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In Defense of Cookbooks
From Novice to Competent Clinician

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Clinical practicum is an important means through which clinicians gain the knowledge and skills needed to provide effective services for a broad variety of clients. Through practicum, student clinicians learn about the practices of the profession. The manner in which this transmission of knowledge occurs, however, is largely unknown. The focus of this paper is to examine the fundamental assumptions that underlie the success of clinical training and integrate it with knowledge from various strands of learning models. Using a cookbook analogy, we examine the studies of learning in different conditions and the literature comparing novice and expert learners. On the basis of these findings, we propose a two-dimensional, phased model of clinical teaching. We then provide examples of how this model can be implemented into clinical training of speech–language pathology students. An added benefit to a phased approach is that the theory-to-practice link is strengthened when students have the opportunity to develop, implement, and test the assessment and intervention proposals in a systematic manner. **Key words:** *clinical education, competency, scaffolded learning, scripted training, supervision*

CLINICAL SUPERVISION is an important part of the practice of speech–language pathology and audiology, which is recognized as requiring specific competencies and specialized training (American Speech–Language–Hearing Association, 2008b). The primary expected outcome of graduate clinical education is for students to become independent, self-supervising practitioners of the profession (Casey, 1988). The methods that supervisors employ when supervising clinicians, however, may differ on the basis of their experiences as student clinicians, as well as their beliefs and assumptions about effective supervision practices (Lee, Baik, & Charlesworth, 2006; Nettle, 1998; Tillema & Knol, 1997). O'Connor (2008) asserted that often supervisors take on the supervision of clinicians without adequate preparation and study. Teaching and supervision practices need to be informed by theoretical models and evidence of effectiveness, just as our clinical service delivery is predicated on what is known about how people learn and what works most effectively (Lincoln & McCabe, 2005).

How then do student clinicians move from novice to competent clinicians? Gillam and Peña (1995) described a social constructivist perspective of clinical education. They proposed that, within this model, the role of supervisor is that of a mediator who scaffolds learning for novice clinicians. The mediator provides models, feedback, and other supports during learning, to guide the learning process through helping students understand: the goal for learning (*intentionality*), the importance of the goal (*meaning*), application of the strategy in other contexts (*transcendence*), and strategies for self-monitoring (*competence*). Although students have had a number of background courses and thus have access to information, the supervisor as mediator helps them make sense of that information and apply it in effective ways by helping the learner attend to the critical aspects of what they know. Through attention to important features of clinical practice, supervisors assist student clinicians to develop representations or mental scripts of assessment and

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intervention procedures. We are particularly interested in the process by which novice clinicians use, adapt, and develop clinical scripts and how they learn to evaluate them. Using a social constructivist framework, we draw from learning theory, including adult learning (Knowles, 1978), schema theory (McVee, Dunsmore, & Gavelek, 2005), trial and error learning (Ivancic & Hesketh, 2000), and implicit learning (Baddeley & Wilson, 1994), to present a two-dimensional, phased model of clinical supervision.

To set the stage for this model, we offer the metaphor of transition from novice to expert cook. Consider the two recipes for vegetarian lasagna in Figure 1. What is the difference between the first and the second recipe? If one were a complete novice at cooking, which recipe would likely support greater culinary success? A master chef could either improve on recipe or adapt it to ingredients at hand, but a novice cook likely would need the more explicit information provided by the second recipe. Imagining these scenarios brings a few important principles about teaching and learning to light.

1. Any beginner in training can expect to achieve a basic level of competency in making lasagna by following the second recipe (with detailed instructions) in a relatively shorter period of time than by following the first recipe.
2. Reviewing a recipe after the dish is made allows a cook to identify the locus of a problem in case the dish does not turn out quite as expected.
3. Understanding the individual contributions and interactions of the various ingredients is an important part of successful cooking; once these key ingredients and interactions are understood well, a cook can vary the recipe in a number of new ways—even inventing new lasagna recipes.

These three principles are analogous to three important key points for clinical education in the field of speech–language pathology. Initially, learning the steps involved in a clinical practice from a master clinician ensures successful implementation of diagnostic and intervention procedures, even if the novice clinician does not fully understand the principles involved. Likewise, identifying the cause of the problem in a not-so-perfect dish is akin to the need for speech–language pathology clinicians to systematically problem solve and logically analyze the different components of speech/language processes to isolate impairments and target specific goals. Just as understanding the individual contributions of various ingredients is an important part of successful cooking, understanding the basic anatomical/physiological foundations of human communication is an essential skill for every clinician. Correspondingly, once student clinicians understand the basic anatomical and physiological substrates of human speech and language, coupling this knowledge with experience, diagnosing, and treating specific speech–language impairment becomes easier.

The cookbook metaphor is one that has been around in clinical professions for quite a while. It is usually invoked with respect to what professionals do *not* wish to do in clinical education. We propose, however, that there is something to be gained from starting with a cookbook approach, particularly when learning new diagnostic or intervention procedures. We use this metaphor as a springboard to examine assumptions about clinical education and look to learning theory for developing a model of effective clinical teaching.

