talk with teachers/role models and then I had to put it into practice."*	0.732
Stresses follow up[a,b,g]	Outlines how to monitor the success of the solution	*"And after the intervention, I would watch her a couple more times, if I still did not see changes, we would have to do a write up of that teaacher."*	0.901
Student vs. staff oriented goals[a,f,g]	Focuses on student goals rather than staff goals	*"Because our focus has to be on student learning, if the student is learning, then we aren't doing our job."*	0.824
Aspiring Principals' Problem-Solving Processes			
Assumptions[a]	Narrows problem with a broad generalization	*"I don't like high school teachers. You know high school teachers are always saying elementary teachers are wimps and the high school teachers are always very militant and you know."*	0.587
Avoids conflict[c]	Changes position or diverts blame to avoid conflict	*"My first concern would be that I don't want to blame anybody. I don't want to point fingers or say that somebody was responsible."*	1.000

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Concerned feelings[a,g]	Expresses concern for teachers, parents, and students	"*Start instituting parent workshops in the school where the parents can come in and learn how to do the same things…so there's not that fear. It would break down that fear factor.*"	0.911
Consequences for self[a,f]	Considers personal image, success or situation	*"See the other thing we do at our school is when they do assessments, and I'm not a very popular person with my teachers for doing this…"*	1.000
Pleases parents[a]	Stresses pleasing the parents	*"And we always try to make sure that our bilingual teachers are of the personality not to offend or turn off the parents because we need them ."*	0.832
Perceives constraints[a,b]	Identifies obstacles that interfere with the solution	*"There is nothing we can do, No Child Left Behind says we are a failing school—it doesn't matter how hard we try, or if we keep our scores up, if we don't make AYP forget about it, we are stigmatized—a failing school."*	0.579
Poor anecdote [a,b]	Relates an unsuccessful experience	*"You know, we tried to do bilingual here, and we had one parent who insisted on English only for her daughter, and it was like how are we supposed to have a class just for your child? I don't have the resources for that. She went all the way to the board and I had to use my resource staff for that class. It was basically sacrificing the good of the many for the not so good of the one."*	1.000

[a]Leithwood and Stager (1989)
[b]Leithwood, Steinbach, and Raun (1995)
[c]Bullock, James, and Jamieson (1997)
[d]Copland (2003)
[e]Glaser and Chi (1988)
[f]Berliner (1986)
[g]Leithwood (1994)

Appendix B. Organizational and Leadership Measures.

Type	Measure	Description (1999)
Leadership	Instructional Leadership	The extent to which teachers feel that the school's goals and actions are focused on student learning. Questions ask teachers if the school has well-defined learning expectations for all students, sets high standards for academic performance, makes decisions based on what is best for student learning, and works to develop students' social skills. High levels indicate that the school is working to improve every student's learning. (Separation: 2.53; Reliability: 0.86)
Leadership	Principal Inclusive Leadership	Teachers' view of their principal as a facilitative and inclusive leader who engages parents and the community in the school, creates a sense of community, and is committed to shared decision making. High levels indicate that teachers view their principal as a leader who strongly encourages broad participation in school affairs. (Separation: 1.75; Reliability: 0.75)
Leadership	Teacher-Principal Trust	The extent to which teachers feel their principal respects and supports them. Questions ask teachers if the principal looks out for their welfare, has confidence in their expertise, and if they respect the principal as an educator. High levels indicate that teachers share deep mutual trust and respect with the principal. (Separation: 2.77;
Organizational	Peer Collaboration	Collaboration among staff. Questions ask teachers about the quality of the relationships among faculty, if staff coordinates teaching and learning across grades, and if teachers collaborate in their design of new instructional programs. High levels indicate that teachers have moved beyond cordial relationships with their colleagues to ones in which they are actively working together. (Separation:
Organizational	Collective Responsibility	Teachers' assessment of the strength of their shared commitment to improve the school so that all students learn. Questions ask teachers how many colleagues feel responsible for students' academic and social development, set high standards for professional practice, and take responsibility for school improvement. High levels indicate a strong sense of shared responsibility among faculty. (Separation: 3.40; Reliability: 0.92)
Organizational	Focus on Student Learning	The extent to which teachers feel that the school's goals and actions are focused on student learning. Questions ask teachers if the school has well-defined learning expectations for all students, sets high standards for academic performance, makes decisions based on what is best for student learning, and works to develop students' social skills. High levels indicate that the school is working to improve every student's learning. (Separation: 2.04; Reliability: 0.81)

(*Continued*)

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Appendix B. (*Continued*)

Type	Measure	Description (1999)
Organizational	Innovation	Continually learning and seeking new ideas, have a "can do" attitude, and are encouraged to try new ideas in their teaching. High levels indicate that there is a strong orientation toward improvement and a willingness to be part of an active learning environment. (Separation: 2.82;Reliability: 0.89)
Organizational	Reflective Dialogue	Teachers' assessment of how often they talk with one another about instruction and student learning. Questions ask teachers about their discussion of curriculum and instruction, the school's goals, and the best ways to help students learn and manage-classroom behavior. High levels indicate that teachers frequently discuss instruction and student learning. (Separation: 1.89; Reliability: 0.78)
Organizational	School Commitment	The extent to which teachers feel loyal and committed to the school. Questions ask teachers if they look forward to going to work, would rather work somewhere else,and if they would recommend the school to parents. High levels indicate teachers are deeply committed to the school. (Separation: 1.96; Reliability: 0.79)
Organizational	Support for Change	The level of support for change that teachers receive from their principal and colleagues. Questions ask teachers if their principal encourages them to take risks and try new methods of instruction, and to assess whether the faculty as a whole embraces change initiatives. High levels indicate a school wide environment supportive of change. (Separation: 2.12; Reliability: 0.82)

