Problem-based learning (PBL) is a constructivist teaching method in which instructors provide students with complex, open-ended problems or scenarios that are similar to those they may encounter in the real world, which they then work through in groups (Edens, 2000; Hadley & Fulcomer, 2010; Visconti, 2010). Problems can have many potential solutions (Visconti, 2010), and much like everyday life, there may be no acceptable or satisfying solution (Jonassen, 2000; Pawson et al., 2006).

In general, the emphasis in PBL is on learning rather than instruction (Pawson et al., 2006). PBL is in contrast to more traditional teaching methods in which lectures are presented and are then followed by well-planned activities (Edens, 2000). The role of the instructor also differs. In the lecture-based teaching style, the instructor is seen as the person who holds all of the knowledge, which he or she then shares with students. In PBL, the instructor becomes much more of a mentor, facilitator, and tutor, and the students take a more active role (Visconti, 2010; Whitehill, Bridges, & Chan, 2014).

PBL originated in medical schools in the 1960s and has expanded to educational programs in fields such as business, geography, pharmacy, dietetics, and nursing. PBL was developed in order to better prepare physicians for their future practice (see Barrows & Tamblyn, 1980). More recently, PBL is being used in speech-language pathology programs (Mok, Dodd, & Whitehill, 2009; Visconti, 2010), particularly in Australia, Hong Kong, Ireland, and Sweden (Whitehill et al., 2014). In addition, some universities in the United States have incorporated aspects of PBL into their speech-language pathology programs (Whitehill et al., 2014), including the University of Northern Iowa (UNI).

Because speech-language pathology is a combination of scientific and clinical reasoning, integrating PBL into speech-language pathology training
programs is a logical step in the educational process (Raghavendra, 2009; Tharpe, Rassi, & Biswas, 1995). In addition, the process of PBL, in which students generate questions, search for and critically evaluate information, revise their original perspectives, and share this newfound information with others, is the same process that speech-language pathologists (SLPs) use in evidence-based practice (EBP; Visconti, 2010).

As with many professions today, much of what our students learn may change or even be obsolete in the not-so-distant future (Pawson et al., 2006). Learning how to learn and being able to solve problems in a critical manner are skills that are necessary if our students are to be successful in their work settings. Thus, PBL sets students up to be lifelong learners and gives them a vehicle to accomplish this.

According to the seminal publication by Barrows and Tamblyn (1980), PBL has two fundamental components. The first component of PBL involves learning through problem solving, which is more effective in creating a usable body of knowledge compared to traditional memory-based learning. The second component of PBL involves acquiring problem-solving skills, which are necessary for good patient care (Barrows & Tamblyn, 1980). Problem solving consists of a goal-directed sequence of cognitive operations in which there are two vital attributes (Anderson, 1980). First, individuals must generate a mental representation of the problem, sometimes referred to as the problem space (Newell & Simon, 1972). Second, individuals must actively manipulate this problem space in order to work through the problem (Jonassen, 2000). This active involvement makes mastery of the information more likely (Weimer, 2007). Acquiring such problem-solving abilities should generalize to situations in which individuals gather, interpret, and integrate data from any clinical problem (Norman & Schmidt, 1992).

What Does PBL Look Like?

In PBL, students are assigned to small groups and have a dedicated facilitator or tutor. They are provided with a problem or scenario and are required to explore what is known and not known about the scenario. They must then identify relevant learning issues. Although this brief description may seem straightforward, flexibility is a key component of PBL (Edens, 2000). Some programs use a purely PBL model in which the curriculum is fully integrated across several years, with small groups of students facilitated by a tutor (Amador, Miles, & Peters, 2006; Melville, Wray, Addae, & Young, 1993; Tharpe & Rokuoson, 2010; Whitehill et al., 2014). Other models of PBL include a hybrid PBL approach in which problems are provided to students, but more traditional education methods such as lectures are part of the course (Amador et al., 2006; Melville et al., 1993; Tharpe & Rokuoson, 2010; Whitehill et al., 2014). PBL can also be employed as a single module in which it is implemented in a generally pure form, but a program’s entire curriculum does not use PBL. Other options include using PBL in an online format or without facilitators (Whitehill et al., 2014).

With a variety of possibilities for PBL, Whitehill et al. (2014) suggested that PBL be viewed more as existing on a continuum as opposed to trying to neatly fit what instructors and programs do into a specific category or model (e.g., pure, hybrid). Because of this inherent flexibility, and, some might say, “messiness,” the same course taught by two different instructors using PBL may look quite different. For example, PBL may be the focus of an entire course from the very start, or it may occur within a unit of study and not be introduced until later in the term (Amador et al., 2006; Edens, 2000; Pawson et al., 2006). As Amador et al. (2006) noted, it can be easier to go to an entirely PBL format in smaller classes and include PBL as part of other classroom activities in larger classes. However, some university programs use an entirely PBL format regardless of class size (Mok et al., 2009; M. Rose, personal communication, April 26, 2004, Whitehill et al., 2014).

Other differences can exist when instructors and programs decide to use PBL. For example, the length of time that instructors have groups spend on a problem can differ. In one nursing program, 20 PBL scenarios are typically addressed over a 2-year period, with a single-patient case scenario generally completed in 2 consecutive days (Biley, 1999). Other programs may spend more time on each PBL scenario. How long groups last also may vary. Some instructors, for example, have students stay in their assigned groups for the entire semester (Amador et al., 2006; Pawson et al., 2006); others change group members on a weekly basis (Fenwick, 2002). The fluidity of PBL can be equally exciting and initially frustrating for all involved; however, as reported later in this article, the majority of students and instructors can come to prefer this style of learning (Burd, Hageman, Aguiler, & Off, 2011; Donner & Bickley, 1993; Visconti, 2010).

In order to increase the likelihood that PBL will succeed in a course, instructors need to pay attention to preparing the course and designing the scenarios to be used (Pawson et al., 2006). Generally, the process for instructors begins with careful development of the problem (Visconti, 2010). Instructors may ask, “What constitutes a problem?” According to Jonassen (2000), there are two critical qualities of
a problem: It is an unknown entity that differs from the current situation and the goal situation; and there must be some type of intellectual, cultural, or social value that occurs as a result of working through the unknown aspects of the problem. Thus, there needs to be worth in finding the information (Jonassen, 2000). In addition, it is important for instructors and students to know that problems are not equivalent in their form, content, or process, and that problem solving is not uniform in nature (Jonassen, 2000).

Appropriate problems for the teaching method are open ended, ambiguous, challenging to define, realistic, contemporary in nature, and likely to change. They also have many potential solutions (Amador et al., 2006; Edens, 2000; Pawson et al., 2006; Stephen & Pyke, 1997). Problems can be set up so that they use students’ previous knowledge as a “stepping stone to the new information” (Visconti, 2010, p. 27) but should be complex enough that they require students to work together. Some problems can be controversial, which require students to justify their perspective and demonstrate their critical thinking skills (Edens, 2000). Frequently, students are cast as the main characters in the problems (Amador et al., 2006).

Instructors can develop problems based on real-world events that can be central to a theme or topic in a course. The media in all its facets (e.g., Internet, magazines, newspapers, television) as well as daily life can also be sources from which to develop problems (Amador et al., 2006; Edens, 2000). It is imperative that problems address the learning objectives that students are expected to complete as part of the course (Amador et al., 2006). Instructors should not haphazardly write problems without taking such objectives into consideration. Once a problem is designed, the instructor presents it to the class. Generally, problems are handed out to students one component at a time as opposed to being given to students in their entirety. Such parceling of problems tends to mimic real life—rarely do we know what will happen next in a given situation (Amador et al., 2006). This strategy also provides instructors with more flexibility in managing the class (Amador et al., 2006).

PBL requires that students learn by collaborating within small groups (Visconti, 2010), although the definition of a small group varies. Some authors recommend that groups consist of three to seven students (Pawson et al., 2006; Visconti, 2010); others suggest that groups contain 15–20 students (Biley, 1999). Each group first identifies known information regarding the problem, and students are encouraged to use their existing knowledge to generate potential hypotheses or relationships for a given scenario (Biley, 1999; Visconti, 2010). They then determine what questions remain unanswered (Visconti, 2010). Students search for the unknown information, which they share with the group, requiring them to be responsible for learning and teaching the material to their peers (Pawson et al., 2006).

