

Professional Development for Teachers of Students With ADHD and Characteristics of ADHD

Sydney S. Zentall
Purdue University

James Javorsky
Oakland University

ABSTRACT: Inservice education has the potential to provide teachers with knowledge and skills that are necessary to manage challenging classroom behavior and improve academic and social/emotional outcomes. To assess the effectiveness of 3 inservice programs that focused on knowledge, understanding, and/or functional-assessment interventions, we identified 49 educators of students with attention deficit-hyperactivity disorder (ADHD) and 196 of their students. Three months after implementing all programs we found improved teachers' attitudes about and confidence in teaching students with ADHD and improved self-reported ability to provide accommodations. Our findings were documented differentially in a comparison of program type and by real changes in teaching practices and in ratings and observations of student behavior.

■ Continued inservice education has been described as a critical need for educators (National Institutes of Health, NIH, 2000). The general purpose of inservice education is to improve educators' professional skills in order to improve the behavioral and learning outcomes of their students (Sparks & Richardson, 1997). Inservice education is particularly useful in preparing teachers for the inclusion of students with challenging behavior (Shapiro, Miller, Sawka, Gardill, & Handler, 1999). That is, educators report being unprepared for and reluctant to include students with challenging behaviors (Landrum & Kaufman, 1992; Lobosco & Newman, 1992; Maag & Katsiyannis, 1999; Schumm & Vaughn, 1995; Woelfel, 1994; Wolfook, Rosoff, & Hoy, 1990). Even when students with challenging behaviors were already included in their classrooms, only 40% of teachers expressed a willingness to provide them with accommodations (Horne, 1983; Houck & Rogers, 1994).

Students with attention deficit-hyperactivity disorder (ADHD) represent a large number of children with significant behavioral challenges within general education (for review see Zentall, 2006). These students spend a majority of their time in general education classrooms and typically without supplementary services. Teachers report that they are unprepared to work with this group of students and only those educators who have experience with students with ADHD or who have education about

them were more willing to make instructional changes (Reid, Vasa, Maag, & Wright, 1994).

To examine the potential of inservice education, specifically for teachers of students with ADHD, six grantees received funding from the Office of Special Education Programs, Division of Personnel Preparation, to design and disseminate ADHD-specific professional development programs (Bos, Nahmias, & Urban, 1997; Bradley-Klug, Shapiro, & DuPaul, 1997; Kallas, Reeve, Welch, & Wright, 1997; Marchant & Siperstein, 1997; Swartz, Hooper, Gut, Wakely, & Levine, 1997; Worthington, Wortham, Smith, & Patterson, 1997). Surveying the research designs of these studies yielded one study using posttest only (Swartz et al.); four studies using pre- and posttest design; and one study using a pre- and posttest with a 3-month follow-up interview (Bradley-Klug et al.). See Table 1 for a comparison of the six projects.

None of these inservice programs involved a comparison of interventions. Furthermore, the evaluations used in these six studies were consumer satisfaction surveys, which all demonstrated high levels of satisfaction. Consumer satisfaction measures do not measure the effectiveness of inservice education, but assess other factors, such as the presenter's style, participants' needs to provide socially desirable responses, and the facility's physical comfort (i.e., quality of programming, Guskey, 2000). That is, consumer satisfaction measures

assess the process of inservice education but not its outcomes on students or teachers. Bos and her colleagues (1997) acknowledged that their study “did not directly address the question of change in classroom practice” (p. 142).

Only Bradley-Klug et al. (1997) designed and evaluated an intensive school-based collaborative consultation model that reported findings of increased knowledge after 2 days of inservice education, as well as the maintenance of an intervention after 60 hr of education, which included individual on-site consultation. A related on-site consultation model was able to employ teacher ratings and direct behavioral assessments of one student with disruptive behaviors (e.g., Wilkinson, 2003). The effectiveness and quality of measurement of this study could be attributed to the parsimony of single-case designs. However, it failed to achieve generality.

The evaluation of these on-site consultation models met important assessment criteria (i.e., multiple outcome measures and assessment of treatment acceptability, integrity, and consumer satisfaction). Unfortunately, the consultation models of Wilkinson (2003) and the consultation levels 2 and 3 defined by Bradley-Klug (1997) and colleagues’ are not as cost-effective as inservice models. Thus, the purpose of this study was to evaluate inservice education and also meet the previously mentioned assessment criteria. To this purpose, we collected pre- and postdata (i.e., 3 months later), weekly data collected by teachers on their students, and an assessment of treatment integrity by outside observers. We also added a comparison group. Comparisons, when present, typically increase the intensity of intervention, usually in time and/or with new components added (e.g., Bradley-Klug et al.). However, we added an independent comparison group to investigate whether inservice education could be more effectively provided by university faculty or by local professionals. This comparison was important because past findings had suggested that outside consultants produced equivalent gains to those of local specialists (Crawford, Gage, Corno, Stayrook, & Mitman, 1978), whereas other findings indicated that outside consultants or experts produced greater gains (Stevens & Driscoll, 1987). Divergent study outcomes could be attributed to the content of inservice education. That is, when inservice education is not effective in producing gains (external validity), it could be attributed to

poor quality or inappropriate content of the programs delivered (internal validity).

A traditional approach to professional development (i.e., that targets knowledge) was the only focus of the local education agency (LEA) inservice education program (see Table 1). The university program similarly used knowledge as a component of its intervention but further partitioned the intervention into two levels of intensity, with some teachers receiving knowledge plus understanding and other teachers receiving these components plus practice in functional assessment. The “understanding” component was designed to address the functional importance of the symptoms of ADHD (i.e., increased activity/impulsivity and inattention produce additional stimulation for these children in the regulation of optimal biological arousal—explained using the optimal stimulation theory, see Zentall, 2006). We emphasized understanding behavioral purpose or function because early research had demonstrated that presentations with both a cognitive and an empathy component could reduce negative teacher evaluations of emotional disturbance relative to pretest assessments (Parish, Ohlsen, & Parish, 1979), and that teachers’ warmth, acceptance, and tolerance could influence the success of students with behavioral problems in general education (MacAuley & Johnson, 1993).

