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Effect of Retrieval Practice on Applied Knowledge: Evidence from a Professional Training Program

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Effect of Retrieval Practice on Applied Knowledge:
Evidence From A Professional Training Program

by

Jenna M. Voss

A dissertation presented to the
Graduate School of Arts and Sciences
Of Washington University in
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of Doctor of Philosophy

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Effect of Retrieval Practice on Applied Knowledge:
Evidence from a professional training program

A primary goal of deaf education teacher preparation programs is to help students acquire a sufficient body of knowledge that they will be able to retain for extended periods of time until they need to apply it in future educational or intervention settings. By the time students graduate from deaf education teacher preparation programs, they ought to have both the factual and pedagogical knowledge required to serve children with hearing loss and their families. Throughout their pre-professional training, students are expected to learn a great deal of content knowledge on topics such as general child development, language and communication development, audiology and hearing technology, behavior management, reading development, parent guidance and coaching, and speech perception. They are also learning how to integrate this knowledge, reflect upon experiences in classrooms and early intervention settings, and apply it while serving children who are diverse learners from a variety of backgrounds.

Those responsible for preparing these future professionals for practice seek to identify ways to improve their training programs, so ultimately outcomes are improved for children with hearing loss and their families. One potential way to improve learning is through the implementation of retrieval practice, a strategy that has been proven effective in a variety of learning environments. This project examines whether retrieval practice would be a useful strategy to help graduate students— in training to become educators of children who are deaf or hard of hearing— improve their learning.

First, I will discuss the instructional strategies commonly used to achieve the primary goals of deaf education teacher preparation programs. Next, I will define retrieval practice as well highlight relevant literature to date. Then, I will provide an overview of the current
theoretical support for the mechanism of retrieval practice. Finally, I will present the results of two experiments designed to explore the use of retrieval practice in deaf education teacher preparation programs before discussing the potential effect of this study on the preparation of deaf educators.

**Deaf Education Teacher Preparation**

Academic programs in the United States have been preparing teachers of the deaf for more than a hundred and sixty years (“Council on Education for the Deaf,” n.d., “Program in Audiology & Communication Sciences History,” 2014; Marschark & Spencer, 2010). The education of these teachers historically, and contemporarily, involves learning of both knowledge and skills. Contemporary preparation programs blend traditional teaching and assessment in university classrooms with applied experience during student teaching field experiences. Though there are likely many aspects to teacher preparation programs that could be improved upon, one is the efficacy of instruction of foundational content. Some educators contend by linking the foundational, theoretical and factual content to real-life scenarios and experiences, the connection between classroom learning and future practice will become more tangible to the learners.

The mastery of factual content knowledge is essential to finding success both during teacher preparation programs and beyond, when teachers need to draw upon their previous learning to problem-solve, troubleshoot challenges, plan lessons and work as effective teachers or early interventionists. Teacher preparation programs strive to increase the development of this core knowledge base, but often use varying instructional strategies to do so. A recent survey of faculty from deaf education teacher preparation programs (Voss & Hayes, 2013) indicates a wide
range of strategy use, with the lecture method remaining a commonly-used strategy. Ninety four percent of respondents indicated the use of lecture as a primary instructional method. This is potentially concerning, as lecture is not necessarily the most effective teaching strategy, especially when goals of instruction aim beyond direct transfer of rote information from teacher to student (Lewis & Lewis, 2005; Mazur, 2009). Some factors, including faculty rank and length of program, appear to affect the type and degree of strategy use. However it seems lecture remains a standard approach to instruction in teacher training programs.

Although peer-led instruction, flipped classrooms, and other forms of active, problem-based learning are gaining popularity among science, technology, engineering, and math fields, the use of lecture classes is still a central tenet of many university programs (Eberlein et al., 2008; Oliver-Hoyo, Allen, Hunt, Hutson, & Pitts, 2004; Prince, 2004; Schell, Lukoff, & Mazur, 2013). Student engagement in lecture classrooms can be enhanced through the use of collaborative, cooperative, and problem-based activities. The implementation of these actively engaging instructional approaches appear to aid in retention of content, with additional positive influences on study habits and learner attitudes (Mayer, 2003; Prince, 2004). The constructivist teaching approach, which supports learners in building of mental representations by engaging in active processing during learning, is a common pedagogical orientation among deaf educators and the programs which prepare them (Brown & Paatsch, 2010; Kretschmer, Wang, & Hartman, 2010). Identification of additional instructional strategies which can actively engage learners in teacher preparation programs may serve to improve learning outcomes for these pre-professionals as well as the children with hearing loss and families they will serve.