How much time students have to conduct their research differs. In some cases, they may have a week; in other instances, they may have a few days or less (Biley, 1999). When students reconvene and present their findings, they re-examine the scenario in order to decide if their hypotheses for the scenario were appropriate. If any new issues arise, they conduct further research and bring back additional findings to the group (Biley, 1999). Students will come to realize that PBL is cyclical in nature, and that the lists of what we know and what we need to know will be updated as they learn and share information with their groups (Edens, 2000).

Instructors need to be flexible and organized in PBL courses because not only are the instructors required to participate in the PBL process (Amador et al., 2006), but they are also expected to facilitate the process by monitoring, probing, guiding, supporting, and challenging their students (Amador et al., 2006; Biley, 1999; Edens, 2000). Instructors must also keep an eye on group dynamics and progress (Pawson et al., 2006). In some programs, instructors observe students throughout the week and provide both formative and summative feedback about their group and individual work as well as the PBL process as a whole (Fenwick, 2002). In addition, instructors may need to model appropriate problem-solving abilities without actually solving the problem, which is a skill that does not always come easily (Amador et al., 2006). However, asking the students “What do you think?” can often be the nudge that the students need in order to delve more deeply into a given scenario (Amador et al., 2006). Although instructors who use a pure PBL approach do not provide students with resources or lectures, those who use a hybrid approach may provide some types of resources, such as online and library resources, specified reading lists, and accompanying traditional lectures (Pawson et al., 2006; Whitehill et al., 2014). However, part of the PBL process requires students to seek out and gather information on their own.

In PBL, there is typically some sort of graded tangible outcome at the end of a problem. For example, some instructors may require a poster presentation; other instructors may give groups 15 min to verbally present their findings and recommendations to their peers (Fenwick, 2002; Pawson et al., 2006). Frequently, instructors have a wrap-up debriefing at the end of a problem or scenario (Edens, 2000). Assessment is still a part of courses that use PBL, and
having clear grading criteria is helpful for both the students and the instructor (Pawson et al., 2006).

Generally, as opposed to traditional tests, assessments in a PBL course can mirror tasks that students will have to do out in the real world. These assessments should include critical thinking and reasoning skills (Stephen & Pyke, 1997). They should also include individual and group contributions as well as peer assessment and self-assessment (Amador et al., 2006; Pawson et al., 2006; Whitehill et al., 2014). Assessments may be conducted at the end of a problem (Edens, 2000) or at other points during the term. Interestingly, significant performance differences on tests of knowledge have not been found between students learning via PBL and those who have a more traditional lecture-based learning experience (Alleyne et al., 2002; Edens, 2000; Pawson et al., 2006).

Benefits, Challenges, and Feedback in PBL

PBL is not necessarily an easy transition for students and instructors. Students can feel frustrated about the process and insecure when transitioning from lecture-based courses to a PBL format (Biley, 1999; Des Marchais, Bureau, Dumais, & Pigeon, 1992; Edens, 2000). They likely will not be used to the degree of active involvement that PBL requires (Amador et al., 2006) and may be anxious about having to deal with group dynamics (Edens, 2000). PBL takes time, and students may not feel that they are prepared for class nor believe that this type of learning is as straightforward as compared to traditionally taught courses (Weimer, 2007). Students can also have difficulty dealing with the ambiguous nature of the knowledge (Hammel et al., 1999). Students might ask for more time to work on a problem or request that the instructor tell them exactly what it is they need to know (Biley, 1999; Edens, 2000), even when they know the advantages of PBL (Biley, 1999).

Yet, there are many benefits to PBL, and students learn much more than just problem-solving skills. Although students may not gain as much discipline-specific knowledge as they would in a traditionally taught lecture-based course, they do retain more of what they have learned (Dochy, Segers, Van den Bossche, & Gijbels, 2003; Yeung, Au-Yeung, Chiu, Mok, & Lai, 2003) and do improve their oral and written communication skills (Amador et al., 2006).

In a PBL course, students learn how to find information and judge its quality (Visconti, 2010) and how to link theory with practice (Amador et al., 2006; Biley, 1999; Edens, 2000). They develop metacognitive skills by learning how to self-judge their performance and their understanding of the information (Jonassen, 2000; Savery & Duffy, 1996). Students also learn how to exert effort and how to persevere as they work through a problem (Davidson & Sternberg, 1998; Jonassen, 2000). Students in a PBL course learn to identify and overcome any obstacles they encounter during the process while simultaneously gaining self-confidence in their problem-solving abilities (Davidson & Sternberg, 1998; Jonassen, 2000). In fact, students tend to “think harder and process material more deeply” (Jonassen, 2000, p. 71) when they believe they are capable of solving a problem.

PBL gives students an opportunity to make mistakes and learn from them (King, 2001), and students appreciate that they have a safe environment in which to practice real-world cases (Fenwick, 2002). Students appreciate that their opinions and previous knowledge are valued (Biley, 1999), and they become more aware of how their attitudes and beliefs can affect how they solve a problem (Jonassen & Tessmer, 1996). For example, students may be initially biased to potential solutions because of personal beliefs (Jonassen, 2000), but after talking with their group, they can develop an understanding of different perspectives (Biley, 1999). In PBL, students learn that one’s personal perspectives can affect problem solving. They also learn how to function as a member of a team and how to relate to others—all necessary skills in today’s workforce (Bell, 2010; Hanrahan & Isaacs, 2001).

Feedback from students in PBL speech-language pathology courses has been obtained in recent years and tends to mirror data that have been collected from other disciplines using PBL. At Baldwin-Wallace College in Ohio, for example, “PBL has been incorporated into all aspects of the curriculum of the Communication Disorders program” (Visconti, 2010, p. 28). PBL tasks become increasingly complex as undergraduate students advance through the major. For example, during the undergraduate introductory course, students must present on a disorder to “family members” (i.e., class members) in “a creative and interactive manner” (Visconti, 2010, p. 28). In an upper-level language assessment course, students must plan an assessment for a patient after receiving a brief case description.

Undergraduate students in the communication disorders program at Baldwin-Wallace College reported that as a result of learning using PBL, they were better able to synthesize information and generate a suitable conclusion, and that their communication and critical thinking skills improved (Visconti, 2010). More than 70% of the students enjoyed the active learning (Visconti, 2010). However, the students also identified concerns with PBL. For example, some students in the program reported that PBL required more
time than traditional lecture-based classes, that learning was not as straightforward, and that it was challenging to manage group dynamics (Visconti, 2010).

Burda et al. (2011) surveyed graduate speech-language pathology students and alumni from UNI, where a hybrid format of PBL has been used in the required adult neurogenic courses since 2005. Overall, the respondents identified the primary strengths of PBL as acquiring effective problem-solving, reasoning, and collaboration skills, as well as becoming self-directed learners. Students reported the primary weaknesses of PBL as difficulty with time management, an inadequate amount of lectures, and challenges in working with their assigned group. For example, quieter students did not always feel that they could easily speak up in the group.

Burda et al. (2011) provided sample participant comments:

PBL provided me with the opportunity to problem-solve very real situations. It taught many of us that not only the data-driven/evidence based answers are important, but to keep in mind the ideals and hopes for the patient and their families

and

I think there should be less group activities; meeting and coordinating with other people continuously can be stressful. You’re so busy trying to coordinate with other people, time and energy for learning is lost.

Kong (2008) also included sample quotes from students about the use of PBL in a speech-language pathology program. Some of these comments included: “I gained more understanding by doing my own research on the topics I was given to discuss and through my fellow classmates’ interpretations of the subject matter they discussed” and “While the PBL approach requires more effort and critical thinking than traditional lecture classes, it is what we should expect in the future.”

Despite the challenges that speech-language pathology students and students in other disciplines report regarding PBL, keep in mind that their beliefs and attitudes tend to evolve over time. Instructors should expect that students may not initially appreciate, and may even resist, the use of PBL (Woods, 1994). When Visconti (2010) first introduced PBL in her speech-language pathology courses in 2007, students preferred a lecture-based class, did not like the use of PBL, and described the course as difficult and as too much work (Visconti, 2010). Anecdotally, UNI graduate speech-language pathology students had similar comments when PBL was first introduced. But, both for Visconti and at UNI, these comments have become much more positive over the past several years, and students now believe that the benefits of PBL tend to outweigh the challenges (Biley, 1999; Visconti, 2010).