CLINICAL LEARNING AND TEACHING

Anderson's model (Anderson, 1988) of clinical supervision—the continuum model—viewed the transition from novice clinician to master clinician, as moving from dependence to independence across three stages. The first stage is the evaluation/feedback stage, in which the supervisor is highly active and directive. The next is a transitional stage, during which the supervisee gradually becomes increasingly independent. The final stage is self-supervision, in which supervisor and supervisee are peers, and supervision is done

VEGETABLE LASAGNA (1)

Portobello mushrooms
Zucchini
Yellow squash
Onion
Spinach
Garlic
Olive oil
Tomato sauce
Lasagna noodles
Ricotta cheese
Shredded mozzarella

Fry mushrooms, onion, garlic, zucchini, and squash in olive oil.

Mix 1/2 cup of mozzarella with ricotta cheese. Layer accordingly, adding spinach.

Bake at 350°F for 30 min to 1 hr.

VEGETABLE LASAGNA (2)

2 tbsp. chopped onion
1 clove garlic, minced
1 tsp. olive oil
1 1/2 c. peeled, diced tomato
2 c. peeled, diced eggplant
1/2 c. chopped green pepper
1 sm. zucchini, diced
1/4 lb. fresh mushrooms, chopped
1 tsp. dried whole oregano
1 bay leaf
1/4 tsp. salt
1/4 tsp. pepper
6 uncooked lasagna noodles
1/8 tsp. salt
2 eggs, beaten
1 c. low-fat cottage cheese
1 tbsp. chopped fresh parsley
Vegetable cooking spray
1/2 c. (2 oz.) shredded mozzarella cheese
1 tbsp. grated Parmesan cheese

Saute onion and garlic in hot oil in a large skillet for 2 min. Stir in next nine ingredients; cover, reduce heat, and simmer for 10 min. Remove bay leaf and set vegetable mixture aside.

Cook lasagna according to package directions, reducing salt to 1/8 teaspoon. Drain noodles, and cut in half crosswise; set aside. Combine eggs, cottage cheese, and parsley; set aside.

Coat an 8-inch square baking dish with cooking spray. Place four noodle halves in dish. Spoon half of cottage cheese mixture over the noodles. Spread half of vegetable mixture over cottage cheese mixture; sprinkle with half of mozzarella. Repeat layers, ending with noodles.

Cover baking dish, and bake at 350°F for 20 min. Sprinkle with Parmesan; cover and bake for an additional 5 min. Yield: six servings (245 calories per serving).

Figure 1. Illustration of varied levels of explicit support for novice cooks.

in a consultative manner. It is important to note that this continuum model is not time specific but rather is considered to span professional development, and the relationship between supervisor and supervisee depends on the combination of individual knowledge relative to the clinical context. The goal of supervision exemplified in Anderson's model

is to help move students from novice clinicians to independent, competent clinicians. Comparisons between novices and experts provide insight about this process and are relevant to the model we propose, which represents novices and experts at 2 ends of the continuum.

Novices and experts use and apply knowledge and improvise on it in qualitatively different ways. Borko and Livingston (1989) identify three key differences in novice and expert approaches to teaching (Borko & Livingston, 1989; Livingston & Borko, 1990). First, unlike experts, novice teachers may have access to the same information but may not understand its relevance or recall as much in a given situation (Egan & Schwartz, 1979; Huffman, Matthews, & Gagne, 2001). Second, teaching (like clinical service delivery) is a complex cognitive process. Expert teachers have well-formed *pedagogical reasoning*, which uses knowledge in a highly flexible and adaptive manner (Hogan, Rabinowitz, & Craven, 2003; James, 2007; Mitchell & Unsworth, 2005). Third, expert teachers have elaborate and detailed *schemata* that are interconnected and from which they can draw to plan and reflect. Schemata are cognitive structures that incorporate scripts (i.e., everyday knowledge representations that are time bound); scenes (i.e., spatial representations of people and events); and propositions (i.e., understanding of the relationship among specific students, strategies, and pedagogy) (Borko, Livingston, & Shavelson, 1990; Shavelson & Stern, 1981).

A TWO-DIMENSIONAL MODEL OF CLINICAL TEACHING

To take into account the differences in cognitive approaches between novices and experts, we propose an adaptive two-dimensional model of clinical teaching that expands Anderson's continuum model. Here, we combine the key aspects of feedback and implementation of assessment and intervention procedures with a focus on systematic progression of independent problem-solving skills. We place these two dimensions of clinical learning on two interrelated axes to illustrate the dynamic nature of their relationship (Figure 2).

The first dimension is the development and application of skills and procedures related to effective practices in speech–language pathology. Student clinicians work on development of mental representations of assessment and intervention procedures related to specific disorder areas. As they become more independent in this domain, they are more able to use theoretical knowledge and to translate it into practice.

The second dimension is monitoring. In this dimension, students learn to monitor their own practices using their developing skills of self-awareness and self-correction. We see the progression within and across these phases as occurring in a dynamic reciprocal manner between supervisor and supervisee depending on cognitive load. Initially, the supervisor both selects the intervention goals and procedures and monitors their implementation. As the intervention procedures are held somewhat constant, the student gradually assumes responsibility for monitoring. As the student moves to a more demanding task (such as adapting the intervention for a different client or using the same framework with a different therapy goal), responsibility for monitoring shifts back to the supervisor. The five main phases of our proposed model are *novice*, *transitional*, *competence*, *mastery*, and *expert*. These phases are based in part on the work of Dreyfus and Dreyfus (Dreyfus & Dreyfus, 1980; Dreyfus, Dreyfus, Costall, & Still, 1987). In this article, we focus on the first three phases (novice, transitional, and competence) because these phases are those developed in masters level programs.

