Clinical Forum

Language and Communication Disorders in Adolescents

Training Secondary School Teachers in Instructional Language Modification Techniques to Support Adolescents With Language Impairment: A Randomized Controlled Trial

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Purpose: This study evaluated the efficacy of a collaborative intervention where a speech-language pathologist (SLP) trained mainstream secondary school teachers to make modifications to their oral and written instructional language. The trained teachers' uptake of techniques in their whole-class teaching practices and the impact this had on the language abilities of students with language impairment (LI) were evaluated.
Method: Two secondary schools were randomly assigned to either a trained or a control condition. A cohort of 13 teachers (7 trained and 6 control) and 43 Year 8 students with LI (21 trained and 22 control) were tested at pre, post, and follow-up times—teachers by structured interview and students by standardized spoken and written language assessments.
Results: Significantly increased use of the language modification techniques by the trained teachers was observed when

compared to the control group of untrained teachers, with this increased use maintained over time. Results from the trained group of students showed a significant improvement in written expression and listening comprehension relative to the control group of students.
Conclusion: This randomized controlled trial is one of the first investigations to evaluate a collaborative intervention that links changes in mainstream secondary teachers' instructional language practices with improvements in the language abilities of adolescents with LI.

Key Words: secondary schools, adolescent language impairment, teachers, training, collaborative intervention, oral and written language

T he concept of inclusive education is gathering momentum internationally, driven by legislation and policy that highlight the need for schools to provide equal educational opportunities to all children, including those who are at risk for educational disadvantage and marginalization (United Nations Educational, Scientific

and Cultural Organization, 1994; U.S. Department of Education, 2002). Inclusive education theory supports teachers in ensuring that all students, regardless of their learning needs, have equal opportunities for accessing the curriculum and for working to their academic potential (Horn & Banerjee, 2009; Shaddock, 2007). The removal of barriers to learning for young people with language and communication needs is a specific recommendation of a recent national review of speech-language pathology services (Bercow, 2008). Similarly, the Response to Intervention (RTI) model has been adopted by many school districts in the United States as a way to provide support to students with additional learning needs (Fuchs, Mock, Morgan, & Young, 2003). Following this tiered intervention model, high-quality core instruction to support students with diverse learning needs in mainstream classes was identified as a high priority at the primary

intervention level (National Centre on Response to Intervention, 2011).

In this climate of inclusive education policy, however, teachers often report feeling undersupported in professional development on how to adapt their instructional practices to accommodate students with additional learning needs, including students with language impairment (LI) (Dockrell & Lindsay, 2001; Forlin, 2001; Pearce & Forlin, 2005). LI, a difficulty with the understanding and/or use of language in both oral and written domains (Leonard, 1991), has a prevalence rate of between 7% and 16% (McLeod & McKinnon, 2007; Tomblin, Records, Buckwalter, Zhang, Smith, & O'Brien, 1997) and a high persistence rate into adolescence (Clegg, Hollis, Mawhood, & Rutter, 2005; Johnson et al., 1999; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). Poor academic progress and disengagement in learning experienced by adolescents with LI (Dockrell & Lindsay, 2007) are risk factors for social, emotional, and behavioral problems (Clegg, Stackhouse, Finch, Murphy, & Nicholls, 2009; Durkin & Conti-Ramsden, 2010; Law, Rush, Schoon, & Parsons, 2009; Snow & Powell, 2004). These findings highlight the need to be proactive in supporting secondary school students with LI. Despite the identification of support needs, there is a significant gap in applicable evidence-based practice (Ebbels, van der Lely, & Dockrell, 2007; Nippold, 2010). Cirrin and Gillam (2008), in their systematic review of the literature on evidence-based studies of children and adolescents with disorders of spoken language, reported that only two out of a total of 21 studies reviewed involved secondary school-age populations.

The current study was designed to address this gap in communication disorder research in the field of adolescent LI and to meet the challenge of providing effective and collaborative speech-language pathology service delivery at the secondary school level. We present the findings of a randomized controlled trial (RCT) of a training-based collaboration between a speech-language pathologist (SLP) and a group of mainstream secondary school teachers. In this program, the SLP trained the teachers over a period of 10 weeks in the use of a set of instructional language modification techniques. We define "instructional language" as teachers' oral and written language that is used in the classroom to instruct their students (Cazden, 2001), and "modification techniques" as strategies that facilitate a change in individuals' behaviors or practices (Kazdin, 2001). Applying these terms to the program evaluated in this study, the intervention aimed to effect a change in the language-based instructional practices of mainstream secondary school teachers, thereby creating a more supportive learning environment for students with LI in their classes.

The Language Environment of Secondary School Classrooms

Language forms the basis of secondary school teachers' instructional teaching practices (Baumann & Graves, 2010).

Teachers use oral and written language to provide instruction, present and analyze language and literary features, instruct in classroom procedures, and convey curriculum content (Nelson, 1989). An increased emphasis by teachers on written language occurs during secondary education, for example, in their use of subject textbooks and in their production of information, work, and assignment resources (Whitmire, 2000). There is also an increased expectation for students to present their understanding of new knowledge through written work, for example, in their production of a range of writing genres and in written responses for assignments, tests, and exams (Kiuhara, Graham, & Hawken, 2009; Larson & McKinley, 1995). Secondary school teachers across all subject areas regularly introduce specific vocabulary items and terminologies for each new curricular topic. Such vocabulary is often new and unfamiliar to the students, and must be processed and retained so that they can develop and demonstrate at least a rudimentary knowledge of each topic (Beck, McKeown, & Lucan, 2002).

The oral and written language used by teachers in mainstream secondary classrooms can be complex, creating barriers to learning for students with LI (Larson & McKinley, 1995; Montgomery & Levine, 1995; Norris, 1997). In her reference to the complexities of instructional language within upper primary and secondary school classrooms, Simon (1998) stated, "School language consists of a barrage of new information presented at a rapid rate in unfamiliar vocabulary and language structure" (p. 259). Children and adolescents with LI are known to have persistent difficulty with oral and written language comprehension (Bishop & Snowling, 2004), oral expression (Wetherell, Botting, & Conti-Ramsden, 2007), written expression (Culatta, Blank, & Black, 2010; Dockrell, Lindsay, & Connelly, 2009), new word learning (Nash & Donaldson, 2005), and short-term and working memory (Archibald & Gathercole, 2006; Leonard et al., 2007). Language difficulties on the part of the adolescent, in combination with teachers' use of complex language, could make general learning tasks such as processing, retaining, and applying new information challenging for students with LI. Facing these obstacles on a regular basis may contribute to associated problems such as poor academic progress and the potential for disengagement in the learning process (Larson & McKinley, 1995).

In addition to explicit academic expectations that students will learn and demonstrate their understanding of large amounts of curriculum content, secondary school teachers also create a set of behavioral expectations for their students. This has been previously described as the "hidden curriculum" (Hoover & Patton, 1997, following Jackson, 1968) and refers to implicit behavioral and academic conformities required of students by different teachers. For secondary school students, these conformities include expectations to attend consistently to information that is presented orally and in written form, to ask and answer questions verbally, to copy efficiently from the board and write notes, and to contribute

verbally to whole-class and small-group discussions (Larson & McKinley, 1995; Nelson, 1998).

Secondary school students with LI often experience additional and significant difficulty with meeting these behavioral expectations (Clegg et al., 2009). This may also contribute to the development of unhelpful acting-out or withdrawal behaviors (Starling, Munro, Togher, & Arciuli, 2011). Such psychosocial issues, combined with long-term language difficulties, conspire to interfere with the academic progress of students with LI, compounding the many factors already causing them to fall behind their peers in language development and literacy-based learning (Brinton, Fujiki, & Baldridge, 2010; Law et al., 2009). Of additional concern is the knowledge that these students' negative behaviors may be misinterpreted and that the underlying LI can remain unidentified and unaddressed (Clegg et al., 2009; Ripley & Yuill, 2005).

The Challenge of Supporting Secondary School Students With LI

Historically, SLPs have found it challenging to provide effective supports for caseloads of students with LI during adolescence, when service provision can be limited compared to that for younger populations with LI (Dockrell, Lindsay, Letchford, & Mackie, 2006; Hollands, van Kraayenoord, & McMahon, 2005; Law et al., 2000). There are many service delivery issues existing within the secondary school setting itself. For example, even though class withdrawal for individual or group therapy sessions can be effective (e.g., Ehren, 2002), the secondary school timetable is complex and creates difficulties for scheduling additional activities (Dohan & Schulz, 1998). Therapy progress can be restricted by having few opportunities for the direct application of therapy goals, due, for example, to a lack of time for SLPs to conduct a sustained and consistent integrated service delivery (Gordon Pershey & Rapking, 2002) and for mainstream teachers to commit to supporting students individually (Larson & McKinley, 2003b; Prelock, 2000). In addition, missed class work can have a negative impact on the academic progress of students with additional learning needs. This may exacerbate an existing problem where secondary school students with LI are already delayed in their academic progress (Bercow, 2008; Smart, Prior, Sanson, & Oberklaid, 2005; Stothard et al., 1998).

An alternative model of service delivery could be the provision of inclusive, classroom-based support. The secondary-level academic environment creates particular challenges for the effective provision of inclusive education for students with additional learning needs, including LI (Shaddock, 2007). For example, mainstream secondary school teachers are pressured to cover curriculum content for groups of students with diverse learning abilities and needs. However, teachers are reported to have little to no training in the awareness and potential impact of learning

disabilities, as well as little to no training in teaching approaches that address these students' additional learning needs (Forlin, 2001; Pearce & Forlin, 2005).