Though effective instructional methods may promote active cognitive processing during learning, it is important to note that increased behavioral activity does not guarantee that the
learner will engage in appropriate cognitive processing. Conversely, behavioral inactivity does not guarantee that the learner will not engage in appropriate cognitive processing. Mayer describes this circumstance with his Constructivist Teaching Fallacy whereby active instructional methods are assumed a requirement to produce active learning (Mayer, 2004). Mayer contends that in order for instructors to promote active learning, instructional methods should prime cognitive processes. This means an instructor should select relevant material, organize material into coherent cognitive representations, and integrate this material into relevant prior knowledge. This active processing during encoding of information is an important aspect of the educational process – namely, getting knowledge into memory. However, research in cognitive science has identified another important aspect to consider: retrieval as a powerful learning event (Carpenter & Pashler, 2007; Karpicke & Roediger, 2008; Pashler, Rohrer, Cepeda, & Carpenter, 2007; Pyc & Rawson, 2009; Roediger & Karpicke, 2006a).

**Retrieval Practice**

There are many opportunities for instructors to make the traditional lecture-to-teach and test-to-assess course structures more engaging for learners, thereby improving the initial learning. There are also opportunities to aid students in improving retention of the material they have learned. From more than 100 years of cognitive psychological research comes a highly effective teaching and studying strategy, namely repeated retrieval practice (e.g., Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Roediger & Butler, 2011; Roediger & Pyc, 2012). Retrieval practice is a process of reconstructing knowledge, following initial encoding, by actively using cues to retrieve target knowledge (Karpicke & Blunt, 2011). Retrieval practice can take several forms, but one of particular interest to educators is quizzing or testing. In
educational settings, tests are traditionally thought of as assessment tools. However, research in cognitive psychology suggests that when learners engage in repeated testing, they practice retrieving the information, thereby increasing their retention of the material (Karpicke, Butler, & Roediger, 2009).

Much like children, adults (in this case, graduate-level university students preparing to be future teachers) do not remember all information they are taught. Effective instructors strive to teach in a way that helps learners remember as much information as possible, so they may apply this information when needed in real-life situations. Graduate students who are tasked with learning information in their university courses will need to hold on to much of that important knowledge, certainly until their end-of-semester exams, but more importantly, until they need to apply it in their future careers. For example, deaf education graduate students might learn several behavioral intervention strategies in a behavior management course, yet they might not have a need to implement one or more of these strategies until they are responsible for a classroom of eight-year-olds. Or, perhaps graduate students will need to recall pertinent features of a congenital syndrome, yet they will not need to retrieve those features until they are working with a family of a child who has just received such a diagnosis. Cognitive psychology and memory researchers report that the practice of retrieving information is an effective technique for remembering information (McDaniel, Roediger, & Mcdermott, 2007; Roediger, Putnam, & Smith, 2011). Early work on retrieval practice failed to tease out whether or not additional study time would produce similar gains in retention to those experienced by learners using retrieval practice as they lacked re-study control groups (Glover, 1989; Spitzer, 1939). Though some early skeptics of retrieval practice suggested that testing might benefit performance by simply providing students another opportunity to study material (Thompson, Wenger, & Bartling, 1978),
it is now clear that testing provides greater benefit to learners than restudying, especially when the final assessment is delayed (Roediger & Karpicke, 2006b; Roediger, Putnam, et al., 2011). Though repetition of material was once thought to produce great mnemonic benefit, it is now understood that the benefit of repetitive study is highly dependent on the learner’s degree of engagement during the repetitive study (Karpicke & Roediger, 2008). The act of retrieving information from memory leads to better retention than restudying the information for an equivalent amount of time (Roediger & Karpicke, 2006a).

Testing had once been considered a neutral event by which learning was measured. However, research shows that testing and quizzes, one form of retrieval practice, can promote learning (R. A. Bjork, 1975; Carrier & Pashler, 1992; Karpicke et al., 2009; Tulving, 1967). Retrieval practice, which requires learners to actively engage in study often through quizzing or low-stakes testing, encourages retrieval and re-encoding (as opposed to standard study or rereading which is just fluent reprocessing) and positively influences long-term retention. It is widely accepted that retrieval practice is beneficial in aiding recall of rote or factual knowledge. However, the research on retrieval practice has primarily been investigated with highly constrained materials in laboratory settings. The effects of retrieval practice in real classrooms, using real content is less understood. Thus, we do not know whether these effects remain across diverse authentic learning environments, with varied complex material, and varied learners. The promise of retrieval practice’s effect on learning and retention provides a robust and prime opportunity to investigate the translation of laboratory findings to classroom settings.