Novice phase

The first phase consists of fully scaffolded implementation of an assessment or intervention practice. Here, we propose developing initial scripts and models for clinicians so that they have steps to follow when implementing intervention. This may mean grouping

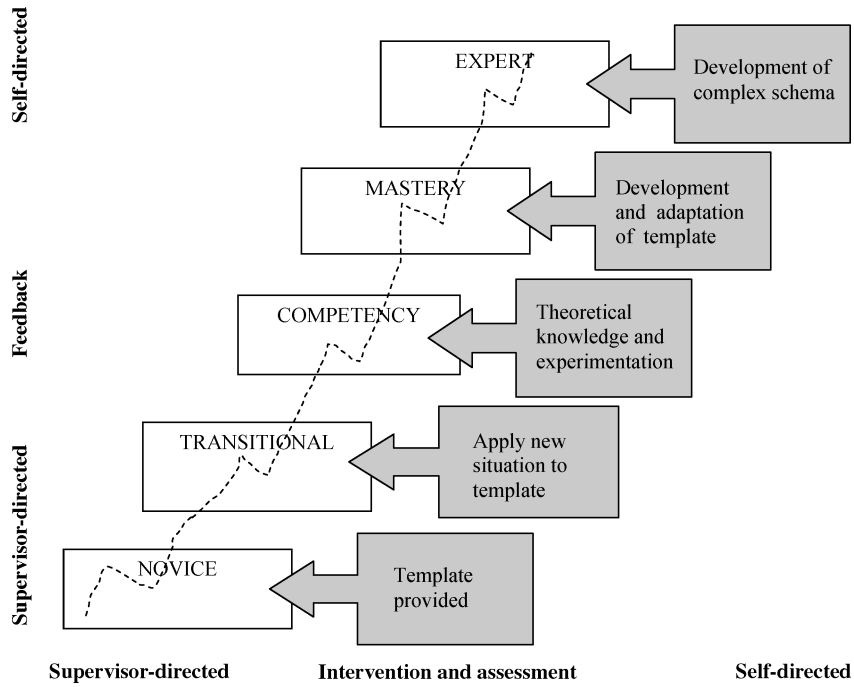

Figure 2. A schematic of our proposed model describing three main phases to facilitate progression from novice to expert.

clinicians according to the type of client so that all clients can receive essentially the same kind of intervention, but with individual adjustments according to client strengths, needs, and responsiveness (for an example applied to stuttering treatment see Murphy & Watson, 2004). Although clinician competency can be achieved without scripts or models, the burden of devising an appropriate evaluative and treatment approach is on the beginner clinician. We argue that the time frame for successfully implementing the intervention under these conditions is ultimately longer and more stressful for the beginner clinician. The advantage of repeated practice of a script that is modeled by an expert is seen in learning complex tasks in medicine (Sullivan et al., 1998), as well as motor tasks such as pitching (Horn, Williams, Hayes, Hodges, & Scott, 2007). The fact that it takes longer for clinicians to successfully implement a given intervention means that clients may not reap full benefits for a number of sessions. Thus, a balance between high reliability in implementation of assessment and intervention procedures along with reduction of clinician frustration is highly desirable.

The goal is for clinicians to be able to call on internalized mental scripts that are part of more complex cognitive schemata for addressing various clinical problems. Scripts are learned on the basis of experience, however, and take time to develop. Providing novice student clinicians with written scripts or steps on the basis of the intervention framework in the early stages of clinical training allows them to competently implement the intervention while they are learning to understand what they are doing and why they are doing it. The supervisor's role during this phase is to signal or cue clinicians online with respect to the next steps to take and monitor that students stick with the general plan. Feedback discussions should initially focus on how well the critical components of the plan were implemented, with a focus on helping the student

recall all the steps. Instruction about why a particular script or template was developed or why this kind of intervention works is appropriate. But, at this point, students may not be able to fully integrate what they know with the steps they are following. The supervisor as mediator should also help the student clinician think about alternate scenarios and possible responses to the client depending on how he or she responds. Such responses help students construct alternate mental scripts and increase flexibility (Borko & Livingston, 1989). Toward the latter part of this learning phase, clinicians can start to monitor their own implementation of the written and alternate plans.

Literature on development of novice teachers emphasizes the benefit of focusing narrowly on a set of skills, allowing students to learn to self-monitor, while they begin to understand the framework that guides their activities. The focus is on becoming comfortable in the clinical situation and beginning to understand the links between what graduate clinicians already know and what they are doing. Supervisors have an ethical responsibility to ensure that clients are receiving competent care from student clinicians. Experimental work on errorless learning highlights the advantage of learning under conditions that are structured in such a way that error is reduced and, consequently, the frustration associated with trial-and-error learning is minimized.