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APPENDIX C

The six hypothetical scenarios correspond to questions about (a) the school improvement plan (SIPA), (b) teachers using drill and kill methods, (c) requirements that Spanish speaking students learn English, (d) teachers' discomfort teaching math, (e) working in a new type of school, and (f) a literacy initiative as a response to reading test score results. The exact wording of each scenario follows:

a. After your first day as principal of your school you realize how poorly the previous school improvement plan was done. Apparently the previous principal used last year's plan and changed a few paragraphs. As the new instructional leader of this building, how do you approach this situation?
b. While reviewing the lesson plans of one of your best teachers, you realize she has not been teaching mathematics based on the philosophy of your building. Instead she uses a drill-and-kill style of teaching. Teachers in

your school know to use manipulatives and other strategies to reach students. However, this otherwise proficient teacher has not complied. What steps will you take to bring this teacher on board?

c. A majority of the students in the school where you are principal speak Spanish as their primary language. However, the school district insists that the majority of your students read, speak, and write in English. While most of your students' parents are supportive, many of them do not speak English either. How will you meet the needs of your students in the face of the demands by your district?
d. A large number of the elementary teachers in your school have admitted to you they are not comfortable teaching mathematics. Your mathematics test scores demonstrate a weakness in this area. However, the school district in which you work uses both mathematics and literacy test results to determine how well a school is doing academically. How will you address this situation?
e. During most of your professional career you worked in an elementary (high) school. You were a 5th grade teacher as well as an assistant principal at an elementary building. Recently you were selected to be a high (elementary) school principal and are eager to get to work. Unfortunately, you are hearing that many of your teachers, parents and students have strong concerns about your elementary (high school) background. What steps will you take in this situation?
f. As you review your school's reading test scores, you realize they are significantly lower than the district average. Your teachers, however, explain to you they are working extremely hard to meet the literacy needs of their students. When you visit their classrooms you see teachers working very hard. However, you do not see evidence of effective teaching strategies that will better serve the students' needs. You also do not see the spirit of the district's literacy initiative being implemented in your teachers' classrooms. As the new principal, how will you address this situation?

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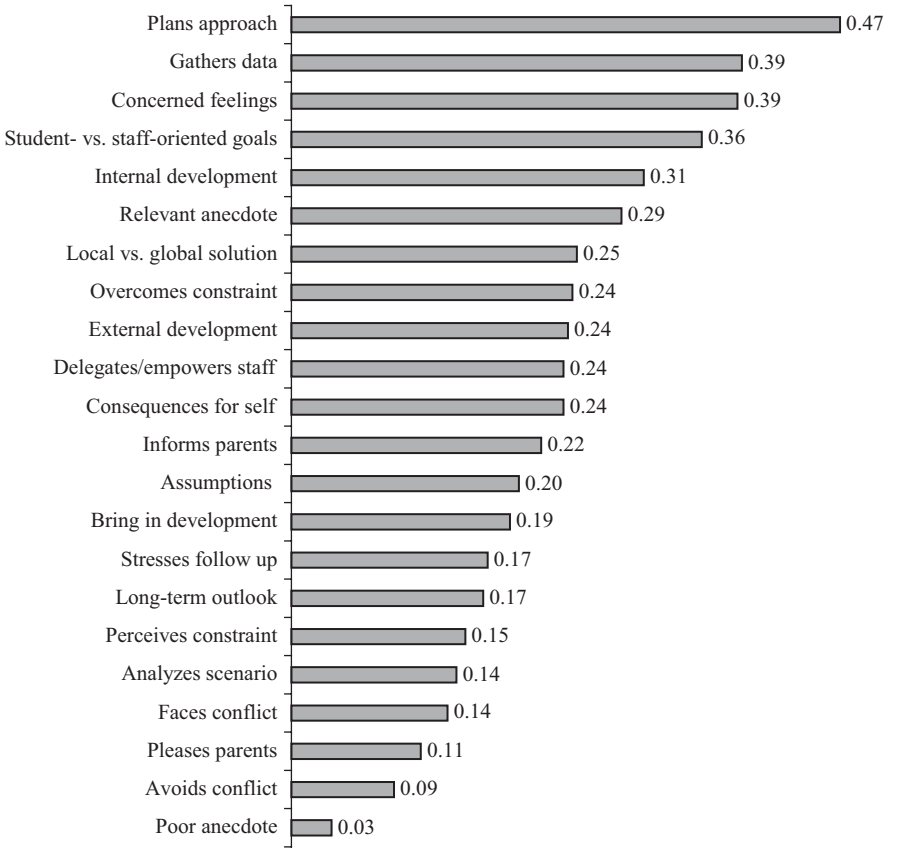
APPENDIX D. RATES OF USING PROBLEM SOLVING PROCESSES



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