The benefits and challenges of PBL also affect the instructor. Both instructors and students can experience difficulty in transitioning to PBL (Greenwald, 2006; Visconti, 2010). PBL is a marked change from the traditional method of teaching. Thus, its use can increase the instructor’s workload (Edens, 2000). Instructors can feel uncomfortable with PBL when they must shift their perspective from being the professor of a class to being a tutor for the class (Hung, Bailey, & Jonassen, 2003). Other challenges can include difficulty in creating problems, managing groups (e.g., some students may dominate while others withdraw; Benbow & McMahon, 2001; Prideaux, Gannon, Farmer, Runciman, & Rolfe, 2001), knowing how to strike a balance between giving an adequate amount of guidance without solving problems for the students, and determining what and how to assess (Edens, 2000; Visconti, 2010; Weimer, 2007). Instructors using PBL may feel that the process is ambiguous and may not be able to plan their syllabus in advance or follow it in a structured manner because classes evolve in a somewhat unpredictable fashion (Edens, 2000).

Even when given such challenges, instructors report benefits from using PBL. For example, attendance and class participation improve, students are increasingly actively engaged, and students spend more time studying course information (Banta, Black, & Kline, 2000; Weimer, 2007). In addition, many instructors who have taught in both traditional and PBL manners tend to favor PBL because it is generally a more natural form of learning and is thought to be more inherently motivating for students (Donner & Bickley, 1993).

Applying PBL to Speech-Language Pathology

The remainder of this section will describe more fully how PBL is used at UNI. Readers should keep in mind that although the PBL process can be similar regardless of discipline, how it is included at UNI is not necessarily representative of what others may do. Thus, if you decide to use PBL, you may find that you need to carry it out somewhat differently from what is described here in order to best meet your needs and the needs of your students. Readers may find Amador et al. (2006) and articles from the January–February 2014 issue of Clinical Linguistics and Phonetics (e.g., Whitehill et al., 2014) to be helpful guides if and when they decide to use PBL.

Amador et al.’s (2006) book most closely resembles how PBL is done at UNI. It offers an in-depth description of how three professors in the disciplines...
of sociology, biology, and political science revamped their courses in order to include PBL. Although Amador et al. (2006) and Pawson et al. (2006) cautioned that care needs to be taken in preparing for a PBL course, and that doing it gradually can let instructors see what works, what does not, and what needs to be revised, at some point in time, instructors just have to do it! Yes, adopting PBL should not be taken lightly, and the first few times using PBL will be messy and challenging, but do not be intimidated. It does improve. At this point in time, PBL has been in use for so long at UNI that it would be hard to imagine going back to teaching these courses in a primarily lecture-only format.

The use of PBL was initiated at UNI in 2005 after a 2004 workshop that was presented by Miranda Rose of La Trobe University in Melbourne, Australia in which both undergraduate and graduate speech-language pathology curriculums are conducted entirely using a purely PBL approach. At UNI, four required speech-language pathology graduate classes are co-taught using what best mirrors a hybrid PBL format (i.e., small groups of students receive problems to work through, lectures are also provided). Part of this decision was due to necessity. Per the workshop with Rose, pure PBL will often have instructors other than the assigned faculty members serve as facilitators. For example, an audiology professor might be the facilitator for a dysphagia class and vice versa. However, we (two authors) are the only faculty members in the communication sciences and disorders department who use PBL in our courses. Thus, no other colleagues in different areas of expertise were available who could dedicate their time to attend the courses. In addition, the plan was to apply PBL principles without entirely throwing out everything that had been done previously and starting over from scratch. Also, it seemed valuable to continue to include various activities in the course that allowed the students to be engaged in other ways that may be useful, particularly for those who have difficulty speaking up in their PBL groups (Amador et al., 2006). For example, clips of patients exhibiting different types of disorders (e.g., dysarthrias, aphasia) are shown, and students are asked to come up with and present an oral report on the characteristics present, the level of severity observed, and appropriate areas to address in treatment.

During the fall semester, two courses, voice disorders and motor speech disorders, are co-taught; during the spring semester, dysphagia and aphasia are co-taught. Each pair of courses accounts for five credits of the students’ class load. Courses meet twice a week. Three years ago, our department began blocking all graduate courses into 2 days, with classes starting at 7:30 a.m. and ending at 5:00 p.m. During the fall semester, courses meet on Tuesdays for nearly 3 hr (2 hr, 50 min) and on Fridays for almost 2 hr (1 hr, 50 min). In the spring semester, the longer class session (2 hr, 50 min) meets on Thursdays, with the 1 hr, 50 min session meeting on Fridays. Students work through four to five triggers (i.e., problem scenarios) each semester. At UNI, students are admitted in both the fall and spring semesters to our graduate program. Thus, all classes using the hybrid PBL approach include first- and second-semester students. This is an advantage because it allows those students who have already been through PBL to act as mentors for those who are just learning the PBL process.

Various activities, assignments, and assessments are used for grading purposes in the combined courses, each of which is worth 100 points. Assessments and assignments graded by the instructors include (a) a wrap-up activity (e.g., presentation, debate) for each trigger, (b) a criterion test that covers basic anatomical and neurological information that students should have learned in their undergraduate course work, (c) an EBP paper about a randomly assigned topic in which each student must support or refute an assigned statement (e.g., The Lee-Silverman voice treatment improves speech in persons with multiple sclerosis, The modified barium swallow shows what happens when a patient eats a meal), (d) a cranial nerve demonstration examination, and (e) a final examination. The combined aphasia and dysphagia courses also require that students develop a notebook that includes information that is helpful for assessing adult clients. The inclusion of individual assignments allows us to ensure that all students are making satisfactory progress and understanding the course material. In addition to instructor-graded items, students complete self-assessments and peer assessments following each trigger and project (e.g., aphasia–dysphagia notebook). Facilitators also assess each of the students on a weekly basis for each problem. Final grades are calculated based on the final mean performance over the course of the semester.

On the first day of class, the instructors explain why PBL is used in the course. Similar to Amador et al.’s (2006) approach, time is spent explaining that the course will likely be different than what the students have experienced in the past. Although Amador et al. suggested that such explanations can help ease students’ transitions to PBL, there is generally a good deal of anxiety for the first-semester graduate students until the first trigger (i.e., problem) is completed. Triggers are the problems that the students will address during the course of the semester (more information on triggers will follow).

Typical to syllabi in traditional courses, course learning objectives are included as is information on
how the students will earn grades both individually and in groups. Required textbooks and readings as well as assignments and their respective due dates are also included in the syllabi. Different from typical syllabi, however, a detailed daily schedule is not included; instead, a general schedule of triggers and the corresponding, yet uncertain, time lines are included. Time is also spent discussing what kinds of resources are appropriate to use when students conduct their research. Although EBP and the different levels of evidence are also discussed, care is taken to stress that a case study is not “worse than” a randomized, double-blind study (which rarely exists in speech-language pathology), and a discussion of appropriate journals or websites (e.g., American Speech-Language-Hearing Association, National Institutes of Health) is provided because we want to avoid students using nonscholarly sites as resources. Feedback regarding students’ research abilities, resources, and decisions is given throughout the semester.

Lectures throughout the semester include discussions on how to decide which studies should be highly regarded when making treatment recommendations and which should not be seriously considered because they have been poorly conceived or conducted or have weak conclusions. After discussing the syllabus and research expectations, the second-semester graduate students are allowed to leave. The remaining class time is spent working through an example trigger with the first-semester graduate students. Through this example, the students learn that PBL tends to follow a pattern of asking “What do I know? What are my hypotheses? What do I need to know? How do I find it? Now I need to teach it to my group and re-evaluate what we have already discussed.” Even though new students may vocally participate during the example trigger, many tend to be reticent to speak in their assigned groups early on. This usually changes during the course of the semester once the students have more practice at PBL and gain confidence with it.

Typically, we randomly assign students to cohorts that are listed on the syllabus or in another shared document. We prefer random assignment as opposed to allowing self-selection. It is ideal to try to have a fairly equal number of both first- and second-semester students in each group. Thus, although all attempts are made to randomize as much as possible, sometimes groups are revised before they are finalized for the semester. Cohorts are stable for the duration of the semester, which allows the students to develop a stronger sense of community (Fenwick, 2002; MacKinnon, 1999). It also more accurately reflects the work world: Not everyone may like all of the members on their team, but they have to learn to work together. Group members are encouraged to learn how to deal with multiple personalities, perspectives, and learning styles, including their own. We have found that having approximately 12–13 students in a group is ideal.

As the number of graduate students in our program has increased, we have increased the number of PBL groups from two groups per semester to three. Smaller groups have not been tried systematically partly due to logistics and the limited space in the department. In addition, groups in the work world (e.g., grand rounds in hospital settings) tend to have a larger number of individuals. Also, because the triggers tend to be complex and have a great deal of information that students must research, smaller groups would likely be too overwhelmed. Larger groups allow the work to be more evenly distributed as respective group members typically, but not always, look up different topics and truly become teachers of that material to their peers.