The notion of errorless learning is based on Baddeley and Wilson's (1994) proposal that, in memory, representational strength increases with practice and reinforcement. Responses made in error may be inadvertently strengthened and, therefore, compete with the memory trace of the correct response. Errorless learning facilitates strong memory associations (Squires, Hunkin, & Parkin, 1997) and leads to high retention of specific information in adults (Haslam, Gilroy, Black, & Beesley, 2006). Another advantage of errorless learning is that it leads to confidence (Ivancic & Hesketh, 2000) and reduces frustration (Mount et al., 2007).

The applicability of the principles of errorless learning to the training of novice clinicians can be interpreted through analogy. For example, a novice chef learning to make lasagna described in the introduction has a much higher potential for success with detailed step-by-step instructions and minimal scope for error when compared with an unrestricted recipe. Likewise, novice learners of putting in the game of golf provide a similar interpretation regarding error-reduced learning. Maxwell, Masters, Kerr, and Weedon (2001) compared how novice learners acquired skills under error-reduced (putting from close to the hole and systematically moving away), errorful (putting far from the hole and systematically moving closer), and random conditions (putting from both close to the hole and far from the hole with no systematic pattern). Learning in the error-reduced condition was higher during the learning stage, retention, and carryover tasks. When a secondary tone-counting task was introduced, learners in the error-reduced condition did not show the same level of degradation on the primary task as did those in the other two conditions.

Although making lasagna and learning to putt are different skills than learning to treat communication disorders, some parallels can be drawn regarding the overall benefits of errorless (or error-reduced) learning. Applied to clinical training, beginning clinicians may benefit by applying a specific protocol in an errorless manner initially. The point that we wish to make here is that, for novice learners, mental focus on too many things at once could reduce learning and increase error (and anxiety) during the beginning stages of learning. A scaffolded approach using written scripts and detailed plans potentially reduces error, allows the student clinicians to build up their mental schema, and allows them to self-monitor. When less cognitive effort is allocated to task development, more resources are available for constructing higher-level concepts. Although students are not expected to fully understand the framework for the treatment they are applying, a comprehensive

understanding may evolve through multiple opportunities to practice the same kind of treatment or achieve the same kinds of goals. From a social constructivist perspective, the supervisor helps the student clinicians focus on important aspects of the task and monitors their implementation. Self-monitoring shifts to the student clinician during the scaffolding process.

Transitional phase

The second phase of clinical training should be designed to provide students with multiple opportunities for the practice of script implementation. This phase should begin once students learn the basic script. Here, the focus should be on providing opportunities for students to use the script with different clients or different goals as appropriate. The purpose of extending the script to similar, but different clients is to help students develop a mental framework or template of how the script works and how it might be adapted to meet individual needs. A group supervision model can also support exposure to different clients within a disorder area. Multiple opportunities for practice allow novices to develop mental scripts about different ways to present material and to respond to individual needs (Borko & Livingston, 1989; Livingston & Borko, 1990). Continuing our analogy, this is the stage when novice chefs are able to undertake variations in their preparations of lasagna (e.g., lasagna with béchamel sauce, broken lasagna with walnut pesto) after they have practiced multiple iterations of the traditional lasagna. If results are unsatisfactory, they now have a way to form hypotheses about what went wrong.

For a student to ultimately progress from novice to master, repeated practice is essential. Multiple hours in practice situations help students learn to implement an intervention or conduct an assessment in a more automatic manner. Consistent with the notion of error-reduced demands (Maxwell, Masters, & Eves, 2003; Maxwell et al., 2001; Poolton, Maxwell, Masters, & Raab, 2006), if students develop their skills to a point where they are more automatic in assessment and treatment, they will also be able to make additional observations of the client and to think more theoretically about what they are doing and why. Before this point, students may understand the conceptual notion for the clinical practice, but may not yet have formed the metacognitive framework to allow them to make comparisons with new situations (Borko & Livingston, 1989). To help students start to develop a more metatheoretical framework, student reflection about the relationship between theory and practice is highly encouraged. This notion is consistent with Tillema's (2000) finding in teacher training that reflection after practice is more effective in adapting practices and beliefs than reflection before opportunities for practice.

It should be noted that, in the transitional phase, dependence on the supervisor for feedback may increase initially while the student transitions to expand or adapt the learned template more independently. For example, students might experiment with the template with a different-age client, incorporate other goals, or develop new ways to help the client meet the stated goals. The supervisor helps the student conceptualize the goals and approach to self-reflect on their performance. We believe that this step of more independently applying or adapting a learned template enhances learning.

The benefit of feedback during application of a learned task has been documented in teaching pilots to safely land the airplanes (Benbassat & Abramson, 2002a, 2002b). These authors trained two groups of novice participants to land using a simulator. The experimental group was given feedback during and after landing. The control group was given feedback only after landing. When both groups were tested on five simulated solo landings, the control group demonstrated more inconsistency. This high variability suggests that these novice learners were utilizing a trial-and-error approach even after training. In contrast, the group that received the auditory cues during training was more consistent and became more accurate over

their five solo landings in which no cues were provided.