Encouraging findings on the benefits of teachers' professional development can be found in recent general education literature. For example, in a large-scale synthesis of evidence-based professional development research, Guskey and Yoon (2009) concluded that sustained, rather than one-off, and site-based professional development activities for teachers that are presented by experts in the relevant field resulted in the most positive effects on student outcomes. It has also been suggested that professional development for teachers should target three major goals to be effective: "Change in the classroom practice of teachers, change in their attitudes and beliefs, and change in the learning outcomes of their students" (Guskey, 2002, p. 383).

Building on these suggestions for fundamental approaches to general student support, we turn to the literature on best practice approaches for whole-class support of students with learning disabilities. Vaughn, Gersten, and Chard (2000), in their review of evidence-based studies in this field, identified some common principles of effective classroom teaching practices. These included making instruction visible and explicit, for example, by teaching the steps of the writing process and frameworks for different writing genres (Gersten & Baker, 2001); moderating task difficulty by, for example, monitoring the order and sequence of presentation of curriculum content (Keogh, 1982); and explicitly teaching procedural facilitators and strategies to assist students with planning and executing their work (Harris & Pressley, 1991).

Teachers' inclusive support of students with additional learning needs through the use of direct vocabulary instruction has also received attention (Beck et al., 2002; Bos & Anders, 1990; Graves, 2000; Joffe, 2006; Mastropieri, Scruggs, & Mushinski Fulk, 1990; Throneburg, Calvert, Sturm, Paramboukas, & Paul, 2000; Wilson, Nash, & Earl, 2010). Highlighted is the effectiveness of targeting essential curriculum vocabulary for content mastery and teaching explicit strategies for independent word learning. In summary, there is evidence to support mainstream teachers' increased use of instructional language modification techniques for students with learning disabilities, but to date, this has yet to be systematically examined for students with LI.

Caseload management in the secondary school context also involves deciding on the most efficacious model of service delivery, and SLPs could consider adopting a systems-based approach. Paul (2007) refers to the systems model, where the interactive environment is the focus of change, and where taking a systems-based perspective "means that we do not assume that all of the communication problems are 'in' the child but, rather, are in the relationship between the communication partners" (Paul, 2007, p. 12). This conceptual approach underlines recommendations to support whole populations of adolescents with additional

learning needs, including LI, within their learning environment through interdisciplinary collaborations and integrated service delivery opportunities (American Speech-Language-Hearing Association, 1991; Law et al., 2002; Shaddock, 2007). Moreover, collaborations between SLPs and teachers have been reported to facilitate a useful exchange of ideas and expertise that have resulted in the improvement of language skills in students with LI (Throneburg et al., 2000). The need to situate interventions within the classroom has been advocated (Gordon Pershey & Rapking, 2002), with some authors recommending a specific emphasis on modifying teaching and learning contexts to support the needs of students with LI (e.g., Dockrell, Lindsay, & Palikara, 2011).

The RCT presented in this article builds on a pilot study that was carried out in Sydney, Australia. The pilot was developed and implemented at a secondary school in response to a request for sustained mainstream teacher professional development that would impact whole populations of secondary students with LI who were attending the school. The first author provided 10 weeks of training to 13 teachers who taught students in Years 7, 8, and 9 (which are equivalent to Grades 7, 8, and 9 in the United States). The pilot was evaluated by teacher questionnaire at mid and end points of the program. All teachers provided positive and useful feedback about aspects of the program, such as raising teachers' awareness of the nature and impact of LI in secondary student populations, and the benefits of working collaboratively with an SLP. Nine teachers reported that they had observed students with LI benefitting from the language modifications made to teaching materials, for example, by these students becoming more engaged in classroom activities (Starling, 2007). The constructive teacher feedback from the pilot study was encouraging and provided the impetus for a more robust evaluation of the intervention.

The Current Study

The current study set out to evaluate the hypothesis that, by facilitating changes to mainstream secondary school teachers' oral and written instructional language by means of a sustained on-site training program, SLPs can provide effective support to whole populations of adolescents with LI. Indeed, SLPs' training of secondary school teachers in instructional language modification techniques is a frequently recommended approach to collaborative intervention (Ehren, 2002; Nippold, 2010; Norris, 1997; Prelock, 1997; Simon, 1998). However, to the authors' knowledge, the efficacy of this approach has not previously been examined. It is not yet clear whether mainstream secondary school teachers will find value in adopting instructional language modification techniques and incorporating them into their regular teaching practices to support students with LI in their classes. Neither is it clear whether teachers trained in these techniques will sustain their use of the techniques

without continued support from an SLP. Also, it is not known whether teachers' changes in their language-based whole-class teaching practices will have a significantly positive impact on the oral and written language abilities of students with LI in their classes.

A priority for the current study was to observe and measure the degree to which teachers would adopt and use innovative techniques that were presented to them in a training program. For this purpose, we turned to the Concerns-Based Adoption Model (CBAM; Hord, Rutherford, Huling-Austin, & Hall, 2006). This instrument provides a conceptual framework for measuring the process of change when learners (such as teachers) are asked to adopt and implement new ideas within their teaching practices. The CBAM has undergone rigorous validation (Hord et al., 2006) and has been used to evaluate a range of teacher professional development innovations, including the use of computer technology as an instructional tool (Gershner & Snider, 1999; Newhouse, 2001; Schiller, 2003), the implementation of a new curriculum (Christou, Eliophotou-Menon, & Philippou, 2004), and preservice teacher training programs (Ward, West, & Isaak, 2002). The Levels of Use (LoU; Hall, Dirksen, & George, 2006) is one of three diagnostic tools that form the CBAM. It was selected for this study to measure the participating teachers' change in their levels of use of the instructional language modification techniques before training, immediately after training, and then one school term with no further training.

We conducted the RCT to answer the following research questions:

- Do mainstream secondary school teachers who have been trained in the use of instructional language modification techniques by an SLP demonstrate the use of these techniques in their classroom teaching practices in comparison to a control group of teachers who have not been trained?

- Can trained teachers' use of instructional language modification techniques be sustained over a period of time in the absence of further direct support from the SLP?

- Do secondary school students with LI who have been taught by teachers who used the instructional language modification techniques demonstrate significant improvements in their oral and written language ability in comparison to a control group of students with LI whose teachers have not received the training?

- If improvements in the students' oral and written language skills are observed pre–post teacher training, are these improvements maintained after a period of time when the trained teachers have no further support from the trainer (the SLP)?

We predicted that the teachers would take up and maintain their use of language modification techniques after receiving training from an SLP in a sustained, interactive, and

professionally collaborative approach. We were more cautious about our predictions for improvement in the students' oral and written language abilities. Adolescent LI is entrenched by nature and is known to persist in the long term (Clegg et al., 2005; Law et al., 2009), even when students are supported over time with regular language therapy (Durkin & Conti-Ramsden, 2010). The impact on students with LI of an intervention targeting changes to the language of instruction in secondary teachers' whole-class teaching practices is not known. Our hypothesis was that, by directly training teachers in instructional language modification techniques for use in the students' naturalistic language environment, these changes could have a positive impact on the oral and written language abilities of the students with LI in the teachers' classes.

METHOD

Design

We chose to use an RCT using area sampling (Portnoy & Watkins, 2009), with blinding of assessors and raters. We approached an administrator of government schools, independent of the current study, who located a group of demographically similar secondary schools in metropolitan Sydney, Australia. A short list of schools was identified by the administrator, and two secondary schools agreed to participate in the study.

A concealed randomization process occurred following identification of a cohort of teacher and student participants across the two schools. Whole schools were randomly assigned to the treatment or control condition by means of sealed envelopes chosen by a person independent of the study. The treatment condition school received a school term of training; the control condition school was placed in a wait condition and received the treatment (i.e., the training program) after a wait period of one school term. The primary cohort of participants across the two schools included 13 mainstream secondary school teachers; the secondary cohort of participants included 43 Year 8 students who had been identified with LI. These students attended classes taught by the participating teachers.

The intervention was administered to the group of teachers at the treatment-condition school over the period of an entire school term (10 weeks). Following the posttraining tests,

the intervention was administered to the cohort of teachers at the wait-condition school. Throughout this paper, the cohort of teachers attending the treatment-condition school will be referred to as the "trained group," and the cohort of teachers attending the wait-condition school will be referred to as the "control group." The first author, an experienced and certified SLP, administered the training program. All assessments, scorings, and ratings were carried out by research assistants (RAs) who were blinded to the nature of the intervention, the trained/control condition of the cohorts, and the test phases of the study. Intention to treat analysis was used in this study.

The trained group of teachers and students were assessed at three phases of the study: pre/testing time 1, post/testing time 2, and follow-up post/testing time 3. Due to their delayed treatment condition, the control group of teachers and students participated in two pretraining testing phases of the study (delayed pre/testing time 1 and pre/testing time 2) and were again assessed at post/testing time 3 and follow-up post/testing time 4. There was a period of ~12 weeks between each phase of testing, representing a 2-week school holiday plus one 10-week school term. Table 1 summarizes the training and testing timetable.

Participants

Ethical approval was obtained from the University of Sydney, and permission to conduct the research study was obtained from the New South Wales (NSW) Department of Education and Training. Two large, urban, coeducational government secondary schools in metropolitan Sydney, Australia, were recruited for the study. Approximately 85% of the total student population at both schools was from culturally diverse backgrounds, with English as their primary language. The students attended the second year of secondary education, Year 8, which is the equivalent of middle school Grade 8 in the United States.