Scenarios in the course are referred to as triggers. This is consistent with the teaching practice at La Trobe University in Australia (M. Rose, personal communication, April 26, 2004). Calling a scenario a problem leads students to view it as an issue that needs to be solved. This mindset narrows students’ focus too much, and as a result, students may not fully explore all of the potential reasons for a given situation. As Whitehill et al. (2014) noted, “PBL is less concerned with problem solving than in deepening student understanding of a set of learning issues embedded in a problem” (p. 6).

The duration of the triggers varies. For example, a trigger in the first part of the semester may take several weeks, in part because students are learning the PBL process and because there are several components to it. In addition, time devoted to PBL is also interspersed with lectures and other class activities. As the semester progresses, students may have 1 or 2 weeks per trigger. At the end of the semester, students may be provided with a trigger in which they may have only 1 day or only one class period to work through it. Appendices A and B illustrate how the length of triggers changes over the course of a semester. However, one can never truly anticipate how much time groups will spend on their respective trigger components. PBL shifts the pace and the direction of the classroom onto the students (Amador et al., 2006). Therefore, it is quite common to have groups at different points or discussing different topics for the same trigger.

Students are provided with resources on many of the triggers, including chapters out of their assigned books, journal articles, or websites. As the triggers and the semester progress, fewer resources are
provided. Some portions of triggers may not have any resources provided. This is because students should already be finding and compiling their own set of resources. To this end, we have recently instituted the position of permanent scribe, who compiles all of the information gleaned by all of the cohorts into one document by the end of the semester. As compensation, the permanent scribe is relieved of some of the daily activities.

Writing triggers to ensure that scenarios encompass learning objectives takes time. Due to the instructors’ prior clinical experience before working in academe, and current clinical supervision responsibilities in UNI’s on-campus speech and hearing clinic, there is no lack of realistic, relevant, and challenging scenarios to use. Students on their internships as well as alumni also often send scenarios from their settings that can be used to develop new triggers. Triggers are frequently revised to ensure that they continue to represent relevant and current issues in the field. However, the process of looking at our course objectives, deciding if they are still appropriate or if they need to be refined, and determining how to best incorporate those objectives into triggers requires a good deal of planning. For example, in the combined motor speech disorders and voice disorders courses, we developed Trigger 1 (see Appendix A) to meet our course objectives of having students learn the etiologies of voice disorders, understand voice assessment procedures, and be able to develop treatment approaches for voice disorders. We revised this trigger last year to include more information pertaining to assessing cranial nerves and having a mock counseling session as a wrap-up activity.

Although Edens (2000) recommended that instructors map out all of the possibilities in which a problem can relate to the course content, such a quest would take too much time. The triggers used at the beginning of a semester tend to have several components that can extend over several weeks, which provides the opportunity to modify as needed. Thought is also put into the order in which triggers are presented to the class. Early triggers typically require students to review or learn a great deal of new information (e.g., reviewing the structures of the larynx, reviewing blood flow, learning the types of dysarthrias and aphasias). As the courses progress, later triggers tend to involve students taking this newly learned information, applying it to unexpected or more complex situations, and also continuing to learn new information. For example, in a later trigger during the fall semester, the patient dies. In this instance, students not only discuss previously learned information (e.g., the type of communication disorder the patient demonstrated while alive), but now, they must deal with an ethical situation in which family members of the deceased patient personally know the SLP and are asking him or her if the patient’s death was preventable. This unexpected twist requires students to review the American Speech-Language-Hearing Association’s Code of Ethics (2010) as well as find additional resources on ethical conduct, confidentiality, and potential legal repercussions in the work world.

Students will often go down unexpected paths and sometimes find that the information they thought would be helpful for their topic actually is not (Amador et al., 2006). Yet, students in our classes are told that such occurrences are okay because even if the information they have found for their current trigger seems to have little relevance, it is likely that that information will be useful in another trigger or later in their clinical work. In cases when students go down unexpected paths, there are still favorable outcomes because the students learn information that probably would not have been presented in a lecture format. Students are encouraged to draw on their personal experiences and knowledge from prior classes during their discussions in PBL. Students often know more than they share, but again, this tends to resolve as they become more comfortable with PBL.

Facilitators are a crucial component of PBL (Slattery & Douglas, 2014) and are not meant to be a substitute for the instructor. Instead, facilitators are expected to monitor what happens in the groups and to offer guidance as needed. Generally, this guidance is in the form of providing the group with questions such as “How do you want to handle this issue? or “What do you think about it?” (M. Rose, personal communication, April 26, 2004). If students ask the facilitators to answer a specific question, the facilitators usually respond with yet another question for the group, such as “That’s a good question. Can anyone provide an answer?” Such responses let the groups know that the facilitators are not there to answer their specific content-based questions, and that they must rely on themselves. At UNI, graduate assistants are assigned to act as group facilitators. Time is spent meeting with the facilitators to discuss their role, and regular meetings are held to address any questions they may have (see Appendix C for facilitator suggestions).

Facilitators stay with the same group throughout the entire semester. They provide useful information on the abilities of the students, areas with which some may continue to struggle, and how individual students and the group as a whole evolve over time. The challenges of having graduate assistants serve in this role is that they do it for only one semester, which is not enough time to develop the skills

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needed to be a strong facilitator. Research suggests that regardless of how long individuals act as facilitators, they benefit from opportunities to continue to learn, refine, and self-reflect upon their role (Lyberg-Åhander, Lundskog, & Hansson, 2014; Slattery & Douglas, 2014; Tremblay, Tryssenaar, & Jung, 2001), and that experience can lead to more confidence when facilitating PBL groups (Lyberg-Åhander et al., 2014; Slattery & Douglas, 2014; McLean, 2003).

On occasion, graduate assistants have not been assigned to the PBL class, and we as the instructors have served as facilitators. That has had other drawbacks, and as previously noted, makes the transition for most instructors challenging. Primarily, it is difficult not to state one’s opinion, and frequently, we find ourselves doing more teaching than facilitating. In essence, the instructor becomes the main attraction (Amador et al., 2006). This may be a result of using a hybrid PBL approach in our classes. During lectures, we are the instructors and tend to view ourselves as such. Instruction is not part of PBL, and our ability to shift into the role of facilitators has not been smooth. Although we may circulate through the different groups at various points in the semester in order to listen in on what they are doing, it has proven better to have more of a hands-off approach while the students meet in their groups. Other instructors may find that they are more successful at facilitating. We might be more successful at facilitating if we were in a pure PBL curriculum in which the entire faculty facilitated. Any instructors who plan to become facilitators will benefit from professional development when transitioning to this role.

Students can volunteer for various roles within their groups. Although some instructors have a student volunteer who acts like a group leader or chairperson (Biley, 1999; Whitehill et al., 2014), we do not use group leaders in our courses. Instead, group members take turns volunteering for the roles of board writer and scribe. The board writer will write the titles of the various topics (e.g., What do we know, hypotheses, rationale) on the white board or chalk board in a columnar format. The board writer’s job is to keep track of what the group is talking about in an abbreviated format. The scribe provides a more detailed summary of the discussion, and after the class, he or she posts or sends out these notes to the entire group and the instructors. Students tend to willingly volunteer for these roles. Such opportunities can be particularly nice for some of the quieter students who may not feel comfortable speaking up in the group yet still want to contribute.

Providing students with feedback can be helpful (Fenwick, 2002). At mid-term, students in our courses are provided with formative feedback. This is a mandatory meeting for the first-semester students and is voluntary for the second-semester students. A helpful strategy is to ask students what they believe they are good at (e.g., researching information, coming up with novel ideas) and what they believe they need to improve. The first-semester students will almost always say that it is difficult for them to share or speak up in their group. The second most cited challenge is learning how to find answers to their research questions using scholarly resources. Regarding the first challenge, new graduate students are counseled that they need to make the opportunity to stand up for themselves and state their comments, and that this is good preparation for the work world when people most likely will not politely ask everyone to individually share their thoughts. Students need practice at jumping in and advocating for their ideas and opinions. The facilitators will also ask students who may not frequently speak up to share their opinions and findings. With respect to the second most cited difficulty, our department’s library liaison comes into the class in the first or second week to show the students how to search for information. With the ever-changing technology, students need to know how to make the most out of the available library resources (Lewis, 2000). Including this tutorial session every semester has been a positive experience. If students continue to feel that they are having difficulty finding information, we recommend an individual session with our library liaison. Generally, as students gain more practice, their abilities to find appropriate scholarly resources improves.