However, there were no studies found to suggest that knowledge plus understanding were sufficient to change teacher behavior. For this reason, a practice component was designed around functional assessment and of matching accommodations to this assessment. In summary, the LEA versus university inservice education programs involved a comparison of traditional practices with an experimental university program adding understanding and practice components.

Method

Participants

The project was undertaken with support and approval of a large, midwestern suburban intermediate school district (ISD) supporting 85,000 students and their families and 8,000 professionals. An on-site coordinator obtained agreement from nine elementary and three middle school administrators from within this district. Teacher participants were recruited by these principals, who made announcements at

TABLE 1
Comparison of OSEP-Funded ADHD Inservice Education Projects

Project	Participants	Length and Content	Evaluation Design & Measures	Outcomes
Bos, Nahmias, & Urban, 1997. "Interactive Professional Development on ADHD"	89 volunteer participants (63% were teachers) in 2 summer cohorts.	Estimated 20 hr over 5 days during a summer (optional 1-credit course with assignments).	Pre-/postservice design—no comparison/control group. <ul style="list-style-type: none"> • Knowledge Assessment • Attitude Questionnaire • Adaptation Evaluation • Workshop Evaluation 	A significant increase in teachers' self-reported knowledge, attitudes, and competence in teaching, and in the feasibility of making adaptations.
Bradley-Klug, Shapiro, & DuPaul, 1997. "School-Based Collaborative Consultative Model for ADHD"	Level 1: 57 districts nominated 169 school representatives to participate in 3 levels of service provided by a university	Level 1: 2 full days on assessment and school and home behavioral and medication management. Level 2: An additional 60 hr of consultation from staff, 30 of which were on site. Level 3: Advanced consultation and a 1 week summer course on ADHD.	Pre-/postservice design—no comparison/control group <ul style="list-style-type: none"> • Level 1: Knowledge Test • Level 2: Consumer Satisfaction Survey • Level 3: Adaptation of interventions to other students; specific additions to IEPs; additional training requested. 	Level 1: An 18% significant increase in knowledge. Level 2: Increased satisfaction with services provided. Gains in students' social skills were rated as the second lowest item. Level 3: 72% of districts maintained an intervention after 3 months; 146 students with IEP additions; 68% of staff seeking more education on ADHD.
Kallas, Reeve, Welch, & Wright, 1997. "Continuing Education Modules"	700 participants (29% were teachers)	Full day workshop, sessions, or strands. Materials and modules: <ol style="list-style-type: none"> 1. Characteristics & assessment 2. Model school programs 3. Classroom interventions 4. Policy issues 	Postservice design—no comparison/control group Workshop Evaluation Survey (content, presentation, materials, and transferability of content to practice)	Consumer satisfaction, average rating of 4.2 out of 5.
Marchant & Siperstein, 1997. "Striving for Compatibility"	200 teachers—unknown number participating	Day format or several shorter sessions. Phase I: Characteristics and outcomes; Phase II: Social needs, social/cognitive skills, & accommodations; Phase III: Class settings—collaborative learning.	Pre-/posttest—no comparison/control group Quantitative measures of teacher-perceived: <ul style="list-style-type: none"> • Knowledge of ADHD and classroom interventions • Workshop effectiveness and impact on practices. 	Although no quantitative data were presented, the authors concluded that a central component of the inservice was "more effective in changing teachers' understanding of ADHD than in improving their classroom practices" (p. 99).

TABLE 1 (Continued)
Comparison of OSEP-Funded ADHD Inservice Education Projects

Project	Participants	Length and Content	Evaluation Design & Measures	Outcomes
Swartz, Hooper, Gut, Wakely, & Levine, 1997. "Control of Attention Project"	No numbers provided	Teachers and clinicians = 3–6 hr workshops with topics (attention, characteristics, assessment, methods, issues, affective problems) presented with a workbook & applications	Postinservice—no comparison/control group <ul style="list-style-type: none"> • Consumer satisfaction survey 	No data presented but teachers reported "that the content and materials are relevant to their day-to-day management...[and] will change the way they instruct students with attention deficits" (p.167).
Worthington, Wortham, Smith, & Patterson, 1997. "Project Facilitate"—a trainer of trainers model.	14 nominated school-based teams, with 7 teams randomly selected and 80 to 215 participants per module	Estimated time per module was 1 month. Self-instructional manuals for the following modules: <ol style="list-style-type: none"> 1. Characteristics/outcomes 2. Legal issues 3. Assessment 4. Interventions 	Pre-/Posttest design—no comparison/control group Knowledge survey based on the objectives from each module	Significant perceived knowledge gains in each module domain.

staff meetings or through memoranda. Teachers were told they would be provided with release time from teaching. From a pool of 225 teachers, 49 teachers whose schedules were generally open on those days were selected.

Participants Assigned to Intervention Groups

The on-site coordinator randomly placed teachers in one of the three intervention groups. Thirteen teachers were randomly placed in the local education agency (LEA) treatment group, 15 teachers in the university treatment (UT) group Day 1 (UT 1), and 21 teachers in the university treatment (UT) group Day 2 (UT 2). Twenty-one of the 36 teachers who attended the UT 1 inservice session also participated in the UT 2 inservice. Of these 49 teacher participants, 35 completed all the procedures of this study (see Table 2). The three groups were equivalent in caseloads (i.e., overall number of students, special education students, and number of students with ADHD), as well as in teaching experience, certifications (general, special), and highest educational degree attained. However, there were differences among groups in gender, $\chi^2(2, n = 49) = 7.09, p = .029$; the LEA group had 4 males and 9 females, the UT 1 and UT 2 groups had 2 males and 13 females and 0 males and 21 females, respectively.