Teacher participants. Following identification of the cohort of Year 8 students with LI, all teachers at both schools who had at least one student in one of their regular classes were invited by the school executive to participate in the study. Seventeen teachers originally agreed to participate; however, four withdrew before the study commenced due to personal reasons. Thus, there was a total of 13 teacher participants in the final cohort: seven teachers in the trained group, and six in the control group. These teachers were from a range of teaching disciplines: math; history/geography;

Table 1. Time line of study.

	Testing time 1		Testing time 2		Testing time 3			
Trained group	Pre	Training	Post	No training	Follow-up			
Control group	Delayed pre	No training	Pre	Training	Post	No training	Follow-up	

visual arts; personal development, health, and physical education (PDHPE); English; science; and agriculture. None of the teachers was participating in other professional development programs on language and literacy during their participation in this study. A summary of the teachers' demographic profiles is presented in Table 2.

Student participants. Teaching staff at the two schools were asked to identify a cohort of Year 8 students with known or suspected LI, according to standard exclusion criteria, including the absence of sensory deficits or developmental disabilities (Tomblin, Zhang, Buckwalter, & O'Brien, 2003). Because both schools had a high percentage of students from culturally diverse backgrounds, students were excluded from the study if they were assessed by the schools as being either first- or second-phase English as a Second Language (ESL) learners (NSW Department of Education and Training, 2004). Sixty-six students were identified across the two schools, representing 16.5% (34/206) of the Year 8 students in one school and 17% (32/185) in the other. Consent was sought from the students' parents for inclusion in the study, as a result of which, 47 of the 66 identified students were screened (22 at one school, 25 at the other). One identified student was expelled from school just as the screening program started.

Verbal language screening consisted of five subtests of the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999) to obtain a core language score. Nonverbal abilities were assessed using the Test of Nonverbal Intelligence—3 (TONI–3; Brown, Sherbenou, & Johnsen, 1997). The criterion for inclusion in the study was a core language score indicating LI, being either a specific

language impairment (SLI) or a nonspecific language impairment (NLI). Consistent with previous literature, an SLI was defined as a verbal score of $\leq$ standard score (SS) 85 (i.e., at least 1 *SD* below the norm) and a nonverbal score of $\geq$ SS 85 (Plante, 1998; Stark & Tallal, 1981). An NLI was defined as a verbal score of ≤ 1 *SD* below the norm and a nonverbal score between 1 and 2 *SD*s below the norm (SS 70–85) (Tomblin et al., 2003). The NLI nonverbal cutoff was based on the diagnostic criterion for intellectual and developmental disability as stated in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition-Text Revision* (DSM-IV-TR; American Psychiatric Association, 2000), being a nonverbal IQ < SS 70.

Of the 47 students screened, 43 met the criteria of an LI, 21 (17 males: 4 females) in the trained school group and 22 (16 males: 6 females) in the control school group. Interestingly, the male to female ratio of adolescents with LI identified in this study (3.3m: 1f) reflects the findings of other larger scale prevalence studies. For example, a follow-up study at ages 16–17 of Bishop and Edmundson's (1987) initial cohort of preschool children identified with speech-language impairment reported a 3m: 1f ratio of adolescents with persistent LI (Snowling, Adams, Bishop, & Stothard, 2001). Similarly, the Manchester Language Study (Conti-Ramsden & Botting, 1999) reported a 3.3m: 1f ratio for the initial cohort of 242 7- and 8-year-olds with LI.

There were no significant differences between the groups in terms of age (trained school student age range in months 155–168, M_{age} = 158; control group age range 151–171, M_{age} = 160 months; p = .246). The students' ethnic backgrounds were as follows: Caucasian (trained school: 5, control school: 4), Asian (trained school: 12, control school: 15), African (trained school: 3, control school: 2), and Arabic (trained school: 1, control school: 1). As previously identified in the LI inclusion/exclusion criteria, all student participants were proficient English speakers.

Table 3 presents the screening test results of the trained and control student groups. There were no significant differences

Table 2. Teacher demographics.

	Trained group (n = 7)	Control group (n = 6)
Years of teaching		
1–3	2	0
4–6	2	1
7–9	1	0
10–20	2	1
20+	0	4
Highest qualification		
Diploma/certificate	3	2
Bachelor of Arts degree	4	4
Course in learning difficulties		
None	5	3
Diploma in special education	0	1
Stand-alone course	2	2
Age range		
20–29	3	1
30–39	2	1
40–49	1	4
50–60	1	0
Gender	1m/6f	0m/6f

Table 3. Screening test standard scores (mean and standard deviation) of Year 8 student participants.

Screening test standard score	Trained school n = 21		Control school n = 22			
	M	SD	M	SD	t value	p value
CASL core language score	73.6	9.6	74	9.5	−.329	.744
TONI–3	93.5	10.7	99.6	14.9	−1.431	.160

Note. CASL = Comprehensive Assessment of Spoken Language (Carrow-Woolfolk, 1999). TONI–3 = Test of Nonverbal Intelligence, Third Edition (Brown, Sherbenou, & Johnsen, 1997).

between the groups' verbal and nonverbal screening test standard scores. There were no regular speech-language pathology services available at either school, and none of the participating students was accessing speech-language pathology services in the private sector.

Participant flow. All seven trained group and six control group teachers participated in all phases of the study. For the 21 students in the trained group, all 21 were retested at post, but one student was absent for the follow-up tests (*n* = 20). For the 22 students in the control group, retention rates were similar, with all 22 students tested at the delayed pre and pre times, and one student absent for the posttest (*n* = 21).

The Program

Program content. The following paragraphs summarize the four types of instructional language modification techniques that were presented in the program:

- *Teachers' written language.* Examples included modifying the language used on a teacher-prepared worksheet by breaking down large amounts of information into smaller, visually distinct sections; adding graphics and visual icons; providing descriptions for instructional vocabulary; and ensuring that questions were on the same page as the text for easier reference.

- *Teachers' oral language.* Examples included ensuring that instructions were explicit rather than inferred, allowing time for students' processing and verbal responses, repeating and rephrasing key information and instructions, and facing the class when delivering important information.

- *Information processing.* Examples included ensuring a whole-of-class involvement in the deconstruction of complex texts, for instance, by creating a mind map on the board that summarized "discussed and agreed" key points and associated facts; providing a visual planner on the board; outlining the sequence of tasks to be covered during the lesson; and involving the whole class in creating visual aids such as charts and posters to assist information processing and retention.

- *Direct vocabulary instruction.* Examples included prioritizing vocabulary when starting each new curricular topic, based on the three-tier vocabulary system (Beck et al., 2002); embedding vocabulary in the students' learning through activities such as creating visual symbols to assist with word meanings and retention; and conducting whole-class interactive morphemic analysis that included identifying root words, prefixes, and suffixes for better understanding of unfamiliar vocabulary.

Appendices A and B provide examples of some of the techniques that were used to modify teachers' instructional language, taken from the program implementation.

Program delivery. The training program was delivered by means of individual or small-group interactive meetings between the SLP and the teachers. The meetings occurred at the school during a 50-min out-of-class period once a week for the duration of a school term (10 meetings). When necessary, teachers were provided with a substitute teacher so they could have class release time. In addition, the SLP attended a minimum of three lessons per teacher to observe the teachers' use and application of the trained techniques in situ.

The meetings between the teachers and the SLP served various purposes, including the introduction, explanation, and modeling of the oral and written instructional language modification techniques, as well as discussion of ideas for the application of these techniques to general classroom scenarios. The meetings were also used for follow-up discussion of issues arising from implementation of the ideas as observed by the SLP or reported by the teachers. At a later stage of the program, teachers were encouraged to generate their own ideas and modify resources without direct input from the SLP, and application of these modifications was also observed and discussed. The intention was that all teachers would reach a stage of independent initiation and application of instructional language modifications by the end of the training program.

Program fidelity. Program fidelity was addressed in the following ways. First, at the start of the training program, all participating teachers were provided with the same program manual (Starling, 2008). This manual presented an overview of the program, including background rationale, and an outline of the training program, including the four phases of the program (i.e., overview and planning, instruction, learning and application, and assessment). Hypothetical scenarios were provided for each instruction and learning phase. To ensure consistency, a meeting protocol as outlined in the manual was also used. The program contents (instructional language modification techniques) were presented in the manual, with examples of applications.

Second, observation of the teachers' use of the trained techniques occurred at least three times per teacher over the course of the training program. Two rating forms were developed as an explicit protocol to guide and record the trainer's observations and the teachers' self-evaluations. The forms were adapted from Larson and McKinley's pro forma for the evaluation of teachers' language (Larson & McKinley, 2003a, p. 447), one targeting teachers' spoken language and the other targeting teachers' written language. The forms used a grid of eight areas evaluated on a 5-point rating scale. An example of a spoken language evaluation was "volume of voice," with the five rating points being on a scale from *very quiet* to *very loud.* An example of a written language evaluation was "use of visual aids to support written text," with the five rating points being on a scale from *minimal use* to *highly used.*

The completed forms were used as the basis of discussion at the training meetings, so that comparisons could be made

between the trainer's observations and the teachers' self-perceptions. These discussions facilitated identification of teachers' individual goals for developing instructional language modifications and the subsequent monitoring of progress in meeting these specific goals. For example, a science teacher identified, in consultation with the trainer, that her lessons were very disorganized, that she tended to talk at great length, and that subsequently she did not cover the required curriculum content. The teacher was previously unaware of the challenge she was imposing on the students in her classes who had LI with associated auditory processing and retention difficulties. This teacher made two particular changes to her language-based instructional language practices. First, she wrote a visual planner on the board at the start of each lesson, outlining the topics and activities that she planned to cover. This list would be referred to by both the teacher and her students as the lesson progressed. Second, the trainer and teacher worked collaboratively to develop a set of written resources covering curriculum content information handouts and worksheets that were then applied in the teacher's whole-class teaching practices.