A Typical Class Day

At the beginning of class, the students are told what they will be doing that day. If part of the day includes them being in their groups (many days do), they go to the assigned room and get into their groups. Time spent in their PBL groups can occur before or after a lecture or other class activity and is typically devoted to starting a new trigger, receiving the next part of a current trigger, or teaching their group mates the information they have found. The students also discuss whether or not they need to update their lists of “what do we know” and “what do we need to know.” If groups will be moving onto the next part of a trigger or starting a new one entirely, the facilitators are provided with printed copies of those.

Once the facilitators hand out the trigger, someone volunteers to read it aloud while everyone else follows along silently. After that, one student volunteers to be the scribe, and another student volunteers...
to be the board writer. The groups then spend a significant amount of time talking about the trigger, with information discussed and written down falling under the categories outlined on their trigger. Generally, these categories include key information, hypotheses, rationale, and further learning.

In some instances, groups will have time during the class period to look up information as opposed to looking up information between class periods. If this is the case, regardless of how much or how little time they have had, the last 10 min of the class is spent sharing with their group what they have found thus far. This sharing of information helps hold the students accountable and makes it less likely that they will spend their time on non-class activities.

How much time students have to conduct their research varies greatly. In some cases, they may have 1 week (Biley, 1999); in others, they may have a few days or less than 24 hr. Although such a short period of time is not always ideal, it does mirror the time frame that students will likely encounter during their internships and in their careers. Students’ expectations regarding the depth of information they can find in such a short period may change, but they tend to do a solid job in these situations. Blackboard and Google Docs are also used. Each group has its own discussion board that allows them to post information that they have looked up. The scribe posts the detailed notes from that day’s class period there. Each group also shares references and PowerPoint presentations from their trigger wrap-up activities.

On occasion, groups are purposefully provided with information wherein some of it is irrelevant, thereby requiring the students to determine what is important and what is not. Often, the students will initially believe that every sentence in a trigger is important. But in the real world, they have to learn how to quickly wade through a vast amount of information and pull out the most critical points. As Amador et al. (2006) noted, the inclusion of irrelevant and ambiguous, or even false, information requires students to learn to trust their judgment and teaches them to be somewhat skeptical of everything they read, which is a useful skill. Therefore, students should have opportunities to practice such skills in class. A strategy often employed in our courses is to have the group members discuss why they believe every selected piece of information is important. If they cannot come up with a good reason, they put it in the further learning column they have on the board.

Groups can, and will, get bogged down during their discussions. Some students might not get along with each other or may squabble over their various perspectives. Or, the group may just be stuck.

It is best if instructors resist the urge to jump in and fix the situation. Groups need time to figure out this impasse on their own, even when it appears to be ineffective (Amador et al., 2006). However, if groups seem to be spinning their wheels much longer than expected, sometimes an instructor may need to intervene. One tactic used in our classes is to have the group rank order the importance or likelihood of a particular hypothesis (e.g., What are the top three reasons this person may be having difficulty speaking). Rank ordering requires that the group work together (Amador et al., 2006). Sometimes, each group member is asked to verbally express his or her opinion on the given topic. The instructor may then provide a summary statement, and after that, the group is allowed to continue with its discussions.

**End-of-Trigger Activities**

At the end of a trigger at UNI, the students complete various activities. Although Pawson et al. (2006) stated that students should know what is expected of them, and that there should be a clear outcome stated early on, that is not realistic. Everyday life does not dictate a neatly packaged end result, and students need to practice how to manage their various tasks in a specified period of time. Besides, telling students at the start of a trigger that an oral presentation or particular role-play is expected may detract from their learning throughout the duration of the trigger. It is important that students focus on the process as a whole, not fast forward to the end result.

In addition, we may decide at the last minute to try some sort of new wrap-up activity. We frequently revamp our end-of-trigger activities in order to meet the variable needs of the class, time constraints, and other unpredictable events. However, we generally have different groups complete a variety of activities. Some of the activities that the groups do include role-playing interactions with challenging family members, providing an in-depth demonstration of a treatment approach, demonstrating counseling a patient, and participating in a debate with differing perspectives. Sometimes, the trigger wrap-up consists of a discussion as an entire group. PBL allows a great deal of flexibility, and participating in various activities requires the students to share the information they have learned in an understandable manner (Amador et al., 2006). These wrap-up activities are graded. The students earn points based on a 100-point rating scale, and both individual and group scores are assigned using this scale.

After these wrap-up activities, a debriefing of the trigger occurs, and then anonymous peer review
forms are handed out for the students to complete on themselves and their team members before starting the next trigger. Anonymous peer reviews provide quantifiable data that are used for grading purposes. These reviews also provide qualitative information that allows the instructor to see how the students are progressing and if any of them are having difficulty. For example, although typically infrequent, students have shown up to groups without having done their work. When team members document this, and facilitators have also observed such behavior, the instructor meets with the student to discuss these issues. Therefore, if a systematic problem is documented, the instructors are able to thoughtfully approach these issues in a diplomatic manner. This allows students to alter their behavior (Amador et al., 2006).

**Conclusion**

Anecdotally, the use of PBL has positively affected other courses that are taught in the graduate program at UNI. For example, the students who have taken our courses are more active and do more independent problem solving in their other courses. They also know how to work in a group. In fact, colleagues who do not use PBL have noticed and commented that our students will automatically begin working through an issue as a group using a PBL format.

Despite a recent meta-synthesis suggesting that PBL is superior in terms of long-term retention and skill development, but that traditional teaching approaches are superior for short-term retention as measured by standardized board exams (Strobel & van Braneveld, 2009), there has not been any marked difference in the PRAXIS Speech-Language Pathology Exam passing rates for our students who have gone through the courses that employ PBL. This is similar to previously cited studies in which significant differences in test performance between students taking PBL classes and students taking more traditional classes have not been found (Alleyne et al., 2002; Edens, 2000; Pawson et al., 2006). However, the PRAXIS may not be the best vehicle for measuring the payoff for students. The frequent positive feedback that we have received about the benefit of learning through a problem-based approach and then applying that process to real-life problems is quite gratifying.

In summary, the use of PBL in our graduate-level courses has been positive. Despite its challenges, we believe it has been worth it. Some instructors may feel more comfortable trying a little bit at a time; others may be ready to alter their entire course in a more radical manner. Regardless, it is highly likely that students and faculty will benefit from the addition of PBL to their courses.

**REFERENCES**


**Burda & Hageman: Problem-Based Learning** 57


Contact author: Angela N. Burda, Department of Communication Sciences and Disorders, University of Northern Iowa, 230 Communication Arts Center, Cedar Falls, IA 50614-0356. E-mail: angela.burda@uni.edu
APPENDIX A (p. 1 of 5). SAMPLE TRIGGERS FROM THE COMBINED VOICE DISORDERS AND MOTOR SPEECH DISORDERS COURSES

Learning Objectives for Trigger 1 (provided for this trigger only as an example)

- Review the structures of the larynx.
- Learn etiologies of voice disorders.
- Know how cranial nerve examinations are conducted.
- Understand voice assessment procedures.
- Be able to develop treatment approaches for voice disorders.
- Develop skill in counseling patients.

Sample Trigger 1

Part A
Sue Ecken is a 53-year-old physical therapist at a large Trauma Level I hospital in Minneapolis where you work. She came to the speech pathology department because after an unusually stressful weekend visiting her parents in Wisconsin, she had a hoarse voice.

Sue reported that she has been physically active her entire life, participating in several marathons and triathlons. She also is often in local plays and musicals, but she has reduced her participation in these activities over the past two years. She is single, never married, and has a large group of friends in Minneapolis and is close with her parents and siblings, who reside in Wisconsin. Over the weekend, Sue was visiting her family at their lake home in Wisconsin and a large argument broke out over her brother’s lifestyle (and hers) because neither is married and the parents were anxious about grandchildren (or the lack thereof). After a long bike ride, Sue began to complain of feeling dizzy, having tingling sensations in her hands, having a tight voice, and seeing double. The symptoms have not resolved completely, and she has an appointment with the neurologist tomorrow. In the meantime, she has come to see you because she is extremely anxious about her voice as it is interfering with her work.

Instructions

- List the key information about Sue.
- Identify Sue’s presenting problem(s).
- For each problem, hypothesize the underlying psychological, physiological, or anatomical mechanisms that might account for the problems.
- What further information do you require to lead to hypotheses regarding a diagnosis?
- Identify learning issues.