Additionally, retrieval practice appears to aid learners in flexibly transferring learning to novel contexts, potentially aiding in integrating and application of knowledge (Butler, 2010; Carpenter, Pashler, & Vul, 2006; Carpenter, 2012; McDaniel, Thomas, Agarwal, McDermott, &
Roediger, 2013; Rohrer, Taylor, & Sholar, 2010). Retrieval practice can aid retention of non-tested material, in addition to the targeted/quizzed content (e.g., Chan & Langley, 2011; Chan, McDermott, & Roediger, 2006; Chan, Wilford, & Hughes, 2012; Chan, 2009, 2010). When retrieval practice is implemented, under these optimized conditions, there is evidence that learners develop deep learning and are able to retrieve the targeted information, transferring their knowledge to new situations (Butler, 2010; Carpenter, 2012; McDaniel et al., 2013; Roediger, Putnam, et al., 2011; Rohrer et al., 2010). These same benefits are not realized during standard study or rereading of material as learners may experience an illusion of knowing whereas readers are generally unaware of what they have actually learned versus what they simply recognize from the text (Glenberg, Wilkinson, & Epstein, 1982). Rereading does not necessarily stimulate additional processing of material and may lure students into believing they comprehend the material without changing their underlying mental representation of the content (Callender & McDaniel, 2009; Rawson, Dunlosky, & Thiede, 2000).

Research on retrieval practice has been conducted primarily in labs with adults, to some extent in classrooms with children, and even with medical students and residents in professional preparation programs. Research in laboratory settings provide strong experimental design, allowing for direct manipulation of the independent variable, and are the foundation of investigating the core mechanisms relative to memory and learning. Often, the materials used in laboratory experiments on retrieval practice consisted of foreign language paired-associate word lists (Carrier & Pashler, 1992), short narrative passages (Duchastel, 1981; Glover, 1989; Roediger & Karpicke, 2006a), and general knowledge question prompts (Butler, Karpicke, & Roediger, 2007; McDaniel & Fisher, 1991). Although the use of more complex materials has provided evidence in support of the use of retrieval practice in educational settings, these
materials are still not as sophisticated as the information students are required to acquire and retain in authentic educational settings (Butler & Roediger, 2007). Efforts have been made to design laboratory experiments that approximate classroom environments, while still maintaining the benefits of carefully controlled experiments (Roediger & Karpicke, 2006a). However, limitations in the extant literature persist, including: use of inauthentic (short) retention intervals, non-authentic assessment forms (including a direct match between practice and test question formats), use of non-authentic instructional materials, potential limits to transfer of knowledge from recall of facts to application, and under-exploration in populations of pre-professionals (specifically future educators). The following paragraphs describe relevant literature, including a discussion of limitations and the resultant underutilization of retrieval practice by educators in practice.

The benefits of retrieval practice can also be enhanced when opportunities to retrieve occur multiple times between initial instruction and attempts at recall. It seems that retrieval practice can be implemented in brief segments of time and as a supplement to standard instruction, making this strategy relatively easy to apply or embed in existing curricula (Leeming, 2002; McDaniel, Anderson, Derbish, & Morrisette, 2007; McDaniel, Howard, & Einstein, 2009). The retention interval, or time between the initial learning and delayed assessment of learning, utilized in many of the laboratory studies limits the authenticity of these investigations. Though educators might expect learners to retain knowledge for future application over weeks, months, or even years, many of the studies that manipulate retrieval practice as an independent variable use short intervals such as two to three days. Though some studies have utilized longer retention intervals, these experiments tended to use relatively simple materials such as word or paired-associate lists, thereby limiting authenticity in another way.
(Glover, 1989; McDaniel & Masson, 1985; Nungester & Duchastel, 1982; Wenger, Thompson, & Bartling, 1980). Other studies have demonstrated that repeated retrieval practice produces superior retention than repeated study over 1- to 6-week time periods (Butler & Roediger, 2007; Karpicke & Roediger, 2008; McDaniel, Anderson, et al., 2007; Roediger & Karpicke, 2006a). Though the results of these investigations exploring retention across varying time intervals demonstrates the promise and flexibility of retrieval practice effects, goals of retention in pre-professional programs may well exceed even these intervals.