The UT 1 and UT 2 groups were collapsed to form the UT Group for further comparisons. This combined UT group and the LEA group

were also equivalent across grade level taught, $\chi^2(5, n = 35) = 5.35, p = .38$; highest educational degree attained, $\chi^2(1, n = 35) = .01, p = .91$; type of teaching certifications $\chi^2(1, n = 34) = 1.32, p = .25$; years of experience, $F(1, 33) = .77, p = .39$; number of students, $F(1, 33) = .20, p = .66$; special education students, $F(1, 33) = 1.80, p = .19$; and students with ADHD, $F(1, 33) = .54, p = .47$. Again, gender was not equivalent between groups $\chi^2(1, n = 35) = 6.39, p = .01$.

Procedures

The university research team provided (a) materials, (b) guidance for data collection, and (c) consultation with an on-site coordinator. The ISD provided (a) personnel and opportunities for additional education; (b) clerical support; (c) release time; (d) an inservice program for one group; and (e) permission from parents, students, teachers, and district administrators. Inservice sessions were scheduled during a normal school day and were 7 hr long, with two 15-min breaks and a 45-min lunch. Trainers for the university and for the local inservice sessions were naive to the materials or instruction used by the other.

Intervention Conditions

The LEA and university interventions were planned and implemented independently by individuals who attempted to provide the best that was available at the local level and

TABLE 2
Means (Standard Deviations) of Demographics for the Inservice Education Groups

	<i>LEA Group</i> <i>n = 11</i>	<i>University</i> <i>UT 1: n = 10</i>	<i>Trained Groups</i> <i>UT 2: n = 14</i>	$\chi^2(10, n = 49)$	<i>p =</i>
Degree Level Attained					
Bachelor's	5	6	6	1.61	.45
Master's	6	4	8		
Teacher Certification					
General Education	9	8	12	5.49	.072
Special Education	2	2	2		
Teaching Experience Years	17.54 (9.42)	13.70 (9.73)	20.29 (8.47)	$F(2.45) = .77$.47
Caseload of:					
Students	37.83 (14.37)	33.91 (19.89)	34.31 (17.75)	.32	.73
Special Ed Students	2.29 (1.55)	2.40 (1.43)	2.21 (1.67)	.92	.41
Students With School-Identified ADHD	8.13 (9.91)	9.70 (14.62)	7.00 (4.74)	.49	.62

TABLE 3
LEA and University Inservice Education Interventions

	Format	Content	Time	Staff
LEA Day 1	Lectures: Knowledge	Foundations: History (theories and terms); Diagnosis and Assessment (realistic expectations, the use of rating scales)	60 min	1 Ph.D. child psychologist
	Knowledge	Interventions: 1. School-level strategies (community agency role and interventions available)	30 min	1 Ph.D. child psychologist
	Knowledge	2. Classroom-level strategies (behavioral management, accommodation plans, methods for adapting instruction, "successful techniques")	90 min	1 special education instructor 2 learning and behavioral consultants
	Knowledge	3. Home-level strategies Panel I: (strategies for communicating with families)	45 min	1 JD parent/child advocate 1 special education administrator
		Panel II:	30 min	2 M.D. child psychiatrists 1 social worker 1 special education administrator
	Knowledge	4. Medical strategies (medication advantages and disadvantages)	30 min	1 M.D. child psychiatrist 1 Ph.D. special education professor 1 doctoral student in special education
University Day 1	Lectures: Understanding	Theoretical Basis: Optimal stimulation theory and long-term outcomes of ADHD	45 min	
	Knowledge	Foundations: Characteristics and assessment of hyperactivity/impulsivity and selective/sustained inattention	90 min	
	Knowledge	Strategies: Hyperactivity/impulsivity and selective/sustained inattention (channeling activity, adaptations of (a) behavioral management, (b) tasks, (c) classroom design)	150 min	
University Day 2	Knowledge	Functional assessment and Goal-setting: Antecedent-Behavior-Consequence (ABC)	60 min	
	Practice	Applications: Use simulations to practice behavioral assessment	120 min	
		Applications: Practice goal-setting	60 min	

Note: Readers can contact the authors for a more complete outline of the inservice education program and its objectives.

at the university level. Table 3 demonstrates equivalence in time, format, and qualifications of staff, with differences primarily in content.

Local Education Agency (LEA) Treatment. Participants received a 39-page packet of information covering the characteristics of students, environmental design, and instructional accommodations related to the presentations in this session.

University Treatment (Day 1 & Day 2). The university treatment (UT) in this study was based on research and theory (summarized in Zentall, 2006); the lectures and content of the materials (e.g., videos, booklets, manuals) had been used in university coursework, inservice education, and graduate-level distance education coursework (see Zentall & Javorsky, 1997). Participants in the UT (Day 1) inservice session received a 112-page binder of materials that included (a) three booklets that were related to characteristics and methods, (b) two brief manuals describing difficult school settings, (c) an accommodation plan, (d) an individualized education program and a behavior management plan, and (d) informational readings (e.g., Zentall, 1993). Participants also viewed a videotape depicting several instructional strategies.

UT Day 2 participants also received a 29-page manual, *Classroom Behavior Assessment Module*, which was used by the participants to conduct functional assessment of student behavior in small groups (see Zentall, 2006; Zentall & Javorsky, 1995, for a description of this model). During this session, participants were instructed on how to identify triggers (stimulus events/settings), actions (response or behavior), and pay-offs (purpose of behavior) and how to use this information to develop goals and objectives.

Measures

Our purpose was to report satisfaction data from teachers, as has been traditional, but to add an assessment of whether teachers were actually using the techniques that they had been taught (teacher outcomes or treatment integrity), and whether those strategies and teacher attitudes were altering the behavior of their students (student outcomes or treatment validity). To this purpose, we collected data on teachers' self-reported attitudes and practices. In addition, observational data were collected from teachers, who observed and rated student behavior and their responses to their

students' behavior. Each of these measures was completed a week prior to inservice education and 3 months after the inservice intervention. As well, staff made postinservice observations of classrooms (preinservice assessments were not granted by the agency).