Resources

Lectures:
- Hageman: Muscle tone anatomy and physiology

Readings:
- Duffy (2013): Chapters 1, 2 (II & IV)
- Colton, Casper, & Leonard (2011): Chapters 1, 5, 6, 10, 11, 12

Part B
Further information: You saw Sue briefly when she came to your office. During that first visit, you observed that Sue’s voice was rough but not breathy. You were able to record her voice for later acoustic analysis. The acoustic analysis revealed:

- Jitter: 2.9%
- Shimmer: 1.8%
- F0 during sustained /ah/: 170 Hz
- F0 during reading: 174 Hz (mean F0)
- F0 during conversation: 181 Hz (mean F0)
- Noise to harmonic ratio: 2.90
- F0 Tremor Index: 2.3%
- Maximum phonation time: 25.67 seconds
- s/z ratio: .67 (s = 19 s/z = 28)

The neurologist saw Sue later that afternoon. His report noted:

- Stretch reflex × 2
- Normal cranial nerve evaluation
- Normal CT scan and MRI of the cranium
- Normal electrolytes, sugar, sedimentation rate
- All other systems normal

The neurologist was unable to arrive at a diagnosis at this point, but he asked for more specific information regarding Sue’s speech and a hypothesis from the speech-language pathologist as to what neuromuscular systems, if any, were involved in her speech symptoms. He also requested a diagnosis from you.

Instructions

- Summarize the key information about Sue.
- Identify Sue’s presenting problem(s).
• Identify diagnostic procedures that you will need to complete to arrive at a speech diagnosis and to answer the physician’s request.
• What further information do you require?
• Identify learning issues.

Resources:
Lectures:
• Burda: Start classification of neuromuscular disorders
• Hageman and/or Burda: Cranial nerve evaluation
• Hageman: Acoustical measures of voice
• Hageman: Differential diagnosis of voice disorders

Readings:
• Colton et al.: Chapter 7
• Duffy: Chapters 3, 5

Part C
Further evaluation revealed that Sue’s cranial nerve testing is within normal limits. Videostroboscopic evaluation revealed:

Slight edema of the vocal folds with smooth edges. Possible stiffness in the superficial layer of the vocal folds, especially at the midpoint of the anterior and middle thirds of the vocal folds. In addition:

No evidence of GERD
Slight reduction of the mucosal wave bilaterally
Symmetrical arytenoids and ventricular folds
Symmetrical adduction and abduction
No erythema
Excessive medial compression

CONCLUSION: Normal vocal folds with excessive tension.

Case history: Sue’s history is negative for smoking, excessive drinking, excessive talking, or abusive talking. She denies paroxysmal coughing during the night, morning hoarseness, or morning sour taste. Her voice is becoming more troublesome and is worse in the afternoon and is best in the morning. During the interview, she did not excessively clear her throat or cough. She reported that she frequently has painful clicking of her jaw, of which you heard three times during your interview. She also exhibited occasional slightly harsh vocal quality, and at times, her speech sounded slightly imprecise. She did report to you that she had exercised strenuously prior to her meeting with you and was feeling thirsty. There is a negative history of allergies.

During your interview with Sue, she revealed that her voice difficulties actually began approximately two years before the trip to her parents’ home. After considerable probing and with gentle support, she admitted that she was becoming increasingly anxious about a three year relationship with a man, the director of rehabilitation, at work. She was anxious that it might fail and she was extremely worried that if they were discovered to be dating, that the facility might fire one or both of them. During the discussions with her, there were no changes in vocal quality; however, she did seem to cry easily and laugh inappropriately.

Sue came to your meeting today and said that she had concluded that she was sure that nonsymptomatic reflux has been the cause of her voice problem and that she had used Google Scholar to find out all about it. She feels that she can handle the problem by herself and that she does not need your help any longer.

Instructions
• Summarize the key information about Sue.
• Identify Sue’s presenting problem(s).
• Identify a treatment(s)

Resources:
• Sapienza & Ruddy (2009): Chapters 2, 3, 4, 5, 7
• Aronson (1999): Videos regarding muscle tension dysphonia and circumlaryngeal massage
• Duffy: Chapters 16, 17

Part D
Within your group: Rank order your hypotheses regarding Sue’s characteristics and subsequent diagnoses. You need at least two hypotheses/diagnoses.

Provide evidence/argument for each hypothesis.

Trigger 1 Wrap-Up: Presentations

Group 1: Develop and present a management strategy during vocal production based on the notion that Sue

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is hyperadducting the vocal folds. Also include a plan for vocal hygiene. Include references as part of your presentation.

**Group 2:** Role-play a counseling session centered on Sue’s notions that she has mastered what is wrong with her, especially regarding reflux, and that she feels she can find any additional information to manage her situation online. Include references as part of your presentation.

**Group 3:** Develop and present an intervention based on the hypothesis that Sue may have a neuromuscular disorder (you decide which one you suspect) and present it. Include references as part of your presentation.

**Sample Trigger 2**

**Part A**

As the only SLP for a regional hospital in northwestern Iowa, you are responsible for all in-patient and out-patient service delivery. When you arrived on Monday morning, a referral for Mr. Juan Aguilera was on your desk. Mr. Aguilera was referred by his primary care physician for out-patient speech therapy. This afternoon, he and his wife Josie are coming to the clinic for out-patient rehabilitation.

**Past medical history:** The known history was provided in a report from the physician, Dr. Hermann, which stated that Mr. Aguilera does not talk much, that his wife constantly speaks for him, and that Mr. Aguilera is very frustrated. Physically, he has recovered reasonably well from a stroke, although he continues to have residual weakness in his right arm.

One month ago, Mr. Aguilera suffered a left-hemisphere embolic stroke in the middle cerebral artery distribution. Because he was brought to the hospital approximately 1 hour after the onset of symptoms, Mr. Aguilera was administered TPA. MRI and CT scans showed that the infarct was about the size of a dime and penetrated approximately 1 cm in the inferior aspect of the 3rd frontal convolution. Two small, but old, infarcts were discovered in temporal-parietal areas and the cerebellum, which were asymptomatic prior to the stroke.

His wife had heard about PET scans and wanted him to have one, but Dr. Hermann did not believe it to be necessary. However, the physician continues to be concerned about cerebral blood flow. He noted that Mr. Aguilera and his wife spend the winter months in Tucson, AZ and return each April to Iowa for the summer. Although Mr. and Mrs. Aguilera are still interested in going to Tucson this winter, Mr. Aguilera and his wife want to be near their children in Iowa and South Dakota and have Mr. Aguilera receive therapy for his deficits in their hometown.

**Instructions**

- Identify the key information about Mr. Aguilera.
- Identify key learning issues.
- Propose two to four preliminary hypotheses and identify diagnostic procedures that you will complete to differentiate among them.

**Resources and Other Things to Think On:**

- All previous lectures by Burda and Hageman and previously assigned publications
- Duffy (2013): Chapters 4, 10, 11, 15, 17 18
- These other topics:
  - Wernicke’s area: contribution to speech & language
  - Broca’s area: contribution to speech & language
  - 3rd frontal convolution: contribution to speech & language
  - Blood flow distribution in the brain; gray versus white matter; lobes and function
  - Upper motor neuron versus lower motor neuron
  - Motor strip versus premotor areas; initiation of movement areas
  - Arcuate fasciculus: contribution to speech & language
  - Aphasia classifications: Broca’s; Wernicke’s; conduction; nonfluent

**Part B**

Speech/language assessments tasks results are as follows:

- Repetition – poor
- AMRs – 1.8 syllables per second, metathetic errors, irregular production
- Spontaneous speech – nonfluent, 1-2 word phrase length consisting mostly of repetitive words and phrases. Instances of a fluent word or phrase did occur at irregular moments.
- Reading Comprehension Battery for Aphasias—Second Edition (RCBA–2; LaPointe & Horner, 1998):
  - Subtests 1–6 = scores of 10; Subtest 7 = score of 8; Subtest 8 = score of 9;
  - Subtests 9 and 10 = scores of 7.

Speech characteristics observed during the evaluation:

- Consonant and vowel distortions with more consonant distortion than vowels
- Perseverative substitutions
- Voice-voiceless errors
- Substitutions of sounds often distorted
- Slow overall rate especially as he tried to speak with longer utterances
- Vowels were often prolonged, especially in the few multisyllable words he uttered
- Prolonged intervals between words but they were variable in length
- Equalized stress across syllables (flat intensity and pitch variability)
- Increased rate led to increased errors
- Several attempts at self-correction of articulatory errors, both successful and unsuccessful
- Errors were more frequent on his volitional utterances than automatic ones
- His SMRs were more abnormal than his AMRs
- More errors on consonant clusters than singletons
- Inconsistent speech errors
- Segregated syllables and increased interword syllables
- His speech appeared slow and effortful; he appeared aware of his errors

Motor speech evaluation:

- Mild right-side weakness of the lower face
- Tongue protruded symmetrically but with reduced range
- Voice normal to slightly hoarse

Instructions

- Identify the key information about Mr. Aguilera.
- Identify key learning issues.
- Propose no less than three diagnostic hypotheses and identify the diagnostic data that determine the speech disorder.
- Develop a treatment plan based on each diagnosis for Mr. Aguilera.