As a third way of addressing program fidelity, modified written resources that were developed collaboratively by the SLP and teachers were collected over the course of the training. A randomly selected sample of 20 such resources (at least two for each trained teacher) identified a 90% rate of use by the teachers in their classroom teaching practices, confirmed by teacher report or SLP observation. By the end of the training program, all of the trained teachers were observed to self-generate and use at least 10 language modification ideas in the classroom (at least one per teacher).

Lastly, to ensure that the direct vocabulary instruction component of the training program was being implemented, whole classes were given pre- and posttopic instruction vocabulary tests. Students were tested on their knowledge of 10 curricular words that had been identified and described by each teacher, in collaboration with the SLP, as being of the highest priority to the learning of a specific topic. Each description included one or two key words that were thought to be contextually appropriate and important for the students' demonstration of an understanding of the curricular word. For example, the history teacher chose *mobility* as an essential curricular word for the topic of indigenous peoples, with the description *"Mobility is the ability to move freely from place to place,"* and the key word being *move.* Trained teachers gave the preinstruction tests to all students in their Year 8 classes before the introduction of a new curricular topic; the postinstruction tests were administered to the same students at the completion of instruction in that topic. In most cases, the postinstruction tests coincided with completion of the 10-week training program. The use of the pre- and postvocabulary tests by all participating teachers reinforced the program's fidelity.

Testing Tools and Procedures

Teachers' use of instructional language modification techniques. As introduced earlier, the LoU tool (Hall et al., 2006) from the CBAM (Hord et al., 2006) was used to evaluate the teachers' changes in their use of the program techniques over time. The LoU tool required a structured face-to-face interview. The interview was audio-recorded and then transcribed, and the teachers' responses were coded according to their individual movement along a continuum of change in relation to a set of seven distinct behavioral parameters.

The LoU tool does not code nonuse or use of an intervention as a discrete binary option. Instead, there are three levels of nonuse: Level 0 (Nonuse), Level I (Orientation), and Level II (Preparation); and five levels of use: Level III (Mechanical Use), Level IVA (Routine), Level IVB (Refinement), Level V (Integration), and Level VI (Renewal). The five user levels are subgrouped as follows: Levels III, IVA, and IVB being user: self-focused; and Levels V and VI being user: impact-focused. These eight levels are described in detail in Table 4.

These levels of use therefore demonstrate a continuum of change from being a nonuser to a user of an intervention. Levels are measured in relation to seven behavioral parameters: Knowledge, Acquiring Information, Sharing, Assessing, Planning, Status Reporting, and Performing. Table 5 provides descriptions of each parameter.

In the context of this study, a teacher who was not using the techniques included in the training program was considered to be at the "nonuser" level. In contrast, a teacher who was in the process of learning and using the techniques in the classroom but was not sharing ideas and resources with colleagues was considered to be at a "user: self-focused" level. At a "user: impact-focused" level, teachers indicated active sharing of ideas and resources with others such as teaching colleagues and school administrators.

The structured interview was conducted by independent RAs at all testing points in the study, for both the trained and control teacher groups. Teachers' audio-recorded and transcribed responses were then coded by independent raters who were blinded to the nature and testing phases of the study. The interviewers were blinded to the specific contents and purpose of the program, the trained/control condition of the participants, and the testing phases of the study. All RAs had a professional qualification relevant to the study, such as speech-language pathology or teaching, and all received training in the interview protocol (Hall et al., 2006) by the principal researcher.

The LoU interview protocol uses the term "innovation" to describe a new program. In our study, the term "innovation" was replaced with the more familiar term "intervention." To orient the teachers to the intervention, RAs qualified this term by adding the phrase "language modification techniques" at the start of the interview.

Table 4. The eight Levels of Use (LoU) of an intervention (Hall, Dirksen, & George, 2006).

LoU	Level name	Subcategory	Description
0 (0)	Nonuse	Nonuse	State in which the user has little or no knowledge of the intervention, has no involvement with the intervention, and is doing nothing toward becoming involved.
1 (I)	Orientation	Nonuse	State in which the user has acquired or is acquiring information about the intervention and/or has explored or is exploring its value orientation and its demands upon the user and the user system.
2 (II)	Preparation	Nonuse	State in which the user is preparing for the first use of the intervention.
3 (III)	Mechanical Use	User: Self-focused	State in which the user focuses the most effort on the short-term, day-to-day use of the intervention with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the intervention, often resulting in disjointed and superficial use.
4 (IVA)	Routine	User: Self-focused	Use of the intervention is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving intervention use or its consequences.
5 (IVB)	Refinement	User: Self-focused	State in which the user varies the use of the intervention to increase the impact on clients within his or her immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.
6 (V)	Integration	User: Impact focused	State in which the user is combining own efforts to use the intervention with the related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.
7 (VI)	Renewal	User: Impact focused	State in which the user reevaluates the quality of the use of the intervention, seeks major modifications or alternatives to the present intervention to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

Note. For column one, the original LoU numbering system is included in parentheses. For data analysis and interpretation, the numbering of the levels is also shown. From *Measuring Implementation in Schools: Levels of Use* (p. 5), by G. E. Hall, D. J. Dirksen, and A. A. George, 2006, Austin, TX: Southwest Educational Development Laboratory (SEDL). Copyright 2006 by SEDL. Adapted with permission.

RAs adhered to the interview protocol by using a standard written script (Hall et al., 2006, Appendix A). This script is organized around a series of decision points that allow the interviewer to make decisions about which questions to ask. For example, if it was decided early in the interview that the interviewee was not aware of, or was not using, the intervention, the interview would follow a particular, and limited, pathway of questioning. However, if it was found that the interviewee was at a certain stage of using the intervention, then the interviewer would continue with appropriate questions to gain more in-depth information. At all levels of questioning, information was sought for each of the seven behavioral parameters.

The following are examples of questions that were asked as part of the interview protocol:

- At an initial stage of the interview: "Are you using the ideas targeted in the intervention?" "Are you currently looking for information about the intervention?"
- Questions asked once it was ascertained that the interviewee was using the ideas introduced in the intervention: "Have you made any changes recently in how you use the intervention?" "What do you see as the strengths and weaknesses of the intervention in your situation?" "Do you ever talk with others about the intervention?"

In this way, each teacher's levels of use could be quantified over the time of the study according to a set of distinct behaviors. For example, a control group teacher who responded to the question, "Have you made a decision to use the intervention in the future?" with "I haven't read it so I don't know how I can use it" for the behavioral category of planning would be coded 0 (Nonuse). This indicates a level of nonuse that aligns itself with the definition, "Individuals… schedule no time and specify no steps for the study or use of the innovation (intervention)" (Hall et al., 2006, Appendix E). In contrast, if a teacher responded "Definitely I'll use it (the intervention), actually I'll have a Year 7 learning difficulties class (next year), so I'm definitely looking into adjusting my worksheets and work that I used this year," this response would be coded at a self-focused level of use (IVB, Refinement). In relation to the parameter Planning, this response is consistent with individuals who "develop intermediate and long-range plans that anticipate possible and needed steps, resources and events designed to enhance client outcomes" (Hall et al., 2006, Appendix E). Similarly, in relation to Status Reporting, a question is asked: "Have you

Table 5. Behavioral parameters for the LoU.

Category	Description
Knowledge	That which the user knows about characteristics of the intervention, how to use it, and consequences of its use.
Acquiring Information	Solicits information about the intervention in a variety of ways, including questioning resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.
Sharing	Discusses the intervention with others. Shares plans, ideas, resources, outcomes, and problems related to use of the intervention.
Assessing	Examines the potential or actual use of the intervention or some aspect of it. This can be a mental assessment or can involve actual collection and analysis of data.
Planning	Designs and outlines short- and long-range steps to be taken during the process of intervention adoption (e.g., aligns resources, schedules, and activities) and meets with others to organize and/or coordinate use of the intervention.
Status Reporting	Describes personal stand at the present time in relation to use of the intervention.
Performing	Carries out the actions and activities entailed in operationalizing the intervention.

Note. From *Measuring Implementation in Schools: Levels of Use* (Appendix E, pp. 79–81), by G. E. Hall, D. J. Dirksen, and A. A. George, 2006, Austin, TX: Southwest Educational Development Laboratory (SEDL). Copyright 2006 by SEDL. Adapted with permission.

made any changes in how you're using the intervention?" A teacher's response such as "I made adjustments for everyone, and then I had further activities for those that finished faster, they had further challenges while I targeted those who couldn't do so much" would also be coded as a self-focused user level of IVB (Refinement). At this level, in relation to the parameter Status Reporting, a user "Reports varying use of the innovation (intervention) in order to change client outcomes" (Hall et al., 2006, Appendix E).

Interrater reliability between blinded assessors and the first author for 25% of the LoU coded data, randomly selected, was 94%.

Student testing. To evaluate the potential impact of the teachers' use of instructional language modification techniques on the cohort of students' language-based learning abilities, four subtests of the Wechsler Individual Achievement Test—Second Edition, Australian Standardised Edition (WIAT–II; Wechsler, 2007) were used: Reading Comprehension, Written Expression, Listening Comprehension, and Oral Expression. This assessment tool was chosen due to its provision of (a) subtests that assess both oral and written language, (b) Australian population normative data, (c) Australian language adaptations, and (d) robust content validity in relation to Australian curriculum content (Wechsler, 2007).