The return rates for the measures described for the three inservice groups (i.e., after additional mailings with a teabag and then a one dollar bill to those who initially failed to respond, as per Rogelberg & Luong, 1998) were: LEA: 84.6% (11 out of a possible 13), UT 1: 66.8% (10 out of a possible 15), and UT 2: 66.8% (14 out of a possible 21). These rates were *not* significantly different $\chi^2(2, n = 49) = 1.51, p = .47$.

Teacher Ratings and Observations of Student Behavior. Each teacher-participant was asked to nominate two male and two female students with school-identified ADHD or with excessive attentional problems and/or activity, as well as two low active, male and female students in his or her classroom (i.e., 8 students per class) and then to rate these students on the Attention Comprehensive Teacher Rating Scale (ACTeRS, Ullmann, Sleanor, & Sprague, 1984b). The ACTeRS is a standardized measure of inattention, impulsivity, social skills, and oppositionality. The scores were averaged to form a set of scores for the high active males, high active females, low active males, and low active females (i.e., 4 student sets per class). The ACTeRS test-retest ($r = .78$ to $.82$) and the internal consistency ($r = .93$ to $.97$) reliabilities exceeded the minimum level for standardized diagnostic instruments (e.g., Salvia & Ysseldyke, 1995). The ACTeRS validity has been well established (Ullmann, Sleanor, & Sprague, 1984a). There has been a reliance on these brief ratings for an assessment of response to intervention (e.g., active drug versus placebo), which are taken in the child's natural environment and by the child's teacher, who has the opportunity to continuously sample behavior and compare it to similar age children.

Teacher-participants also collected data 1 week during preinservice and 8 weeks during posttreatment on classroom behavior using the Classroom Behavior Tally Checklist (CBTC), designed by the authors. Over 9 weeks (1 week prior to inservice education and for 8 weeks after their program), each teacher maintained daily behavioral counts of student behavior: (a) peer conflicts (Peer Conflicts), and (b) teacher-student conflicts (Teacher Conflicts);

and of teachers' responses to student behavior: (a) earned positives, rewards, and privileges (Positives); (b) lost lunches, recesses, assemblies, and rewards (Lost Privileges); (c) instruction stopped because of behavior problems (Instructional Stops); (d) time-outs inside the classroom (Inside Time-Outs); (e) time-outs outside of the classroom (Outside Time-Outs); and (f) after-school detentions (Detentions). Although CBTC data were collected over a 9-week period, we averaged weekly data into four time periods: (a) baseline (1 week prior to inservice education), (b) first period (Weeks 1, 2, and 3); (c) middle period (Weeks 4, 5, and 6); and (d) last period (Weeks 7 and 8).

Classroom Postinservice Observations. To examine whether components of the inservice interventions were put into practice in participants' classrooms (i.e., treatment integrity), classroom observations 3 months after treatment were made using an author-designed 44-item Classroom Observation Checklist. Items were dichotomous (1 = observed, 2 = not observed). Each observation was scheduled for 30 min and was conducted by an author and by a local professional who was naïve to the intervention group. Interobserver agreement was 93%.

Schools were selected for this observation if they employed three or more participants, representing all inservice groups. Classrooms were selected from those participants who had completed 75% of the Classroom Behavior Tally Checklists (see the following) and postinservice measures. These criteria reduced the number of observed participants to 11 (4 participants from the LEA Day 1, 2 participants from UT Day 2, and 5 participants from UT 2).

Teacher Self-Reported Attitudes, Practices, and Satisfaction. The Classroom Environment Scale (CES) is a 25-item survey that assessed teacher beliefs about classroom environments along dimensions that differentiate conventional from individualized classrooms, using a 5-point Likert scale (1 = almost never to 5 = very often; Fraser & Fisher, 1983; Moos & Trickett, 1974). Items measured instructional preferences for (a) individualization of curriculum and instruction (personalization), (b) willingness to involve students in their own learning (participation), (c) involvement of students in rules and classroom practices decisions (independence), (d) promotion of student-based practices that allow students to investigate (investigation), and (e) understanding and accommodating for the special needs of students (differentiation). The

CES's internal consistency ($r = .77$ to $.91$) and its discriminant validity ($r = .16$ to $.30$) were in the adequate range, with well-established predictive validity (e.g., Fraser, 1994).

The Mainstreaming Empathy Scale (MES), adapted from Larrivee and Cook's (1979) *Survey Teacher's Opinion Relative to Mainstreaming Special-Needs Children*, was a 28-item questionnaire with a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree). To analyze the data from each of these factors, we calculated a scaled score by averaging the items of each scale. The internal consistency reliability (Spearman-Brown $r = .92$) was good for research on teacher perceptions (Larrivee, 1985). In the Larrivee factor analytic study (1982), five factors emerged measuring (a) general philosophy of inclusion, (b) classroom behavior of children with behavior and learning problems, (c) perceived ability to teach these children, (d) classroom management, and (e) academic and social growth of these children. We updated terminology and eliminated two items which were not significant in the factor analysis.

The LEA Needs Assessment Survey (NAS) was a school district-designed measure of staff self-reported development needs. Of the 18 items, 16 assessed teachers' perceptions of the helpfulness of specific interventions and 2 assessed teachers' understanding of ADHD and interest in learning strategies to teach students with ADHD. The items were grouped into 5 distinct categories: (1) Behavioral interventions, (2) Cognitive interventions, (3) Collaborative interventions, (4) Home-School interventions, and (5) Instructional/Testing accommodations. Two secondary-level educators, both holding Master's degrees in Education, established these categories with interrater agreement of 95%.

Results

Evaluations of the assumptions of normality, homogeneity of variance, and linearity for each measure were performed using visual inspection of the normality plots and/or presence of heterogeneity of variance (Bartlett's Test $p < .001$, Tabachnick & Fidell, 1996). When individual measures were not normally distributed, logarithmic transformations ($y = \log_{10}[x+1]$) were used. For those measures for which heterogeneity of variance were found, the Greenhouse-Gesier adjustment for

this violation were performed, which did not alter the findings.