As in the previous section, we do not argue about the direct relevance of pilot training to speech pathology, but instead wish to draw some general parallels in terms of learning approaches that lead to competence in a given domain. As an example, speech–language pathology students often receive feedback after a session is done (i.e., similar to the traditional training that pilots receive). Providing online cues during the session can help students learn what to do next or how to correct an error may be more helpful than waiting until the session is over.

Competence

Learning in adults is often described as intuitive, associative, and highly independent. In his influential proposal about adult learners, Knowles (1978) posited that adults were self-directed and self-evaluative. The best learning environments are, therefore, assumed to be those in which learners have the opportunity to develop their own inquiries and develop, discover, test, and evaluate potential solutions. Our point in this article is that self-guided learning works best when it follows two prior phases of more explicit mediation.

Encasing clinical training in a scaffolded environment promotes the theory-to-practice link as students have more opportunities to understand the relationship between the basis of communication disorders and evaluative and therapeutic approaches to alleviate the specific disorders. In the *competency* phase, students should be prepared to work from a theoretical framework to further refine their ideas and use the framework to generate additional applications.

Once student clinicians have had multiple opportunities for practice and understand the theoretical framework that drives that practice, they can generate new scripts for practice or apply the theoretical framework to a novel clinical question. Here, student clinicians should be able to generate hypotheses about how a new application would work and systematically test its implementation. Students also can make changes to the intervention on the basis of their findings. Here, the supervisor's role may be to provide feedback at a more theoretical level to help students understand the impact of their intervention and how to make adjustments to their practice. Thus, the supervisor serves more as mentor than mediator, and the student clinician takes more of the responsibility for generating or experimenting with the practices. It is likely that there will be introduction of more errors or missteps as this shift occurs, but students should be better able to benefit from these errors and to know how to fix them.

In this stage, student clinicians are building up experiences with both self-monitoring and building up mental schemata through implementation, adaptation, and testing of different clinical scripts. This rich clinical representation allows them to learn new frameworks and practices more efficiently as they can mentally prepare new scripts to those in their repertoire.

Mastery and expert

The last two stages in our model, *mastery* and *expert*, reflect the transition of the student clinician to an independent practitioner. Research on adult learning demonstrates that when learning something new, novices have sketchy mental schemas, which makes learning more effortful (Borko & Livingston, 1989; Horn et al., 2007; Luu, Tucker, & Stripling, 2007). In contrast, experts have broader experience to draw from, and that allows them to use less effort to learn a new procedure. To continue our analogy, an expert chef can easily create a new dish from a different cuisine by understanding what the basic ingredients for that specific dish are and by drawing from his/her experience making similar dishes. As *mastery* and *expert* stages are less dependent on the role of the supervisor during master's training, we will not elaborate on the nature and progression within these stages, which would be expected to occur post graduation.

TEACHING CLINICAL SCRIPTS

In the case of clinical education, "recipes" may be in the form of clinical scripts, protocols, and plans that are written out and highly detailed. We do not expect these scripts to be memorized and applied verbatim, but we do expect them to be detailed enough so that the critical aspects of the treatment are applied. When cooking, recipes can be modeled initially and later a recipe can be followed without a model. Talking to other more expert cooks about how and why one does certain things when following a recipe can help a novice cook understand why the given steps exist. For example, boiling lasagna noodles in a large volume of water can keep them from sticking to each other because the starch is better distributed in a larger rather than smaller volume of water. It probably does not help novice cooks to teach them principles about water volume and starch when they have never made lasagna before. During the transition stage, however, new cooks might experiment with doubling the recipe or substituting ingredients. They may need feedback and consultation at this point about what might happen and to understand what happened if it did not go so well.

At the competence stage, cooks might both adapt and self-monitor their lasagna recipe, trying different kinds of ingredients or combinations. Someone who has mastered the lasagna recipe can adapt it in numerous ways and can understand the principles involved in its success. In addition, master cooks can coordinate making the lasagna with the preparation of another dish to serve it as part of a whole meal. At the expert level, we expect a chef to be able to create a gourmet spread of which lasagna is but one dish.

The principles proposed in the supervision model for speech–language pathology clinicians are somewhat similar to current guidelines established for other healthcare providers. We draw on an example from training in medicine during which, each year of training and multiple hours of skill practice, the decision-making role of the student is gradually increased.

The *Accreditation Council for Graduate Medical Education* has identified six areas in which neurosurgery residents must demonstrate competency to successfully complete a residency program. These include (a) patient care, (b) medical knowledge, (c) practice-based learning and improvement (d) interpersonal communication, (e) professionalism, and (f) system-based practice (http://www.acgme.org/acWebsite/RRC_280/280_coreComp.asp). Most residency programs in the United States offer a 6- to 7-year training program where the focus is on the evolution of an independent and competent practitioner (http://www.aans.org/medical_students/).

In general, the first 2 years of neurosurgical training are spent acquiring skills and knowledge required for preoperative and postoperative care of patients with neurosurgical disease. During these years, the resident's role is in implementing and practicing specific procedures, with less focus placed on independent decision-making. Example requirements for clinicians include the ability to (a) establish and implement effective patient care plans, (b) demonstrate a growing familiarity with classic and current aspects of the neurosurgical literature, and (c) locate, appraise, and assimilate evidence from scientific studies related to common neurosurgical problems. To achieve these competencies, the resident is placed on a team and under direct supervision of a senior physician. Part of the resident's training experience includes independent practice of established surgical procedures such as cerebrospinal fluid shunts and assisting senior residents on complex procedures such as intracranial surgery or pediatric neurosurgery. Residents are provided with frequent and specific feedback about accuracy of medical care.