For the Reading Comprehension subtest, students read a series of short and longer passages and then verbally answered questions related to the texts. For the Written Expression subtest, students completed (a) a written word fluency task, (b) a sentence-writing task, and (c) an expository essay-writing task. The Listening Comprehension subtest involved receptive vocabulary, sentence comprehension, and answering questions such as "Tell me the word that means 'to break loose or free.'" The Oral Expression subtest involved an oral word fluency task, a visual passage retell, and giving oral directions for two procedures.

Students were tested, and the responses scored, by trained RAs who were blinded to the nature, the trained/control condition, and the testing phases of the study.

Interrater reliability testing between the first RAs and a second set of RAs was carried out for a random sample of 25% of the tests, with 92% reliability. An additional set of reliability tests was carried out for two of the four subtests of the WIAT–II, Written Expression and Oral Expression, as these required more response interpretation than Reading Comprehension and Oral Comprehension. Interrater reliability for scoring the Written Expression and Oral Expression subtests for 25% of randomly selected test data was 90%.

Data Analysis

Teacher cohort. To evaluate the trained group of teachers relative to the control group of teachers, data were compared at time points relevant to when the trained teachers were first tested. This meant that the efficacy of the training was measured at pre and post conditions for the trained group relative to the delayed pre and pre conditions of the control group. For ease of presentation, the results will be anchored to the terms *pre* (time 1) and *post* (time 2). Recall that the coded LoU teacher data could reflect the effects of professional development by an individual's movement along a continuum of change, that is, from being a nonuser of an intervention to being a self-focused user and, ultimately, to being an impact-focused user. The data as such could range from Level 0 (Nonuse), Level 1 (Orientation), Level II (Preparation), Level 111 (Mechanical Use), Level IVA (Routine), Level IVB (Refinement), Level V (Integration), and finally, Level VI (Renewal), where Levels 0–II indicate a nonuser of an intervention, Levels III–IVB reflect a self-focused user of an intervention, and Levels V and VI reflect an impact-focused user (Hall et al., 2006).

To account for the ordinal nature of these data, we needed to change Level IVA (Routine) and Level IVB (Refinement). To do this, we recoded Level IVA data as scores of 4 and Level IVB data as scores of 5. This meant that Level V (Integration) data were then changed to 6 and Level VI (Renewal) data to 7. Thus, the range of levels of use for our analysis became a score from 0–7 (nonuser: Levels 0–2, user: self-focused: Levels 3–5, and user: impact-focused: Levels 6–7).

Inspection of the LoU data revealed that it was not normally distributed. As such, standard repeated measures analyses of variance (ANOVAs) using the raw LoU data were not pursued. Instead, we used aligned rank procedures for testing multivariate interactions. Such procedures are known to better control for Type 1 error rates for nonnormal data (Beasley, 2002). To do this, LoU scores for each dependent variable were first ranked. To specifically investigate potential main effects of time and group, the ranks of the original scores were subjected to 2×2 repeated measures ANOVAs. Then, to investigate possible interactions, aligned scores were calculated by subtracting the main effect means from each individual unranked score. This produced the aligned scores for each dependent variable that were then analyzed via 2×2 repeated measures ANOVAs, ignoring the main effects and this time specifically looking for Time × Group interactions. Effect sizes are reported where η_p^2 values of 0.0099 refer to a small effect size, 0.0588 to a medium effect size, and 0.1379 to a large effect size (Cohen, 1969; Richardson, 2011).

For ease of presentation, the statistical output is reported, but with median and interquartile ranges displayed. The data can thus be interpreted against the parameters of the LoU instrument, where teachers ranged from being nonusers of the techniques to being self- and impact-focused users (i.e., with scores from 0–7). To answer whether trained teachers were able to sustain their use of the instructional language modification techniques over time without any further instructional support, separate Wilcoxon signed-ranks tests were conducted from post to follow-up testing conditions using the original data.

Student cohort. To evaluate the students whose teachers had received the training compared to those in the control group, data were compared at time points relevant to when the students from the trained school were first tested. This meant that the potential effects of the teacher training on the students' written and oral language performance were measured at pre and post conditions for the trained group relative to the delayed pre and pre conditions for the control group. Consistent with the teacher data, these results will continue to be anchored to the terms *pre* (time 1) and *post* (time 2). The student data were normally distributed and so were analyzed by repeated measures ANOVAs. Effect size benchmarks are reported as per the teacher cohort. To observe longer term student outcomes once their teachers were trained, separate paired *t* tests were conducted from post to follow-up testing conditions.

RESULTS

Teacher Outcomes

Pre and post training. There are seven behavioral parameters within the LoU instrument. These are Knowledge, Acquiring Information, Sharing, Assessing, Planning, Status

Table 6. Descriptive results (median, minimum, maximum, and interquartile range) of the seven behavioral parameters of the LoU pre and post training for the trained teachers versus the control teachers.

LOU parameter	Trained teachers' pretraining scores	Trained teachers' posttraining scores	Control teachers' pre scores	Control teachers' post scores
Knowledge				
Median	0	4	0	0
Min/Max	0–1	3–6	0	0–1
25%–75%	0–1	4–5	0	0–.25
Acquiring Information				
Median	0	4	0	0
Min/Max	0–1	4–6	0	0–1
25%–75%	0–1	4–5	0	0–1
Sharing				
Median	0	5	0	0
Min/Max	0	4–6	0	0–1
25%–75%	0	4–6	0	0–1
Assessing				
Median	0	4	0	0
Min/Max	0–1	4–5	0–1	0–1
25%–75%	0–1	4–5	0–1	0–1
Planning				
Median	0	5	0	0
Min/Max	0	3–6	0	0–1
25%–75%	0	4–5	0	0–1
Status Reporting				
Median	0	4	0	0
Min/Max	0–1	3–6	0	0–1
25%–75%	0	4–5	0	0–1
Performing				
Median	0	4	0	0
Min/Max	0	3–5	0	0
25%–75%	0	3–5	0	0

Note. Score of 3 = Mechanical Use of an intervention, 4 = Routine use, 5 = Refinement, and 6 = Integration.

Reporting, and Performing. Table 6 presents the median, minimum, maximum, and interquartile ranges of the seven parameters of the LoU pre and post training for the trained teachers and the control teachers.

To interpret these data, a score from 0–7 reflects a group's movement along a continuum from being a nonuser of an intervention (scores 0–2) to being a self-focused user (scores from 3–5) to being an impact-focused user (scores of 6 and 7). Table 6 reveals that across all of the behavioral parameters of the LoU, the groups were equivalent in their nonuse of the intervention when they were interviewed before the trained group received training; that is, neither group reported the use of language modification techniques in their regular teaching practices.

After training, the teachers showed increased scores that reflected being a user of the intervention. The median scores post training for the trained teachers indicated that these

teachers were now self-focused users of the intervention (scores from 3–5) across five of the behavioral parameters, indicating routine use of the intervention (median score of 4 for Knowledge, Acquiring Information, Assessing, Status Reporting, and Performing). Two parameters (Sharing and Planning) had a median score of 5, indicating refinement of the intervention.

Table 6 also identifies the range of scores post training as some teachers moved from being a nonuser of the intervention to being an impact-focused user (i.e., having a score of 6 across five of the behavioral parameters, including Knowledge, Acquiring Information, Sharing, Planning, and Status Reporting). Table 7 presents frequency data of the trained teachers' levels of use post training. This identifies that out of the seven teachers, one teacher scored a 6 for four parameters (i.e., Acquiring Information, Sharing, Planning, and Status Reporting), one scored a 6 for Knowledge and Sharing, and one scored a 6 for Sharing.

Significant main effects for time and group were observed for the following parameters: Knowledge, Sharing, Assessing, Planning, Status Reporting, and Performing. These were qualified by significant Time × Group interactions: Knowledge, $F(1, 11) = 35.419$, $p = .0001$, $\eta_p^2 = .763$; Sharing, $F(1, 11) = 18.494$, $p = .001$, $\eta_p^2 = .627$; Assessing, $F(1, 11) = 48.656$, $p = .0001$, $\eta_p^2 = .816$; Planning, $F(1, 11) = 9.489$, $p = .01$, $\eta_p^2 = .463$; Status Reporting, $F(1, 11) = 8.323$, $p = .02$, $\eta_p^2 = .431$; and Performing, $F(1, 11) = 38.259$, $p = .0001$, $\eta_p^2 = .777$. With respect to the parameter Acquiring Information, a significant main effect was found for time, $F(1, 11) = 34.181$, $p = .0001$, $\eta_p^2 = .757$, and for group, $F(1, 11) = 26.274$, $p = .0001$, $\eta_p^2 = .705$, but only a marginal Time × Group interaction was observed, $F(1, 11) = 3.999$, $p = .071$, $\eta_p^2 = .267$.

Post training to follow-up. To investigate whether trained teachers were able to sustain their use of the instructional language modification techniques over time, Wilcoxon signed-ranks tests were conducted using the raw data from post to follow-up testing conditions for each LoU behavioral parameter. These tests revealed no significant differences between post and follow-up conditions for the trained teacher group on all behavioral parameters of the LoU:

Table 7. Frequency table of the trained teachers' ($n = 7$) posttraining scores across the LoU behavioral parameters.