To control for Type I error, we employed a 2-inservice group by 2-time period MANOVA for those measures that were conceptually related, as indicated by significant correlations, $p < .05$. Pillai's Trace, which compensates for unbalanced groups, was reported (Tabachnick & Fidell, 1996). For inservice comparisons, the alpha level was set at .10, similar to the majority of field based studies (e.g., Dass & Yager, 1999; Hollenbeck, Rozek-Tedesco, Tindal, & Glasgow, 2000). Where indicated by the significant effects in the omnibus MANOVA and by follow-up univariate interactions, simple effect analyses were performed to compare inservice group differences at pre- and postinservice. If there were initial group differences on the pre-inservice measure, follow-up paired t tests (pre- to post-) were performed separately for each inservice group (i.e., because postintervention comparisons would have been invalid given pretest differences, see Finckenor & Byrd-Bredbenner, 2000; Shepard & Stump, 1999).

For variables that were not intercorrelated, mixed design analyses of variance were performed for the repeated factor of time (pre- and post-) and the nonrepeated factor of inservice group (e.g., Huberty & Morris, 1989). We reported planned contrasts between the LEA and the UT (UT 1 + UT 2) groups first, followed by planned contrasts between the UT 1 and the UT 2 groups.

University and LEA Inservice Comparisons

Teacher-Rated and Observed Student Behavior

ACTeRS. The *ACTeRS* scales were conceptually independent (Ullmann et al., 1984b) and yielded group differences on the Social Skills scale, $F(1, 262) = 3.99$, $p = .046$. Because of pretest differences, follow-up tests on each inservice group independently yielded pre- to postdifferences only on the UT group's ratings on the Social Skills scale which improved an average of 2.09 from pre- ($M = 42.05$, $SD = 11.92$) to postinservice ($M = 44.13$, $SD = 9.91$), $t(173) = 3.11$, $p = .002$. No differences were yielded for the LEA group, or for the other three scales.

Classroom Behavior Tally Checklist. Instructional Stops and Positives were normally distributed. The six remaining categories were collapsed into three and transformed to produce normally distributed variables. These were: (a) Classroom Removals that assessed the number of times a teacher removed students from the classroom for misbehavior (i.e., for Detentions + Outside of Classroom Time-Outs); (b) Classroom Conflicts that assessed the frequency of peer and teacher-student conflicts (i.e., Peer Conflicts + Teacher-Student Conflict); and (c) Classroom Discipline that assessed the frequency of negative classroom consequences (i.e., Lost Privileges + Inside Classroom Time-Outs) initiated by the teacher for inappropriate classroom behavior. Correlational analyses among the three data categories indicated conceptual independence (i.e., fewer than one third of the correlations were significant, $p < .05$; Cole, Maxwell, Arvey, & Salas, 1993; 1994).

Analyses of these primarily independent categories yielded group differences for Classroom Removals, Pillai's Trace = .247, $F(3, 26) = 2.84$, $p = .057$. Simple effect analyses indicated that both groups employed Classroom Removals at similar rates at baseline (UT: $M = 2.79$, $SD = 2.80$; LEA: $M = 2.44$, $SD = 3.36$), $F < 1$. However, use of classroom removals differed between inservice groups when measured during the first 3 weeks after inservice education (UT: $M = 1.32$, $SD = 1.52$; LEA: $M = 4.50$, $SD = 6.24$), $F(1, 28) = 4.80$, $p = .03$, and similarly during the second postinservice period, $M = 1.63$, $SD = 1.98$; $M = 4.25$, $SD = 5.81$, $F(1, 28) = 3.38$, $p = .077$.

Classroom Postinservice Observations

Chi-square tests yielded significant inservice group differences. On the one hand, the UT group (a) had more colorful/interesting bulletin boards and/or posters in their classrooms, $\chi^2(1, n = 11) = 4.28$, $p = .039$; (b) were more likely to have short transition times (2 min or less), $\chi^2(1, n = 11) = 4.06$, $p = .041$; and (c) conducted more choral responding activities, $\chi^2(1, n = 11) = 3.59$, $p = .049$, than the LEA group. On the other hand, the LEA group posted more "don't rules," $\chi^2(1, n = 11) = 5.24$, $p = .022$, and were more likely than the UT group to use negative consequences for misbehavior, $\chi^2(1, n = 11) = 4.28$, $p = .039$.

Teacher Attitudes, Practices, and Satisfaction

Classroom Environment Scale (CES). Significant correlations were yielded among the Personalization, Participation, Differences, and Investigation scales required for a MANOVA. On the MANOVA, a significant group effect, $F(1, 33) = 5.18, p = .029$, and a group by time interaction were obtained, Pillai's Trace = .562, $F(3, 31) = 2.67, p = .071$. Follow-up univariates yielded significant effects for (a) Participation, $F(1, 33) = 5.67, p = .023$; (b) Differences, $F(1, 33) = 4.31, p = .046$; (c) Independence, $F(1, 33) = 4.88, p = .034$; and (d) Investigation, $F(1, 33) = 3.72, p = .061$. On the CES Independence scale, the simple effect analysis of the postinservice measure yielded a significant effect of group, $F(1, 33) = 4.40, p = .044$, indicating that the UT group ($M = 16.71, SD = 2.58$) employed more teaching practices that emphasized student independence (e.g., self-monitoring and self-management practices) than the LEA group ($M = 14.27, SD = 3.78$). Initial pretest group differences on the CES Differences, Participation, and Investigation scales required an examination of the paired t test. On the CES Differences scale, differences were found for the UT group, who reported a significant improvement pre- to postinservice in their use of practices that accommodated students, $t(23) = 2.03, p = .054$. On the Participation and Investigation Scales respectfully, paired t test comparisons of pre- to postinservice measures were not significant for either inservice group.