It is not until year 4 or 5 of the training program that the resident is exposed to an increased expectation for independent decision-making regarding patient care. At this point, residents are expected to have developed the ability to critically evaluate

unresolved needs in current practice, as well as to monitor their own delivery of care. For instance, by year 6, residents are expected to (a) establish and implement effective patient care plans, assuming the role of primary leader on the neurosurgery service, under appropriate supervision of an attending surgeon, (b) demonstrate a solid evidence-based approach to patient care at the level of a practicing surgeon, and (c) participate meaningfully in ongoing professional development by submitting research for peer review to journals and national professional meetings. By this stage, residents are expected to independently perform the advanced neurosurgical procedures, such as cranioplasty and carotid endarterectomy. Around this stage, residents also are engaged in a year of research study with a reduction in clinical duties. This year of laboratory research provides an opportunity for the resident to acquire facility in the scientific method of clinical practice. Clearly, the educational model implemented for neurosurgical training emphasizes this gradual progression from basic scientific knowledge to competency in the various surgical procedures and, eventually, to mastery of specific aspects of neurosurgery.

APPLICATION OF THE TWO-DIMENSIONAL PHASED APPROACH

Currently, few examples of scaffolded approaches to clinician education are available in the field of speech–language pathology. To date, much of the work in clinical education has focused on helping students monitor their own clinical performance (Larson, 2007; O'Connor, 2008; Pickering, 1987) or how to use problem-solving techniques (Geller, 2001; Shapiro & Moses, 1989). We know less about effective ways to teach students to apply specific clinical practices (Kathard, 2005; Lincoln & McCabe, 2005; McAllister, 2005; Reilly, 2004). To address this gap, we present examples from procedures used to train students in our laboratories to a high level of treatment fidelity for the purpose of conducting clinical research.

Several researchers have noted that the traditional one-on-one model of supervision is time consuming and does not seem to result in student transition to independence (Baxter, 2005; Cruice, 2005; Kathard, 2005; Lincoln & McCabe, 2005). Given our increasing scope of practice, coupled with time constraints, we find that a phased approach in training students ensures the high fidelity of the intervention program we are evaluating. An additional benefit is that students report increasing comfort with clients. Finally, students have reported that they have continued to use and adapt many of the approaches they learned in the clinical research project in their own clinical practice. These examples are anecdotal and, as such, need to be further evaluated with respect to teaching efficacy.

Phased teaching in aphasia rehabilitation

One example of the usefulness of the phased approach comes from our current work on aphasia rehabilitation (Kiran, 2005, 2007; Kiran & Thompson, 2003). In these treatment studies, clients with aphasia are provided a structured, step-by-step treatment to improve the their ability to name specific items within a category. Participants attend therapy twice a week for 2 hr in each session. In each session, they practice the six steps of the treatment protocol for each stimulus under the guidance of a student clinician. At the same time, improvement in treatment is assessed through weekly probes conducted by the student clinicians. Such a protocol allows little flexibility for creativity or modifications, as the effectiveness of treatment is evaluated contingent upon as little variation in the treatment as possible.

An immediate benefit of using a scripted approach such as this to train students in aphasia rehabilitation is that the clinician does not have to spend time in developing an appropriate treatment protocol for remediation and can devote more time to reading or reviewing relevant research studies. Increased familiarity with the current research helps students develop stronger links between research and

Table 1. Examples of scripted approaches in treatment of naming deficits in patients with aphasia

Typicality treatment protocol (Kiran & Bassetto, 2008)	**Naming treatment protocol (Edmonds & Kiran, 2006)**
1. Picture naming. Initially, the participant was presented with the picture and was asked to name it. *2. Category Sorting.* The examiner placed written category cards *(birds/vegetables, animals, fruits, and musical instruments)*, and the patient was required to sort the pictures according to their category. *3. Feature Selection.* The participant was then required to select the first six features that were pertinent to the target example. For example, for *chicken: lays eggs, is food* were acceptable semantic features, while *flies distance* and *swims* were features that were not applicable. The participant is then asked to read the cards aloud. *4. Yes/No Questions.* The participant was asked 15 questions about the target example and was required to answer *yes* or *no* in response. *5. Picture naming.* Same procedure as in Step 1.	1. *Picture naming*. Initially, the participant was presented with the picture and was asked to name it. 2. *Feature selection and analysis.* The participant was provided 12 characteristic features (six are correct, six are not correct) that represent the following information: (a) category, (b) function, (c) physical attributes, (d) location, and (e) association. 3. *Yes/No Questions.* The participant was asked 15 questions about the target example and was required to answer *yes* or *no* in response. *4. Picture naming.* Same procedure as in Step 1.

practice. In contrast, a student beginning a clinical experience would be required to devise objective goals of treatment outcome (e.g., naming accuracy, number of errors in each session, etc) as well as establish criteria for clinician feedback and reinforcement (e.g., fading cues, verbal/visual reinforcement); he or she would have less opportunity to learn the principles of evidence-based practice, including their role in developing the evidence. In Table 1, we illustrate scripts for two aphasia rehabilitation approaches to improve naming abilities.