Parameter	LoU score			
	3	*4*	*5*	*6*
Knowledge	1	3	2	1
Acquiring Information		5	1	1
Sharing		2	2	3
Assessing		5	2	
Planning	1	2	3	1
Status Reporting	1	3	2	1
Performing	2	2	3	

Knowledge (follow-up median score = 4, interquartile range 4–5, $Z = 7.500$, asymptomatic (two tailed) = .1000); Acquiring Information, (follow-up median score = 4, interquartile range 4–4, $Z = 1.500$, asymptomatic (two tailed) = .414); Sharing (follow-up median score = 4, interquartile range 4–5, $Z = <.001$, asymptomatic (two tailed) = .059); Assessing, (follow-up median score = 4, interquartile range 4–5, $Z = 1.500$, asymptomatic (two tailed) = 1.000); Planning (follow-up median score = 4, interquartile range 4–5, $Z = 1.500$, asymptomatic (two tailed) = 1.000); Status Reporting (follow-up median score = 4, interquartile range 3–5, $Z = 7.000$, asymptomatic (two tailed) = .414); and Performing (follow-up median score = 4, interquartile range 3–5, $Z = 7.500$, asymptomatic (two tailed) = 1.000).

Student Outcomes

Pre and post training. The students from the trained and control groups were tested pre and post training on the WIAT–II subtests of Listening Comprehension, Written Expression, Reading Comprehension, and Oral Expression. Figure 1 identifies standard scores for all four subtests of the students with LI whose teachers had (trained group) or had not (control group) received the training.

WIAT–II: Written Expression. A significant main effect was found for time, $F(1, 41) = 4.174$, $p = .05$, $\eta_p^2 = .092$, but not for group, $F(1, 41) = 3.05$, $p = .08$, $\eta_p^2 = .069$. There was a significant Time × Group interaction, $F(1, 41) = 11.338$, $p = .002$, $\eta_p^2 = .217$, where the students whose teachers had received the training significantly improved from pre to post testing compared to the students whose teachers had not received the training.

WIAT–II: Listening Comprehension. A significant main effect was found for time, $F(1, 41) = 10.581$, $p = .002$, $\eta_p^2 = .205$, and a marginal effect was observed for group, $F(1, 41) = 3.517$, $p = .068$, $\eta_p^2 = .079$. This was qualified by a significant Time × Group interaction, $F(1, 41) = 4.859$, $p = .033$, $\eta_p^2 = .106$. Consistent with the Written Expression results, the students taught by the trained teachers improved significantly from pre–post times when compared to the control group of students.

WIAT–II: Oral Expression. Figure 1 identifies that the students' Oral Expression standard scores did not improve pre–post teacher training. There were no main effects observed for time, $F(1, 41) = .116$, $p = .735$, $\eta_p^2 = .003$, or group, $F(1, 41) = .0843$, $p = .364$, $\eta_p^2 = .020$, and there was no significant Time × Group interaction, $F(1, 41) = .637$, $p = .429$, $\eta_p^2 = .015$.

WIAT–II: Reading Comprehension. For Reading Comprehension, a significant main effect of time was observed, $F(1, 41) = 6.562$, $p = .014$, $\eta_p^2 = .138$, but there was no main effect for group, $F(1, 41) = 2.344$, $p = .133$, $\eta_p^2 = .054$. Similar to the Oral Expression subtest results, there was no significant Time × Group interaction, $F(1, 41) = .045$, $p = .833$, $\eta_p^2 = .01$.

Figure 1. Wechsler Individual Achievement Test, Second Edition, Australian Standardised Edition (Wechsler, 2007) subtest results at pre and post training for Year 8 students with language impairment in the trained school versus the control school.
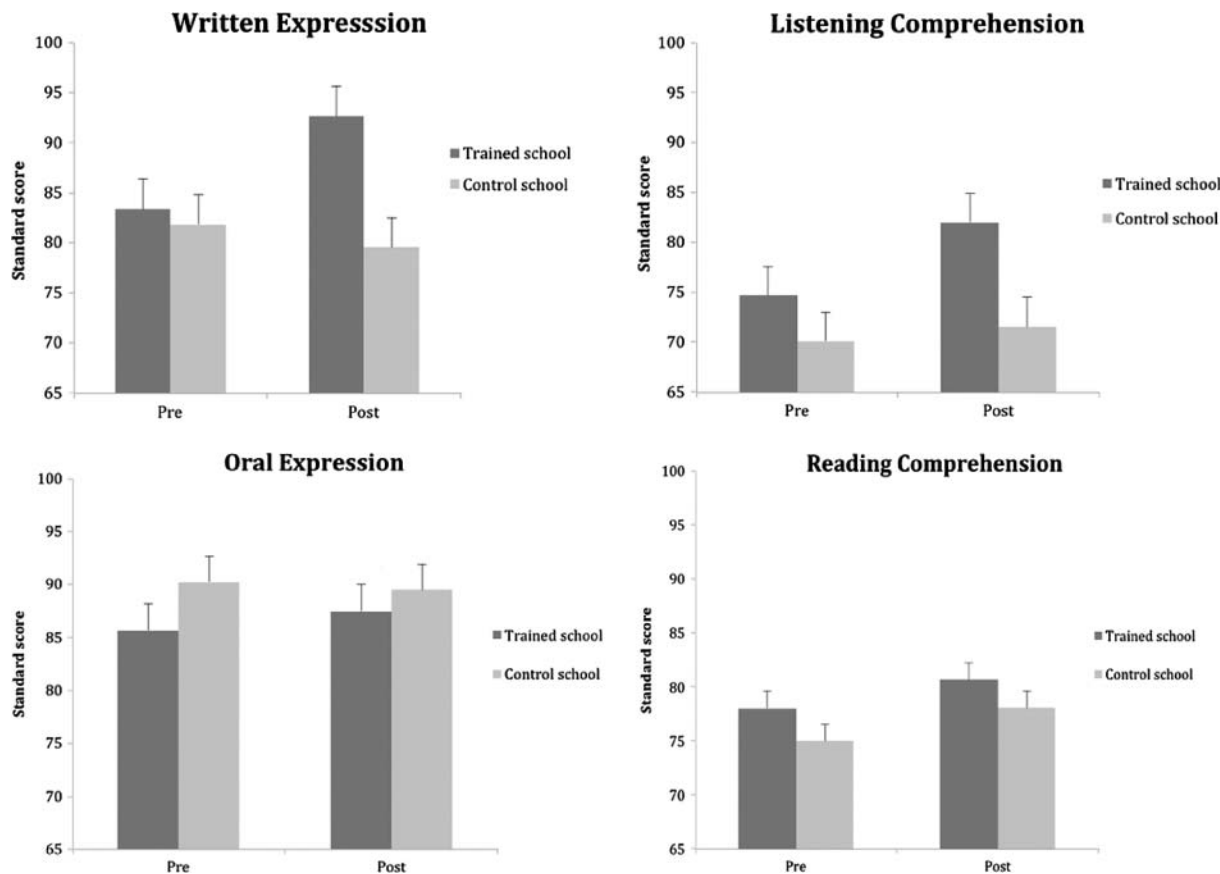
Post training to follow-up. Paired *t* tests (post to follow-up) were conducted on each of the four WIAT–II subtests that were administered to the students in the trained group. Average standard scores remained stable over the 12-week period between the tests. There was no significant difference in performance between post to follow-up tests on Reading Comprehension, postintervention mean = 80.62, *SD* = 5.5, follow-up mean = 80.1, *SD* = 6.2, *t*(19) = .447, *p* = .660; Listening Comprehension, postintervention mean = 82.4, *SD* = 14.5, follow-up mean = 82.4, *SD* = 12.8, *t*(19) = .0001, *p* = 1.00; Oral Expression, postintervention mean = 87.48, *SD* = 10.0, follow-up mean = 87.8, *SD* = 8.6, *t*(19) = .214, *p* = .833; or Written Expression, postintervention mean = 92.2, *SD* = 12.9, follow-up mean = 92.5, *SD* = 13.0, *t*(19) = .117, *p* = .908.

DISCUSSION

This study evaluated the efficacy of a training-based collaboration between an SLP and a group of mainstream secondary school teachers. The purpose of the training was to facilitate changes to teachers' oral and written instructional language and to observe the impact this had on the language abilities of students with LI in their classes. Our first hypothesis was that the teachers who were trained over a period of time by the SLP in the use of a set of instructional language modification techniques would adopt these techniques and apply them to their regular whole-class teaching practices. An additional hypothesis was that, as a carryover benefit, the use and application of the techniques by the teachers would lead to improvements in the language abilities of the students with LI in their classes.

The findings of the present study support these hypotheses. Results indicated that the trained teachers significantly moved along a continuum of change in their levels of use of the techniques, to at least a self-focused level and, in some cases, to an impact-focused level of use. In contrast, no change was seen in the levels of use of the intervention by the control group who had not yet received the training. Similarly, positive outcomes were observed in the group of

secondary school students with LI who were taught by the trained teachers, relative to those students in the control condition school. For the students who were instructed by teachers who underwent training, we found significant improvements in two of the WIAT–II subtests, namely, Written Expression and Listening Comprehension, assessed pre and post teacher training.

To the authors' knowledge, this RCT study is among the first of its kind to evaluate a systems-based approach to the treatment of LI in adolescence that links changes in mainstream secondary school classroom teachers' instructional language practices with the language abilities of whole populations of secondary school students with LI. The study makes a significant contribution to the body of evidence for supporting adolescents with LI, as it validates a treatment approach that enables regular classroom teachers to create a more supportive and information-accessible language environment for the students with LI in their classes.