Mainstreaming Empathy Scale (MES). Because the scoring of the MES produced one composite score, this scale was analyzed separately and yielded a significant group by time interaction, $F(1, 31) = 7.67, p = .009$. More empathy or understanding after inservice education was documented for the UT group, Preinservice: $M = 2.91, SD = .36$; Postinservice: $M = 3.09, SD = .39, t(19) = 2.87, p = .009$. However, there was no significant change pre- to postinservice for the LEA group (Preinservice: $M = 2.91, SD = .35$; Postinservice: $M = 2.84, SD = .48$).

Data from the LEA *Needs Assessment Survey* were collapsed and analyzed in three domains listed in the following.

Confidence and Willingness to Learn About ADHD. Because the correlation between these two items was not significant, each item was analyzed separately. A significant time effect indicated that self-reported willingness

to learn about ADHD for all participants across inservice groups increased pre- to postinservice, $F(1, 31) = 15.98, p < .001$, and confidence in teaching students with ADHD increased from pre- to postinservice, $F(1, 31) = 4.61, p = .039$. Although there were no group effects for the Willingness item, a significant between-group difference was found on the Confidence item, $F(1, 31) = 4.68, p = .038$. However, follow-up tests failed to yield differences for the LEA group, nor for the UT group.

Perceptions of Inclusion Resources. A preliminary correlational analysis indicated that the four survey items intercorrelated into two categories: Administrative Support and Additional Resources. A significant group effect was observed for the Additional Resources category, Pillai's Trace = .353, $F(4, 30) = 4.09, p = .009$. As well, two significant interactions were found: (a) a Category \times Inservice Group \times Time, Pillai's Trace = .120, $F(1, 33) = 4.52, p = .041$, and (b) a Category \times Inservice \times Group, Pillai's Trace = .132, $F(1, 33) = 5.02, p = .032$. For the Additional Resources category, follow-up univariates yielded a significant between-inservice-groups effect, $F(1, 33) = 4.33, p = .045$. At postinservice, the LEA group ($M = 3.09, SD = .87$) perceived more additional resources available to support inclusion of these students in their classrooms than the UT group ($M = 2.29, SD = .88$), $F(1, 33) = 5.71, p = .028$.

Perceptions of Effectiveness of Inservice Strategies. MANOVAs yielded significant effects on two of the categories: (a) Behavior Interventions that consisted of four items—*Positive reinforcement, Time-out, Structured classrooms, and Contracts*; and (b) Collaborative Interventions, which were two items—*Group learning and Interactive teaching*. For the Behavior Interventions category, a significant inservice group by time interaction was documented, Pillai's Trace = .231, $F(4, 26) = 2.69, p = .053$, and an inservice group effect, Pillai's Trace = .518, $F(10, 20) = 2.15, p = .069$. Follow-up repeated measures univariates on each of the four items in this category yielded a group effect on Time-out, $F(1, 32) = 5.21, p = .029$. After inservice education the LEA group perceived Time-out to be more useful (postinservice: $M = 2.64, SD = .50$) than the UT group (postinservice: $M = 2.17, SD = .65$) in the simple effects analyses, $F(1, 29) = 4.50, p = .043$. The other items in this category (Positive reinforcement, Structured classrooms, Contracts) did not yield significant effects, and

the interaction, although significant across all four items, was also not significant in the univariate analyses of individual items.

On the Collaborative Interventions category, the MANOVA yielded a significant category by inservice group effect, Pillai's Trace = .095, $F(1, 30) = 3.14$, $p = .087$, and an inservice group effect, Pillai's Trace = 1.11, $F(1, 30) = 4.47$, $p = .043$. The repeated measures univariates further documented a significant group effect for the Interactive Teaching item, $F(1, 30) = 4.82$, $p = .039$. Simple effect analyses yielded initial group differences at preinservice, requiring paired t tests, which were not significant for the LEA group nor for the UT group.

Inservice Evaluation/Satisfaction (IES). For this measure, there were no significant group differences to suggest that one group of inservice attendees was more satisfied than the other. Descriptively, satisfaction was indicated on the final item, "Overall, I would rate this education program as..." Each group rated each inservice day in the high-to-above average range: (LEA Inservice: $M = 3.81$, $SD = .75$; UT Inservice: $M = 3.91$, $SD = .93$).

University Treatment Group 1 and Group 2 Comparisons

Within the pre- to postinservice data analysis, planned contrasts were conducted between participants who attended the first day of the university session (UT 1 group) and participants who attended both days of the university sessions (UT 2 group). The UT 2 group received an additional 4 hr of education, emphasizing functional behavioral assessment and practice.

Teacher Ratings and Observations of Student Behavior

The ACTeRS scores yielded differences on the Hyperactivity and Oppositionality scales. Because there were differences at preinservice, paired t tests were examined for each inservice group (UT 1 and UT 2). A significant inservice group difference was yielded, $F(1, 172) = 5.07$, $p = .026$, but the higher order group by time interaction, Pillai's Trace = .039, $F(1, 172) = 6.98$, $p = .009$, was further examined. This interaction indicated that the UT 2 group rated their students significantly less hyperactive from preinservice to postinservice, $t(103) =$

4.38, $p < .0001$, which was not found for the UT 1 group. Participants in the UT 2 group reported a 5.00-point or .5 SD decrease on the ACTeRS Hyperactivity scale (preinservice: $M = 61.37$, $SD = 14.65$; postinservice: $M = 56.37$, $SD = 11.49$). In addition, on the ACTeRS Oppositionality scale, a significant between-group effect was yielded, $F(1, 172) = 6.08$, $p = .015$. The UT 2 group reported a 3.11 point or roughly one-third standard deviation decrease in oppositionality ratings, $t(103) = 2.38$, $p = .019$. $M = 62.78$, $SD = 13.83$; postinservice: $M = 59.61$, $SD = 11.99$.