There are also some additional benefits to using a scripted approach to aphasia rehabilitation. As illustrated by the cooking analogy, beginning clinicians can learn the treatment protocol fairly quickly because the steps in the treatment protocol (as in the first recipe in Figure 1) are clearly specified. For example, the treatment protocol specifies how to reinforce a client when he or she provides an incorrect response versus a correct response. Also, as discussed previously, using a scripted approach implicitly encourages a process of errorless learning of how to provide therapy for people with aphasia. As an example, one of the treatment steps requires the patient to say "yes" or "no" for 15 auditorily presented questions. The role of the clinician in this treatment step is to ask the patient a question (e.g., "Does this bird lay eggs?" for ROBIN) and request the patient's judgment. For this step, approximately 35 questions are generated on the basis of a question matrix. The responsibility of the clinician is to select 15 questions for that specific session. Because the task is highly constrained, there is little opportunity for error. At the same time, clinicians can exercise flexibility in the questions they select across consecutive treatment sessions. Students have reported that having a script to use during treatment allows them to feel less pressured and anxious during the actual delivery of the treatment to the patient.

Two other similarities with the cooking analogy provided in the introduction are relevant here. First, providing clinicians with a script to use during treatment provides an environment for the student to understand the role of each treatment step in improving the naming skills of people with aphasia. In other words, practicing the same treatment approach on a weekly basis without errors or uncontrolled variation allows the student to evaluate the aspects of treatment that contribute to the patient's success in treatment and those aspects that do not. Consequently, if the need arises to modify an aspect of treatment to accommodate a participant's needs (e.g., providing written cues for a client who may need it), the clinician is competent to actualize such a change.

Another important and related advantage of the scripted approach is that it fosters a motivation for the clinician to integrate theoretical and fundamental principles of communication with practical issues specific to a particular client. Because the aphasia treatment approach described above is based on a theoretical framework of language processing, it offers opportunities for students to evaluate each client's impairment and consequent progress in treatment against a standard (in this case the predictions of the theoretical model). With subsequent exposure to new clients, the clinician becomes more competent at evaluating the effectiveness of the treatment prospectively and is able to recommend modifications to the treatment protocol appropriate for each new client a priori. It is expected that the ultimate goal of such training will result in mastery of similar aphasia treatment practices that can be applied in clinical practice.

Teaching students to use mediated learning in the dynamic assessment of narratives

Procedures used to teach student clinicians how to implement dynamic assessment approaches with children with language disorders provide another illustration of how these principles are applied in activities that combine clinical research with clinical education. In one application of dynamic assessment, we use a test–teach–retest approach to observe how children learn to tell school-like stories (Peña et al., 2006). The teaching portion of dynamic assessment utilizes Feuerstein's theory of mediated learning experience (MLE) (Feuerstein, 1979; Lidz, 1991, 2002). Critical components of MLE include intentionality (understanding of the goal), meaning (understanding of the purpose for that goal), transcendence (development of hypothetical thinking related to the goal), and competence (development of a plan for realizing the stated goal). Applied to narrative intervention, we make sure that the child understands that the goal is to tell better and more complete stories (intentionality), that a reason for telling stories is to understand events and interpret them (meaning), and that children use narratives in many settings, such as with peers and in the classroom (transcendence). Finally, in the intervention, we help children develop a plan (competence) for ensuring inclusion of the different aspects of a story. Then, the student's independent story telling skill is retested.

Teaching novice clinicians how to develop a narrative intervention around these principles is accomplished at several levels simultaneously. Although it is not difficult to grasp how these concepts can be applied to teaching children about narrative uses of language, it is challenging to ensure that MLE will be consistently implemented while responding within the child's zone of proximal development. In addition, children need a balance between such a meta-cognitive approach and specific examples and tasks during the teaching sessions. When children do not understand, or when they provide an incorrect response, student clinicians must be able to provide redirection. Thus, we have developed and used written intervention scripts for implementing MLE. This serves dual purposes of ensuring fidelity in clinical research and providing appropriate support for clinical training (see Peña et al., 2006 for sample scripts).

A number of benefits are associated with our utilization of MLE scripts. First, we find that most students can successfully utilize MLE scripts with minimal training. Utilization of the scripts ensures that the intervention is consistently implemented. These benefits exemplify the key aspects of our phased model. Providing clinician scripts for implementing MLE allows students at different levels to successfully implement the intervention within a short period of time. A particular benefit is that student frustration and stress are reduced, and they enjoy immediate success.

In the training phase, students typically spend time in the laboratory reading and learning the script together with a supervisor. They watch videotapes of more experienced clinicians working with a child using the MLE script. While watching the videotape, the clinical supervisor/researcher discusses the script and how it is being implemented. Watching videotaped examples provides a model for the MLE that students will soon be implementing. It also provides an immediate example of how a theoretical framework they are learning about in academic coursework is implemented. This theory-to-practice link is crucial for students to begin to understand how theories they have learned about in their coursework can be applied.