Teachers' Use of Instructional Language Modification Techniques

Our key question was whether a group of across-subject mainstream secondary school teachers would demonstrate the use and application of the ideas that were presented in the training program. To address this, we used a measurement tool that demonstrated changes in the teachers' behavior across time as it related to their involvement in the program. We were primarily interested in the general movement of the teachers along a continuum of change from being non-users of the intervention to being active users at progressively self- and impact-focused levels.

We found that all of the trained teachers changed from being nonusers of the techniques introduced in the program to being users at, at least, self-focused levels, and in some cases, at an impact-focused level of use. In contrast, the control group of untrained teachers remained at the nonuser level. Additionally, the trained teachers sustained their use of the intervention over a period of time following completion of the training when there was no further input from, or support by, the SLP.

Specifically, the trained teachers significantly improved over time in the levels of use for six of the seven parameters relative to the control group. These included Knowledge, Sharing, Assessing, Planning, Status Reporting, and Performing. Only a marginal Time × Group interaction was observed for Acquiring Information. This parameter involves an individual's seeking of information about a new intervention by, for example, conducting Internet research or asking colleagues for information. The lack of a significant Time × Group interaction for this parameter may have been influenced by two teachers in the wait-condition control group whose responses moved from Level 0 (Nonuse: little or no knowledge of, or interest in, the intervention) to Level I (Orientation: still at a nonuse stage, however has sought

information about the intervention). It may be that these teachers, by being interviewed, became curious about the impending program and its contents and so independently sought information about the nature of adolescent LI.

According to the LoU tool, to be assessed as a self-focused user of an intervention means that individuals demonstrate regular instances of use and application of new ideas in their day-to-day practices, with an emphasis on mastering the steps needed to implement these ideas (Level III: Mechanical Use), to the next level where the ideas are becoming more routinely established in their regular teaching practices (Level IVA: Routine). The third level of self-focused use (Level IVB: Refinement) is attained when individuals become more involved in the generalization of basic concepts introduced in the training and in the creation of their own resources based on the presented techniques (i.e., without direct input from the trainer). By moving into this area of independent use, the ideas and resources (in this case, the instructional language modifications) become of greater usefulness to their specific teaching needs and are more appropriate for their students and specific subject content.

Of interest was the movement of the teachers from the routine to the refinement level of use. By the completion of the training, all seven trained teachers had reached Level IVA (Routine) for most of the parameters, and five of the seven had reached the next level, Level IVB (Refinement), for five of the seven parameters (Knowledge, Acquiring Information, Sharing, Planning, and Status Reporting). For instance, one teacher who was at Level IVB at the posttraining phase for the parameter of Knowledge reported: "I actually used some of the [ideas] on my Year 10s, especially with that brainstorm summary. . . . . and now it's given them ideas. They knew it, they had the knowledge but they didn't know how to express it." This illustrates how the teacher generalized techniques learned from the training program to a different student group.

At the self-focused levels of use, the focus is not only on the teachers themselves, but also on the impact of the intervention on the students within their "immediate sphere of influence" (Hall et al., 2006, p. 5). For example, one teacher described the impact of her use of vocabulary instruction techniques on students in the following way: "It takes away that big fear of 'Oh, such a big word,' then they switch off, but with [the SLP] showing me how to break them [the words] down and teach them in the way that she explained, they aren't that scared any more." Another teacher, talking about the modifications made to a set of written resources, stated,

> I thought that some students weren't listening properly or that the problems were for other reasons. Now I have identified that a lot of the problems are based on maybe a lack of understanding of vocabulary or maybe I'm just using too many words that they're not familiar with, or presenting them with too much written information, and then they're

not even going to attempt to try and understand it or do the work. So it's [the intervention's] helped me gain a lot of skills to present materials in different ways.

By the completion of the training, three teachers had progressed to the impact-focused level of use for three of the parameters (Knowledge, Planning, and Sharing). To be assessed at this level, the teachers needed to demonstrate that they were looking beyond their classes to the whole-of-school environment as well as to broader issues of professional development. One trained teacher at this impact-focused level of use stated, "We have a couple of prac [pre-service] teachers at the moment, and they've come up with a couple of really good worksheets. So I'm going to incorporate my process of presenting information into their worksheets. That way they're getting a little bit [of a] wider view." School management infrastructures were in place that supported the sharing of information and resources between teachers and departments, including monthly inter- and intradepartmental meetings of all departmental staff. One trained teacher presented an overview of the program at one of these meetings; another shared information in a more spontaneous manner at an interschool curricular planning meeting.

One of the major contributions of this study is the finding that trained teachers were able to sustain their use of the intervention in the longer term with no further support by the SLP. Follow-up testing 3 months after completion of the training revealed that there were no significant changes in the levels of the teachers' use of the techniques. This indicates that the trained teachers perceived the ideas embedded in the program as holding value for them—a concept considered critical for the uptake and application of ideas presented through teachers' professional development (Guskey, 2002).

All of the fundamental language modification techniques included in the program were presented to all teachers during their 10 weeks of training. It is important to note, though, that the techniques in and of themselves were flexible enough to accommodate individual classroom needs across a range of teachers and their subject disciplines. For example, visual aids were already commonplace in some teachers' instructional practices. However, a visual arts teacher identified the need to strengthen the links between the presentation of visual and written information. As a result, the teacher and the SLP worked collaboratively to modify a set of written information, assignment, and test sheets to improve the accessibility of the information for students and to strengthen the links between words and graphics. This teacher noted, "They [the students] can draw the answers, but they have difficulty putting it into words."

Similarly, a physical education teacher whose teaching style was highly verbal and physical noted that her students had problems retaining information. In this case, the collaboration included the development of reinforcing written resources and revision sheets for all students in her classes. Additionally, a history teacher found a text breakdown

strategy useful as many of her students were overwhelmed by information that was presented in multiparagraph print form. This was resulting in poor levels of engagement, processing, and retention of the information that was embedded in the texts. The specific language modification technique adopted and used regularly by this teacher involved a whole-class discussion with a board-based mind-map type activity. The teacher found that, along with the increased engagement of more students with the activity and therefore the learning process, she was able to build on students' improved interaction with the text by then developing a range of other interactive tasks. These reported instances complement the teacher interview data; however, a tally of individual teachers' use of specific techniques was deemed to be outside the scope of this study.

Future studies could complement the LoU structured interview by observing and recording individual teachers' use of language modification techniques in the classroom, pre–post and follow-up post intervention. For our study, permission to use video and audio recording of the teachers within their classrooms was not granted. An additional consideration for future research could be whether differences in teaching qualifications and/or years of teaching experience impact teachers' adoption of these language modification techniques. It could be that teachers who have more years of teaching experience (relative to new teachers) are less amenable to training content and/or collaboration. However, the reverse may also be true. Given our sample characteristics, it was not possible to evaluate such issues comprehensively.

One final consideration in relation to the teachers' data was that although the LoU tool was able to capture teachers' use of an intervention, it is not entirely known whether teachers were using language modification techniques before the training but did not refer to them as such. It is therefore possible that reported nonuse of the intervention at the pretraining interview for some teachers in both groups could have been from a lack of familiarity with the term "language modification techniques." What we do know is that over the course of the study, the trained teachers knew more and expressed more about these techniques in their interviews whereas the control group of untrained teachers did not.

The Impact of Teacher Training on Students With LI

To address the question of whether secondary school students with LI would show improvements in their oral and written language abilities as a result of the change in teachers' instructional language practices, we chose a standardized measure of oral and written language that provided a robust measure of change in students' language abilities over time. The four specific language areas tested were oral and written expression and listening and reading comprehension, all of which have significant relevance to academic skills

in the secondary school environment (Nippold, 2007). These language skills also reflect contemporary assessment and intervention practices for adolescents with LI (Larson & McKinley, 2003a). Our study found that the students whose teachers had received the training showed significant improvements in the Written Expression and Listening Comprehension subtests of the WIAT–II relative to the students in the control group. This was encouraging considering the entrenched nature of long-term LI (e.g., Clegg et al., 2005).

We suggest that the improvements in the written expression abilities of the trained group of students were related to the trained teachers' increased use of language techniques targeting written language. The intervention included training in strategies such as text deconstruction and reconstruction, visual scaffolds, and explicit teaching of writing genre structures. In addition, the teachers were trained in strategies for modifying their own written resources, such as worksheets and information summaries. The intention of training teachers in these techniques was to make information such as instructions and curriculum content more readily accessible and easier to process for all students in their classes. By the teachers' application of these techniques across whole classes, thereby modeling good practice in written expression, we conclude that the students with LI in these classes became more engaged in independently processing written information. Also, by being exposed to these replicable written structures and procedures, the students were able to generalize techniques to their own written work. This was evidenced not only in the students' improved WIAT–II scores, but also by teachers' anecdotal comments about changes in the amount and quality of written work produced by students with LI in their classes. For example, a math teacher stated, "They love to write now. I just couldn't believe it! It's a math lesson and they actually enjoy writing about the specific terms and what they know."

Similarly, improvements noted in the Written Expression and Listening Comprehension subtests of the WIAT–II post teacher training could be related to the program's emphasis on direct vocabulary instruction. The training introduced techniques to teachers that facilitated identifying and providing direct and interactive instruction in essential curricular vocabulary. For instance, teachers identified core curricular vocabulary and used student-generated definitions and visual symbols to encourage vocabulary growth. In these ways, students were more directly involved in the processes of understanding and gaining an expanded knowledge of core vocabulary, increasing the possibility that they could then apply these strategies independently when faced with additional new and unfamiliar words. By involving all students in a range of procedures for new word learning, we conjecture that the students with LI in these classes became more engaged in the process and were able to generalize these skills to develop improved listening comprehension abilities, skills that involve the understanding of a range of individual words as well as vocabulary in context.