Significant differences were also found between the UT 1 and UT 2 groups on two categories of the Classroom Behavior Tally Checklist, Classroom Removals (outside classroom removals + detentions) and Classroom Discipline (inside the classroom time-outs + loss of privileges). On the Classroom Discipline category, follow-up of simple effect analyses of the group by time interaction, Pillai's Trace = .359, $F(3, 15) = 2.79$, $p = .076$, yielded a group difference for the middle time period, $F(1, 18) = 4.41$, $p = .05$. This finding indicated that the UT 1 group used significantly more disciplinary practices on average during the middle time period than did the UT 2 group. On the Classroom Removals category, a significant group by time interaction, Pillai's Trace = .243, $F(3, 15) = 3.07$, $p = .059$, indicated that the groups responded differently over time. However, simple effect analyses yielded no group differences at any of the four time periods.

Teacher Self-Reported Attitudes, Practices, and Satisfaction

There was also a group by time interaction on the Confidence item of the *LEA Needs Assessment Survey (NAS)*, Pillai's Trace = .166, $F(1, 20) = 3.99$, $p = .059$. The UT 1 group self-reported a 10% increase in self-confidence from preinservice to postinservice in teaching students with ADHD, $t(9) = -3.00$, $p = .015$, which was not significant for the UT 2 group.

Discussion

Inservice education has the potential to provide teachers with the skills and knowledge to manage students' challenging classroom behavior and improve academic, social, and emotional student outcomes. However,

the effectiveness of inservice programs has typically been assessed using only teachers' self-reported satisfaction and without program comparisons. In the current study, we similarly assessed satisfaction, as well as teachers' willingness to learn about ADHD and their confidence in teaching these students. These are summarized in the following two types of program comparisons.

Comparing the Effectiveness of Two Inservice Educational Programs

Teacher Self-Reported Attitudes, Practices, and Satisfaction. The teacher perceived needs survey (NAS) indicated that participants perceived they had equivalent access to resources at preinservice; after inservice education the LEA group perceived that additional resources were more accessible to them than to the UT group. In the area of perceived effectiveness of behavioral practices, the LEA group also reported a higher rate of effectiveness in the use of time-out than the UT group after inservice intervention. This could be attributed to the fact that the LEA curriculum content included education on the use of time-out in the classroom.

In contrast, the UT intervention curriculum provided the participants with alternatives to time-out, such as different methods to channel behavior within the classroom. Perhaps for this reason, the UT groups alone showed pre- to postinservice improvement in their use of practices on the CES involving accommodations for student differences, which emphasized student independence (e.g., self-monitoring, self-management practices). The UT group, but not the LEA group, also reported that empathy for students with learning/behavior disorders improved from pre- to postinservice on the MES to validate the content focus (understanding the function of the behavioral characteristics), which was emphasized in the UT program.

Teacher Ratings and Observations of Student Behavior. In support of these teacher gains (i.e., changes in empathy and in teaching practices), the UT group, but not the LEA group, reported significant improvements from pre- to postinservice on ratings of children on the ACTeRS Social Skills Scale. The UT group's mean change was 2.03 points (about .4 *SD*). Because the ACTeRS Scale is a standardized measure using *t* scores ($M = 50, SD = 10$), this finding can be translated into percentile ranks.

On average, a student who was rated at the 50th percentile rank on Social Skills at preinservice by participants in the UT group would be rated as improved to the 58th percentile rank.

University Groups (UT 1 vs. UT 2) Comparisons

Attending an additional day of the inservice education program with added practice in functional behavioral assessment also yielded effects.

Teacher Self-Reported Attitudes, Practices, and Satisfaction. An unexpected finding was documented for the group *without* an additional day of functional assessment. That is, the UT 1 group's confidence in teaching students with ADHD improved from pre- to postinservice on the CES, but not that of the UT 2 group. Perhaps learning a new skill (on Day 2) was more challenging than learning more general strategies (on Day 1).

Teacher Ratings and Observations of Student Behavior. Although the confidence of the UT 2 group did not show the same improvement from pre- to postinservice as did the confidence of the UT 1 group, findings on the ACTeRS Hyperactivity and Oppositionality scales provided evidence of the critical influence of the second day of functional behavioral assessment. The UT 2 group rated their students as improved an average of 5.00 points on the ACTeRS Hyperactivity scale and 3.11 points on the ACTeRS Oppositionality scale. Because the ACTeRS is a standardized measure using *t* scores ($M = 50, SD = 10$), these findings can be translated into percentile ranks. On average, students who were rated at the 50th percentile rank at preinservice by UT 2 participants would be rated at the 30th percentile rank on the Hyperactivity scale and at the 37th percentile rank on the Oppositionality scale. By analyzing the function of behavior, the UT 2 group may have acquired more skills in reducing or redirecting these types of behavior. That is, the UT 2 group participants, who recorded less hyperactivity and oppositionality 3 months after inservice education programming, either (a) demonstrated more skill in analyzing behavior and adapting instruction or (b) became more understanding/tolerant of these types of behavior. In support of the first possibility of changes of skill, the UT 1 group used an average of 6.1 Classroom Discipline practices (time-out

+ loss of privileges) per week; whereas the UT 2 group used an average of only 2 of these practices per week, which was significant in the middle time period of the study (i.e., Weeks 4, 5, and 6). This finding suggested that the UT 2 group was applying different approaches to address disruptive behavior.

Limitations

Potential limitations of the present study were in measurement and participant selection, which are typical limitations for the majority of field-based studies (Cook & Campbell, 1979). In the area of measurement, some participants failed to complete the postinservice measures. This was attributed to the extended time required, as similarly reported elsewhere (e.g., Hemmeter, Doyle, Collins, & Ault, 1996; Javorsky, Kline, & Zentall, 2000; i.e., not a bias systematically affecting only one intervention). As well, we relied on the accuracy of teachers' tallies on the Classroom Behavior Tally Checklist, because we were not provided with consent for video observation of whole classes of students. However, teacher self-reports are valid and do not represent socially desirable responses when teachers are asked to make accuracy ratings (i.e., as documented in a comparison of the recordings of observers with teachers' ratings of both students' and their own teaching behavior; Newfield, 1980).