In addition, we have students observe us implementing the script. Once supervisors are confident that student clinicians can implement this script, they practice under our direct guidance. A master clinician sits at the student's side and provides immediate online feedback. These steps take about 4–5 hr for novice clinicians and 1–2 hr for more experienced, graduate clinicians. Both groups of clinicians can then implement the script with a high degree of success. The difference, of course, is that the experienced, graduate clinicians (similar to the expert chefs of our analogy) can make online adaptations to the script and can generate hypotheses about what to do next more readily because they have more experience on which to draw even if they have never done MLE. Providing side-by-side support during initial sessions allows novice student clinicians to complete the MLE with few errors. Students report that this level of support during the first one to two sessions helps reduce stress.

A second benefit of novice clinicians using scripted intervention is that the script provides a standard against which to compare clinical performance and facilitates the ability to self-monitor and self-correct. We use the scripts mainly as guidelines rather than as memorized text, but the explicit examples of MLE components are considered essential to its success. Comparing the intervention session to the script provides clinicians a way to evaluate whether they consistently used the MLE components. Often novice student clinicians are unsure about how they are doing or what clinical behaviors they should prioritize or focus on. A script helps them learn to monitor their own learning and affords them a feedback loop for error correction. Once students have had multiple opportunities for practice under guided, reduced-error conditions, they advance to the point where they can monitor, recognize, and resolve their own mistakes.

Another advantage of beginning with a script for clinicians to follow is that after several sessions, internalization of the script helps clinicians develop a framework for understanding the key ingredients of MLE. This framework allows clinicians to compare novel events or situations and adapt the script as needed. The notion that novice clinicians develop a framework for intervention through a combination of observation and participation is consistent with the theoretical notion of development of generalized event representation (Nelson & Gruendel, 1981). Through several implementations of MLE session, students start to develop a mental script comprising possible events that fit into the MLE schema. These events are variable, and over multiple exposures, clinicians learn different ways in which the MLE framework can be applied. In combination with instruction and practice, development of a mental framework provides a structure that can be modified and applied to other domains, populations, and

ages. Thus, clinicians develop a deep understanding, not just of MLE of narratives, but of MLE in general that enables them to independently apply the principles in novel ways.

CONCLUSION

An important goal for clinical teaching is the development of a metacognitive framework from which clinicians can operate. We believe that research on learning provides insights about effective learning methods that lead to development of a metacognitive clinical framework. At specific points in learning, scaffolded approaches can free up cognitive space for development of clinical knowledge. As they acquire clinical experience, they can compare across variations of an intervention approach, thus developing greater flexibility. These supports and experiences allow student clinicians to build clinical schemata.

Development of a clinical schema to apply in a given domain requires concept formation, comparison of ideas, and the ability to compare novel ideas with those already formed. The early stages of learning new information involve multiple exposures to a new concept or idea. Often the initial stage of concept formation involves implicit learning, building up what is known as procedural knowledge. This kind of learning leads to concept formation, but not necessarily to metacognitive schemata. Explicit or declarative learning, on the other hand, allows for hypothesis testing, which helps refine knowledge and leads to development of metacognitive tools that can be applied in learning new information (Kessels, Boekhorst, & Postma, 2005; Kozulin, 2002).

We have provided two examples (semantic training in aphasia rehabilitation and MLE applied to narratives) that integrate learning theory with practical scenarios involving clinical education. These situations were used to illustrate how the phased clinical model can be implemented to further clinical education; many other illustrations are available (e.g., Murphy & Watson, 2004, in stuttering; Seal & Hilton, 2007, related to autism). The point of this essay is to stimulate a discussion about what clinical educators do, and why, to frame this dialogue in the context of theories of learning and feedback. For information about the principles/guidelines for teaching/clinical supervision in speech–language pathology, readers are referred to the recent American Speech–Language–Hearing Association technical report and competencies on clinical supervision in speech pathology (American Speech–Language–Hearing Association, 2008a; 2008b), which provide extensive guidelines on aspects of the supervision process.

In this article, we speculate about relevant issues to address during planning and implementation of clinical training programs that would reap the greatest rewards for the profession. The focus is on educating competent clinicians. A bonus of the phased model of clinical education described here is that the field can also benefit from having access to increased evidence about new treatment approaches when student clinicians are engaged and trained as research clinicians. The scope of clinical practice in speech–language pathology has changed considerably over the last 20 years. At the same time, the emphasis on providing services that are defensible on the basis of scientific evidence has increased (Dollaghan, 2004; Gillam & Gillam, 2006). Thus, clinical education must focus on a broader skill set along with the tools needed to make evidence-based decisions for clients.

The model we propose can move students quickly into competent service provision because they develop necessary theoretical and meta-analytical skills by the time they finish their clinical program. Beginning with scripts ("cookbooks" in our analogy) ensures consistent and appropriate assessment and intervention for university-based clients and has the benefit of reducing frustration for students when they are in the early stages of developing their clinical skills. As supervisors and educators, we need to ensure that student clinicians complete their training program with the skills and tools they need to continue to explore, inquire, and develop intervention and assessment practices that meet

the highest level of evidence in the profession. As researchers, we can engage our students in valuable practices, and stage appropriate learning experiences, while also adding to their skills to become informed consumers of research on clinical practices.

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