A growth in students' vocabulary knowledge and use could also have been reflected in improved and more expansive written expression, as observed in the WIAT–II results of the trained group of students, as well as from teachers' anecdotal observations.

In a study that examined the predictors of academic outcome for adolescents with a history of LI, listening comprehension served as a significant and unique predictor (Dockrell et al., 2011). The researchers posit that oral language comprehension is important for the learning outcomes of students with LI. Our training study also supports this notion but crucially identifies how classroom teachers can assist and improve this important language skill.

Other spoken and written language abilities, however, did not show significant trained group improvements from pre to post training. Standard scores for reading comprehension significantly improved for both trained and control groups over time, suggestive of maturational effects rather than effects related to the teacher training. Even though the current literature on supporting reading comprehension difficulties in adolescence informed the program content, it may be that, in comparison to the written expression and vocabulary instruction techniques embedded in the program, specific strategies for reading comprehension per se were not addressed as directly and systematically. There is a known correlation between reading disorders and LI (Snowling, Bishop, & Stothard, 2003), with an often widening gap between levels of reading ability for students with reading difficulties and required reading materials once they reach secondary school (Mastropieri, Scruggs, & Graetz, 2003). It may be that specific support for reading comprehension during adolescence necessitates specialist and often intensive intervention (Biancarosa & Snow, 2006; Ehren, 2009; Kamil et al., 2008). Future research could consider extending the existing program to include more specific and systematic teacher support for students' reading comprehension needs.

No significant improvements were observed in either group of students for the Oral Expression subtest of the WIAT–II. The intransigent nature of the participating students' difficulties with oral expression presents a quandary for SLPs' traditional intervention focus on oral language. There is an increased use of written language in the secondary school academic environment and added expectations of students' written language competencies for assessment through assignments, tests, and internal and external exams (Gordon Pershey, 2003; Schumaker & Deshler, 2003). This direction was reflected in the greater emphasis on both teachers' and students' written language in the training program. It is possible that there is a corresponding decrease in focus on the importance of oral language in secondary classrooms. A valuable area of future research could be an investigation into the nature of academic discourse in secondary schools as it relates to both written and oral language, and how this impacts populations of secondary school students with LI.

As with the trained teachers, we were interested to know if the students maintained any improvements in their language abilities in the longer term. To answer this question, students in the trained group were retested at the same follow-up time as the trained teachers (i.e., a period of time after completion of the training program when there had been no further support by the SLP for the trained teachers). No significant differences were found for the four language domains tested between post to follow-up. Instead, the students in the trained group maintained their scores over this time period. We contend that the training program does have immediate carryover benefits to students with LI, as witnessed by significant improvements in their written expression and listening comprehension pre to post teacher training. Perhaps though, the lack of significant continued improvement post to follow up suggests that these students require additional support to achieve further gains in the longer term. The data here suggest that the use of a systems-based approach may not be sufficient on its own to shift the long-term trajectory of adolescent LI. Additional information about the impact of a systems-based intervention on the long-term academic progress of students with LI would be useful. Future studies could also examine students' academic progress as a means of measuring improved access to language-based curricular information.

Theoretical and Clinical Implications

The results of this study validate a systems-based approach to supporting secondary school students with LI through the use of a professionally collaborative intervention, one that embeds a process of change in the individuals' key learning environment: the mainstream classroom. The training program provided to teachers supports their efforts with inclusive education practices. Students with additional learning needs, such as adolescents with persistent LI, are regularly enrolled in mainstream classes, yet teachers report feeling undersupported in addressing their needs (Pearce & Forlin, 2005). The value of the present study is its contribution to ways in which SLPs can support both teacher and student populations at the secondary education level. Offering professional development in instructional language modification techniques over a period of time appears to benefit teachers' inclusive teaching practices, with positive benefits for their students with LI as well.

Observed improvements in students' listening comprehension and written expression in our study suggests that specific areas of intervention may benefit from a systems-based whole-population approach whereas other intervention areas, such as reading comprehension, could benefit from additional individualized specialist services. In this way, SLPs working with this student population could adopt both approaches for a comprehensive model of service delivery in supporting secondary students with LI.

Using the analogy of a "ripple effect," the teachers participating in our study reported that information and skills developed through the training program were passed on to teachers who were not directly involved in the training, and that the adopted techniques were used in classes other than the ones that were directly involved in the study. One teacher stated, "Some teachers that I have shared the techniques with have used the ideas with a different year group and found they have worked really well." Another trained teacher (history) talked about taking a class of final-year students for an absent teacher, and discovered that the students did not have a robust understanding of some key vocabulary for the topic that they had already been studying for a few lessons (the topic being the Vietnam War, the key vocabulary including such terms as *communism*). The teacher decided to prioritize direct vocabulary instruction with this class, with positive feedback reported from the students that the exercise was helpful to their better understanding of the fundamental concepts integral to the topic.

Such reports of the generalizability of the techniques across broader student groups, including those with no LI, are in line with the findings of a synthesis of learning disability research (Vaughn et al., 2000). According to these authors, "In all cases where interventions have demonstrated significant positive effects for students with learning disabilities, they have resulted in at least as high (and most often higher) effect sizes for all other students in the class" (Vaughn et al., 2000, p. 108). Although it was not possible in the current study to directly examine this issue, future studies could assess both LI and typically developing students before and after teacher professional development.

Crucial to the success of the program was the positive support and direct involvement of the schools' executive staff (such as principals, vice principals, and heads of departments). The NSW government schools follow the guiding principles of the Quality Teaching model (NSW Department of Education and Training, 2003), which includes the pedagogical dimension of promoting a quality learning environment for all students. The schools' involvement in this study, and their teachers' and students' involvement in the training program, was seen as being of direct relevance to the aims of the model. As a result of the perceived value of the program to their staff and students, executive staffs' direct involvement occurred at all stages of administration and decision making, including the allocation of special funds for resources and the provision of release time for the teachers. This explicit support of the program sent a strong message to the teacher participants that their involvement in the study was supported and valued across the schools' teaching and administrative community.

No one intervention can possibly address, or have a positive impact, on all issues arising from the presence of a complex disorder such as LI. However, it would appear that the changes observed in the trained teachers and their students with LI could be influenced by a

constellation of interacting elements, ones that SLPs could universally adopt as part of their overall caseload management. First, we raised the teachers' awareness of the presence of students with LI in their classes, as well as the nature and impact of LI. Second, the need for change was highlighted by demonstrating the ability of teachers' instructional language to either open or close doors to learning for these students. Third, changing teaching practice was made possible by providing the teachers with practical and usable techniques. This constellation of therapeutic supports created a student-centered and supportive language-based learning environment.

Future Directions

One of the motivations behind this study was to contribute a useful and evidence-based service delivery model to the field of adolescent LI. It is hoped that the results of the present study will encourage and promote further intervention research into how to best support whole populations of adolescents with LI.

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APPENDIX A. EXAMPLES OF ACTUAL WRITTEN LANGUAGE MODIFICATION TECHNIQUES USED IN THE TEACHER TRAINING PROGRAM

Original teacher version	Issues discussed by SLP and teacher	Modified version
Risk Story *Students are to devise a story that outlines a character (a minimum of three), context and events related to their risk environment. Students need to identify and describe the following:* *1. Possible consequences of the situation e.g. physical, emotional, legal, financial, for each character* *2. Reason why each one might have occurred*	1. Unfamiliar vocabulary (*minimum, consequences*) 2. Ambiguous instruction: "…*that outlines a character (a minimum of three)*". One or three or more characters needed? 3. Instructional words may be difficult to interpret: *devise, identify, describe* 4. Difficult sequence to follow. 5. No examples provided for the "*consequences.*"	1. Used different words e.g. *write* for *devise*, and explained words: "*The context (setting) of the story*". 2. Wording changed to "*3 characters or more*". 3. Included descriptions for key instruction words e.g. *Identify: To name something.* Placed these in a box to the side of the main text. 4. Set out the sequence of the story: The main events, the risks involved, the possible problems that happen as a result. 5. Provided one example for each consequence e.g. "*Financial e.g. the cost of repairing broken property*".

APPENDIX B. EXAMPLES OF ACTUAL VOCABULARY INSTRUCTION TECHNIQUES USED IN THE TEACHER TRAINING PROGRAM

Original teacher version	Issues discussed by SLP and teacher	Modified version
Topic: Sculpture *Copy these 20 words and definitions into your Visual Arts Diary:* *1. Appropriation: To take or borrow something and use it elsewhere* *2. Conduit: To channel something in a certain direction* *3. Abstraction: Non-representational* *4. Anthropomorphic: Appropriation of human motivation, characteristics, or behavior to inanimate objects, animals or natural phenomena* (plus items 5-20)	-Too many new words at one time -Some words are very complex -Some definitions are also very complex, and so may be difficult to process and retain -The task is passive, i.e. copying from an overhead to a notebook. -This would be a time-consuming task, and there is likely to be little associated learning of the glossary words and their meanings.	1. Following the "10 Key Words" process introduced in the program, 10 of the 20 words were chosen from the list by the teacher as being essential for learning the new topic. 2. The new word learning task became interactive between the teacher and all students, with the end result being: a) a list of words and their descriptions, decided on by the students and using familiar language (for example: *Geometric: To do with shapes such as circles, triangles and squares.*), and b) a poster created by the students with the 10 words, their descriptions and a visual symbol for each as a referent point for further topic study.

Training Secondary School Teachers in Instructional Language Modification Techniques to Support Adolescents With Language Impairment: A Randomized Controlled Trial

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