A second limitation concerns the group differences found between the LEA and UT groups and between the UT 1 and UT 2 groups at preinservice. These pretest differences could indicate lack of equivalence in our intervention groups (i.e., the on-site coordinator placed participants into treatment groups randomly but with constraints to balance the groups by number; gender; school level [elementary, middle]; education type [special, general]; and degree level [bachelor's, master's]). Although these pretest differences may have been an artifact of this assignment, we found that out of all the demographic variables assessed, only gender was not fully balanced. For a supplementary check for bias, we examined the compliance rates of each of the intervention groups. Attrition rates (i.e., those who failed to complete the study measures) of the LEA group (15%), the UT 1 group (23%), and UT 2 group (23%) did not differ. The higher (but in this study nonsignificant) rate of compliance for the LEA group has similarly been reported in other research for the dependent variables of

attendance and completion of surveys (Devlin-Scherer, Devlin-Scherer, Schaffer, & Stringfield, 1985). We also statistically controlled for these initial differences. That is, when there were initial differences, follow-up paired *t* tests (pre to post) were performed separately for each inservice group (i.e., because postintervention comparisons between inservice conditions would have been invalid given pretest differences).

Conclusions

Inservice education, regardless of type, was associated with improvements in educators' self-reports of willingness to learn about ADHD and confidence to teach students with ADHD and to include students with behavior and learning problems in their classrooms.

Examining the question of differential gains for type of inservice program, we documented that local inservice education was associated with gains over the university program in two areas—the perception of more resources available and a higher level of use of and ratings on the effectiveness of time-out. The first finding is consistent with previous studies, finding that participants were more likely to perceive that local school professionals or local experts were more accessible to them after an inservice program (Devlin-Scherer et al., 1985; Guskey, 2000). The second finding was consistent with the content of the LEA inservice education curriculum. In other words, the LEA inservice education program promoted the use of time-out as an effective strategy for students with ADHD, whereas the university inservice programs encouraged teachers to seek alternatives.

Actual practices that validated these effectiveness ratings indicated that both groups used classroom removals (i.e., detentions and out-of-classroom time-outs) at the same weekly rate initially. After the first 3 postinservice weeks, the university treatment groups recorded 50% fewer classroom removals per week; whereas, the LEA group recorded almost 200% more classroom removals per week. During the second set of 3 postinservice weeks, this pattern continued with the university treatment groups reporting that they used 33% fewer classroom removals than the LEA group. That is, the LEA group doubled their use of Classroom Removals over their preinservice mean and were two times more likely to use negative consequences for misbehavior and to

have “Don’t Rules” posted in their classrooms than the UT group.

In contrast, 3 months after inservice education, the UT group reduced by about half their use of time-out compared to their preinservice mean. As well, our observational data documented that the UT group participants were four times more likely to use colorful/interesting bulletin boards, three times more likely to use short transition times (e.g., less than 30 s), and four times more likely to use choral responding than the LEA group. As well, participants in the university groups documented higher levels of use and effectiveness of teaching practices that promoted student independence (e.g., allowing students to choose task order) than the LEA group. In short, changes in teaching practices were consistent with the workshop materials to which participants were exposed, with more positive practices documented for the university groups. Thus, one potential disadvantage of local educational agencies is their reliance on local professionals who may be less knowledgeable about evidence-based positive practices.

Other important gains associated with completing the UT inservice education program were: (a) increased empathy for students with ADHD, (b) willingness to accommodate, and (c) improved ratings of their students’ social skills. These findings provide an advance over prior ADHD inservice research that has failed to find gains in teacher ratings of students’ social skills, even after intensive collaboration and consultation on site (Bradley-Klug et al., 1997).

There were also effects of an additional day of instruction related to functional assessment. Participants who were instructed in this new skill reported a 10% decrease in confidence relative to those teachers in the university group who did not learn this new skill. However, educators practicing a new skill (with somewhat less confidence) were also less likely to use classroom discipline practices of time-out and taking privileges away from their students and also reported decreased ratings on their students’ hyperactivity and oppositionality. These findings indicate that knowledge and practice of functional assessment can be translated into gains for educators and their students.

An educational implication for the content of inservice programs would be to include a focus on functional assessment and on

theoretical understanding of children with disabilities (e.g., the importance of ADHD behavior in regulating arousal, see Zentall, 2006). In addition, providing knowledge about evidence-based practices that are positive (i.e., do not remove the child from the educational environment or take privileges from the child) are important kinds of information for behavioral consultants, teacher educators, and local professionals. The implications for university/LEA collaborations in inservice planning would be for the LEA to obtain university consultants who are knowledgeable about positive practices in their area of specialization.

The implication for future research is to use those measures documented in this study to produce differential gains between inservice programs. This will reduce the number of measures, which should reduce attrition, costs associated with assessment, and the number of statistical tests. The sensitive measures in this study were the ACTeRS, the frequency counts of Classroom Removals and Classroom Discipline from the Classroom Behavior Tally Checklists, the Mainstream Empathy Scale, the Classroom Environment Scale, and ratings on the effectiveness of inservice practices that were paired with observation of the actual use of these practices in classrooms. Daily behavioral tallies over 9 weeks could be shortened (i.e., collecting early, middle, and late probes).

In sum, these results document that evidence-based inservice education can improve teachers’ attitudes and increase their understanding of or empathy with these children. These improvements were validated by observed and rated changes in teaching practices and in student behavior. This chain of evidence is an important step in the assessment of inservice interventions (i.e., that typically do not compare interventions and rarely use a standard of teacher or student outcomes) with important implications for research, inservice/preservice education, and outcomes for students with challenging behavior.

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AUTHORS' NOTES

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Please direct all correspondence to Sydney S. Zentall, Department of Educational Studies, BRNG, Purdue University, West Lafayette, IN 47907; E-mail: zentall@purdue.edu.

MANUSCRIPT

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