Resources

- All previous lectures by Burda and Hageman and previously assigned publications
- Duffy chapters as appropriate

Trigger 2 Wrap-Up

Your job is to prepare a handout and an in-depth demonstration of a treatment with explanation. These presentations have a minimum 10 to 15 minute demonstration. The demonstrations will focus on ataxia and apraxia of speech.

Note: The in-depth demonstrations tend to get shortened much more than they should. Do NOT do that for your presentation. Your classmates should leave feeling like they have an idea about the treatment you will show.

One handout will be prepared by each group for the class. The topics are grouped:

**Group 1:**

Handout: Nonfluent aphasia versus ataxia, Wernicke’s versus Broca’s aphasia, receptive versus expressive aphasia

Treatment demonstration: Ataxia

**Group 2:**

- Handout: Apraxia of speech versus ataxia, apraxia of speech versus nonfluent aphasia, apraxia of speech versus nonverbal oral apraxia
- Treatment demonstration: Apraxia of speech
Group 3:
- Handout: Apraxia of speech versus nonverbal oral apraxia, nonfluent aphasia versus nonverbal oral apraxia
- Treatment demonstrations: Nonverbal oral apraxia

Sample Trigger 3

Part A
Phyllis was referred to you by the ER physician in the local hospital in McCall, Idaho, the community in which you live and work. You are the only speech-language pathologist and split your time between the local school and the hospital.

Phyllis is 65 years old and a retired school teacher. Her son took her to the ER because she was not speaking and did not seem herself when he arrived for a visit. The first impression by the physician is that Phyllis is aware of her surroundings and that she could nod her head to communicate yes/no. The physician believes that she has had a stroke and has aphasia. He has asked you to see her before he admits her or refers her to a larger hospital in a nearby community. Her son is very reluctant to have his mother moved further away, and many family members are arriving in McCall soon.

Instructions
- List the key information about Phyllis.
- Identify Phyllis’s presenting problem(s).
- For each problem, hypothesize the underlying psychological, physiological, or anatomical mechanisms that might account for the problems. Do NOT limit these ideas to the title of this semester’s classes (that is, you may be hypothesizing mechanisms other than those that relate to voice and motor speech disorders).

Instructions
- What further information do you require to lead to hypotheses regarding a diagnosis?
- Identify learning issues.

Part B and Trigger Wrap-Up
Phyllis passed away suddenly while the son, the physician, the charge nurse, the social worker, and you were in a staffing room deciding what course of action to take. Obviously, everyone is quite upset and the son, Don, is particularly agitated. Because Don knows your parents, he is coming to you seeking advice about whether he should sue the doctor and the hospital for negligence.

Instructions
- List the key information.
- Identify the presenting problem.
- What further information do you require?
- Identify any learning issues.
- Propose what your role and ethical responsibilities are and how you could carry them out. Be prepared to discuss these topics in our next class period.
Sample Trigger 1

Part A
Mr. Charles Rouse is 72 years old. Apparently sometime on Friday, while his wife Millie was away visiting her sister in Kansas City for the weekend, Mr. Rouse collapsed. A neighbor, who came over to visit in the evening, found him and called 911, and he was taken to Delphi County Hospital. Upon arrival at the hospital, the attending physician noted that Charles was awake but inattentive, and he had right-sided hemiplegia and the right side of his face was weak. He was not speaking and was not oriented × 3. His neighbor did not know how long Mr. Rouse had lain on the floor, but because the Friday morning paper was on the table, he thought that Charles may have collapsed sometime on Friday morning. The attending physician admitted him.

A CT scan was ordered to r/o hemorrhage. The CT-scan was negative for hemorrhage, so Mr. Rouse was administered TPA. However, by Saturday afternoon, his speech had deteriorated, his hemiplegia had worsened, and he displayed greater altered consciousness. Consequently, he was transported by ambulance to the Northeast Regional Hospital where you are on the neurotrauma team. Mrs. Rouse arrived at the hospital at about the same time.

Mrs. Rouse supplied a history regarding her husband. He is a retired community college instructor with a master’s degree in electrical engineering. He is slightly overweight and has sleep apnea (treated in the past year with CPAP), but he was reported to be in relatively good health before the incident. He has a large family including a spouse, five children who live in the immediate area, and numerous grandchildren. He is an avid fly fisherman who enjoys tying his own flies. He reads for at least an hour daily and spends several hours a week at the country club playing cards with his friends. His wife believes that he has one or two drinks of scotch and water while he plays.

Mrs. Rouse is puzzled about his decline after he entered the hospital. She thinks that she remembers that a drug given after a stroke was supposed to reduce the symptoms. So far, the physicians have not addressed that issue and she has not brought it up to them, but she decided she could talk to you about it. She is also worried because Mr. Rouse has not eaten since sometime Saturday, and no one has told her whether she can offer him food or drink. She thinks Charles looks hungry and thirsty.

A CT scan did not reveal density changes in the brain. However, an fMRI revealed an area of recent infarct in the left temporal parietal area and an old infarct in the posterior right parietal area. Angiography performed revealed a blockage in the left middle cerebral artery. A Doppler ultrasound study of the carotid arteries revealed 75% blockage in the right carotid artery and 80% blockage in the left carotid artery. Mr. Rouse is scheduled to undergo a left endarterectomy Tuesday morning.

Your role on the neurotrauma team is to provide information to the family regarding the current deficits and possible outcomes. Before you see the patient’s family, the neurosurgeon will provide information to the family regarding the specifics of the surgery and the physical ramifications of the surgery.

Instructions:
- Identify the key information about Charles.
- Identify key learning issues.
- Identify Charles’s presenting problems(s).
- Identify topics for further learning.

Part B
After your initial meeting with Mrs. Rouse and the family, you return to the nurse’s station to find that the history and physical examination documentation has reached the patient’s file.
History and Physical Examination

Northeast Regional Hospital  Patient Name:  Charles Rouse
Acct NO:  787888
Room:  704
Att. Physician  Dr. J. Henry
Admit Date:  01/05/13
Age:  72

MEDICATIONS: hydrochlorothiazide, ranitidine, Atenolol/Chlorthalidone 50/25, one tablet daily; Accupril 20 mg daily. He has also been on a muscle relaxant and Accupril.

ALLERGIES: NO KNOWN DRUG ALLERGIES.

PAST MEDICAL HISTORY:
1. Hypertension
2. Degenerative joint disease, status post L4-L5 laminectomy.
4. Hyperlipidemia; last lipid profile is unavailable at this time.
5. Admitted

FAMILY HISTORY: Family history is positive for heart disease and stroke.

SOCIAL HISTORY: Reported by pt’s wife as pt. is currently unable to provide hx at this time. Pt. is married with five children, several grandchildren. They had been living independently at home. He is a retired community college instructor with a master’s degree in electrical engineering. Spouse noted occasional alcohol use in social settings; at most - two scotch/water weekdays.

PHYSICAL EXAMINATION:
GENERAL: He is a well-developed adult male who appears to be in no acute distress. He will divert attention toward voices but he does not follow verbal commands and does not speak.
HEENT: Neck is supple and symmetric without lymphadenopathy, thryomegaly, or jugular venous distention. Carotid bruits were noted. No supraclavicular lymphadenopathy observed.
HEART: Heart is regular without extra sounds.
ABDOMEN: Abdomen is soft and nontender with normal bowel sounds. No hepatosplenomegaly.
EXTREMITIES: No clubbing, cyanosis, or edema.
NEUROLOGIC: Cranial nerves II-XII are notable for right facial droop. His palate does elevate symmetrically. Motor strength is 5/5 proximally and distally in the left arm and leg. 0/5 in the right arm and leg. Pinprick and light touch sensations are intact throughout the left side but absent on the right side. Deep tendon reflexes are 2+ and symmetric throughout. Toes are downgoing on the right and neutral on the left. A CT scan did not reveal density changes in the brain. However, an MRI revealed an area of recent infarct in the left temporal parietal area and an old infarct.
in the posterior right parietal area. Angiography performed revealed a blockage in the left middle cerebral artery. A Doppler ultrasound study of the carotid arteries revealed 75% blockage in the right carotid artery and 80% blockage in the left carotid artery.

LABORATORY: White blood cell count 17,300; hemoglobin 13.3; platelets 253,000; sodium 142; potassium 3.1; BUN 18; creatinine 0.9; glucose 103; INR 0.93.

Chest x-ray showed no infiltrates or effusions. Head CT showed no bleed or masses. EKG showed normal sinus rhythm with nonspecific ST and T wave changes.

ASSESSMENT:
1. Acute left-hemisphere stroke
2. Hypertension
3. Hyperlipidemia
4. Degenerative joint disease

PLAN:
1. Discontinue current blood pressure medications and monitor.
2. Re-do carotid dopplers.
3. Echocardiogram to assess for embolic source.
4. Scheduled to undergo a left endarterectomy Tuesday morning
5. Physical, speech, and occupational therapy for stroke rehab pending endarterectomy.
6. Speech pathology referral for speech and swallowing evaluation.
7. Rule out MI with serial enzymes; given his risk factors for stroke, coronary artery disease is a distinct possibility.
8. Obtain old lipid profile and consider initiation of an appropriate therapy.

D: 01/05/2013 14:25:30
T: 01/05/2013 02:05:07

Cc: James Earl Henry, D.O., Attending Physician
APPENDIX B (p. 4 of 6). SAMPLE TRIGGERS FROM THE COMBINED APHASIA AND DYSPHAGIA COURSES

Instructions

• Identify the key information about Charles.
• Identify key learning issues
• Identify Charles’s presenting problems(s).
• Make a plan for managing Charles’ current communicative status as an acute inpatient.
• Also, decide how you would define “aphasia.” Do this particular item individually and then discuss your respective definitions as a group.

Resources


Journals and Other Publications to Consider and Search in:

• Aphasiology (or Clinical Aphasiology Conference Proceedings for older material)
• American Journal of Speech-Language Pathology
• Journal of Speech-Language-Hearing Research
• Journal of Medical Speech-Language Pathology
• ASHA Leader
• Communication Disorders Quarterly
• Dysphagia
• Brain & Language

Part C

Mr. Rouse tolerated the endarectomy very well and on Wednesday, he was removed from ICU. Nursing reports that he has not been allowed to eat and he has not spoken. However, all of his vital signs are stable and he shows no signs of infections. He remains catheterized for bladder control and has an IV for fluids and medications. Mrs. Rouse is in the room and she is quite distressed that Mr. Rouse has not spoken nor has he taken food or water. He is very lethargic. She is convinced that he is worse today than when he was admitted. He does nod “yes” to questions she asks, but does so inconsistently. All of his children have arrived and have many questions regarding his prognosis and eating. They do not want him to experience extraordinary life supporting efforts, but on the other hand, they do not believe at this point that he is in immediate danger of dying.

Instructions

• Identify the key information about Charles.
• Identify key learning issues.
• Identify Charles’s presenting problems(s).
• Prioritize the problems that the SLP must address.

Part D

You request orders to conduct a VFSS and a more complete swallowing evaluation. The results of that evaluation are as follows:
Clinical Swallowing and Speech Evaluation

Northeast Regional Hospital

Patient Name: Charles Rouse
Acct NO: 787888
Room: 704
Att. Physician Dr. J. Henry
Admit Date: 01/05/13
Age: 71

Oral motor-cranial nerve evaluation:
No visual field deficits or neglect.
Right lower facial weakness with wrinkling of brow upon looking up.
Reduced sensations on the right side of face.
Tongue deviated to the right; unable to resist pressure with tongue in right cheek
Asymmetric lip pursing with weakness on right. Drooling.
Asymmetric smile with right side facial droop.
Coughing and wet vocal quality was observed during the evaluation.

Swallowing-Oral: Pt. had xerostomia and thrush. Food was observed in his mouth, but the RN reported that he had not been fed for the day. Pt. was unable to align his teeth and appeared to chew slowly. He had some difficulty accumulating the bolus at midline and lost food into the left buccal space which he did not clear. He was considerably slower with solids. Oral transit clearly took longer than one second. More than one swallow was required to clear the oral cavity for pudding. He seemed to be indicating that the food did not go down or that he was having discomfort in his neck after the swallow.

Swallowing-Pharyngeal: Palpation of the hyolaryngeal complex suggested delayed and reduced hyolaryngeal movement. For thin liquids, there was weak throat clearing after the swallow. After pudding consistency, there were several spontaneous dry swallows with some weak coughing. He was unable to vocalize an /ah/ upon command, but he did produce a few spontaneous unintelligible syllables which gave the impression of wet hoarseness, but the number of vocalizations was small. Food requiring mastication was not provided to him.

Instructions
• Identify the key information about Charles.
• Identify key learning issues.
• Identify Charles’s presenting problems(s).
• Recommend a course of action and develop a plan to implement it, keeping in mind his co-occurring aphasia.

Trigger 1 Wrap-Up Presentations

Group 1: Your group will be presenting regarding Mr. Rouse’s aphasia.

Direct treatment group: You are to present how you would address Mr. Rouse’s aphasia. Include measurable goals and provide a thorough treatment demonstration. We will expect that you will address and demonstrate more than one modality of communication because it is typical in medical settings that you will work on more than just verbal expression or reading comprehension. Make up data if you need to in order to support your treatment decisions.

Management group: Demonstrate how you will educate Mr. Rouse’s family members in how to best communicate with him.

Group 2: Based on the results of your swallowing testing (e.g., the VFSS), recommend a course of action, develop a plan for specific interventions, and provide an in-depth demonstration of these interventions. You should demonstrate all of the interventions you recommend for swallowing, including your ideas about how to compensate for aphasia in dysphagia intervention. You should be ready with your rationale for your recommended interventions.
Group 3: You have a staffing tomorrow morning with Charles’ primary care physician, nursing case manager, social worker, and physical and occupational therapists. Topics at staffings include current status of the patient and what the different disciplines are doing, where to go next in terms of patient care, and any other pertinent issues (e.g., family issues, reimbursement issues, discharge planning). Expect additional questions from the staff, including questions regarding evidence-based practice from the physician and the nurse. Also, plan for your response to the family’s notion of “no extraordinary life supporting” efforts in case Mr. Rouse does not improve.

All Groups: You are to have references that you will provide to the rest of the class to support your discussions.

Sample Trigger 2

Part A and Wrap-Up All in One

Chao-xing is a 72-year-old female who was admitted to the local hospital where you work for treatment after a fall at home. During the course of treatment, she developed a urinary tract infection and was complaining of significant back pain. The nursing staff reported that she was having difficulty eating meals in a reasonable time and that she drank little water. Due to the problem of keeping her hydrated and slow eating, she was referred to speech-language pathology for an evaluation. She is scheduled to be discharged in one day.

Instructions
- Outline what you would do at bedside.
- Provide a rationale for your plan.
- Provide information on the effect, if any, that a UTI has on swallowing.

BE PREPARED TO PRESENT AND DISCUSS THESE TOPICS IN OUR NEXT CLASS PERIOD. HAVE REFERENCES TO BACK UP YOUR INFORMATION.
APPENDIX C. SUGGESTIONS FOR FACILITATORS (ROSE, 2004)

Refer process-oriented questions back to the group.

When students ask you how to handle a situation, turn it back to them with “How do you want to handle it?” or “What do you think about it?” or “What does the group think/feel?

Content-oriented questions should also be made the responsibility of the students.

Say “That’s a good question. Can anyone provide an answer?” rather than answering the question yourself. When you answer the content questions yourself, you cause confusion about the role of the facilitator and perpetuate “dependent” learning.

Students will frequently ask if they will see an issue again, or more specifically, “How much do we need to know about this issue?”

It is fair to say that any issue will be seen again either in another case or in a clinical setting. Avoid specifically telling the students the level of depth they need to pursue an issue. To become independent learners, the students must develop the skill of determining the appropriate depth of understanding for each situation. The goal is to move the students away from dependent learning toward independent learning.

Encourage the students to create a list of learning issues as they discuss the case, not at the end of the discussion.

Waiting until the session’s end creates a needless time constraint and risks omission of major issues. Early in PBL, it may be necessary for the facilitator to ask: “Do we wish to pursue this issue?” or “Is this a learning issue?” or “Is this important to the case?” to stimulate discussion or the identification of a topic as a learning issue. Over time, the students should assume this responsibility as their own.