Retrieval practice can be utilized as an independent study strategy or embedded into existing instruction as an aspect of an instructor’s pedagogical approach to instruction. When learners independently engage in retrieval practice during self-directed study they might test themselves while studying material outside of class by reviewing flashcards or self-quizzing on their notes. Some textbook publishers offer links to supplemental online content containing question banks for guided study (e.g. “Center for Digital Innovation - CINCH Project, Collaborative Learning for Grades 6-12,” n.d., “ExamView® Assessment Suite | © eInstruction®,” n.d.). In addition to educators having access to these types of resources to prepare exams, learners can access these question banks to engage in self-quizzing over text content. In these ways, individual learners might engage in retrieval practice on their own accord. Alternatively, learners could be forced to participate as a result of an instructor’s course assignment. When retrieval practice is implemented more systematically within classrooms, this is often in the form of teacher-implemented, low or no-stakes quizzes, where students are required to complete brief quizzes with minimal effect on their grade. This implementation is also known as test-enhanced learning and as previously described, has been widely established as an effective strategy for facilitating learning in laboratory settings (Roediger, Putnam, et al.,
When implemented either way, through independent study or class assignment, the practice of retrieval appears to be a more efficient study strategy than simply rereading material many times (Callender & McDaniel, 2009).

In order to identify how generalizable the effects of retrieval practice might be across real classrooms with real learners, it becomes important to consider how different retrieval practice formats might impact different assessment formats (Dunlosky et al., 2013). The benefits of retrieval practice have often been explored through test formats that involve cued recall of targeted information from memory. However, more recent work has begun to explore the use of retrieval practice across varied test formats including multiple-choice, fill-in-the-blank, short-answer question, free-recall, and even inference-based prompts. It has been demonstrated that retrieval practice prompts that do not match the format of the final assessments can still benefit learning. Specifically, multiple-choice retrieval practice can benefit cued recall assessment (Fazio, Agarwal, Marsh, & Roediger, 2010; Marsh, Agarwal, & Roediger III, 2009; Roediger & Marsh, 2005), free-recall practice can enhance learning on multiple-choice and short-answer assessment as evidenced in the “Read-Recite-Review” study technique (McDaniel et al., 2009), and cued recall practice can enhance performance on free-recall and recognition assessments (Carpenter et al., 2006).

It is important to note that though a variety of retrieval practice can benefit learning across a variety of assessment formats, the extent of this benefit is not equivalent across conditions; some retrieval practice formats are more beneficial than others. Glover (1989) compared free-recall retrieval practice, cued-recall (fill-in-the-blank) retrieval practice, and recognition retrieval practice. Regardless of final assessment format, those learners completing initial free-recall practice prompts realized the highest final retention performance, leading to the
Conclusion that recall tests promote greater retention than recognition tests. Similar findings came from work by Carpenter & DeLosh (2006) who found that free-recall retrieval practice outperformed cued-recall practice, regardless of final assessment format. Research by Hinze and Wiley (2011) demonstrated that cued-recall practice enhanced performance on multiple-choice assessment to a greater extent than did fill-in-the-blank practice. It seems that no prescriptive recommendation can be made regarding ideal conditions relative to initial practice and final assessment, as varied combinations of test and assessment formats have proven beneficial to learners. Instead, researchers and educators might continue to explore those retrieval practice opportunities that require effortful processing, or require learners to generate their responses, like those afforded by recall and short-answer responses, over those which simply require recognition of material.

Research by Duchastel & Nungester (1982; 1981; 1982) suggested that both matched retrieval practice and assessment formats, as well as mismatched practice and assessment formats, benefitted retention of material, coining the terms test practice effect and consolidation effect, respectively. Immediate short-answer retrieval practice produced greater retention for delayed assessment compared to multiple-choice retrieval practice or standard study. Researchers interpreted this finding to mean that the immediate short-answer practice enhanced consolidation, as it required great mental effort compared to other study forms. The authors supposed that multiple-choice retrieval practice would reduce the degree to which learners had to deliberately retrieve information from their memory, as the response options were provided as part of the question. This work was conducted in the early 1980’s. Since then, we have greater understanding about the role of effortful processing during retrieval practice opportunities along with the influence of other factors, including the provision of feedback, which may enhance the
potential benefits of retrieval practice.

Feedback, or information provided to learners regarding aspects of one’s own performance, can also enhance learning benefits (Hattie & Timperley, 2007). This feedback can be provided from an external influence, such as a teacher who returns a graded assignment or from peers, who might suggest an alternative viewpoint, or even from the learner herself should she consult text to evaluate the correctness of a given response. As a consequence of feedback, learners may realize improvements in their own metacognitive awareness as testing permits them to discover what they know how to retrieve well and what might require further study. Studies on the power of feedback have manipulated the content of the feedback, for example inclusion of the correct answer or explanation feedback (Butler, Godbole, & Marsh, 2013). Though both correct answer and explanation feedback led to equivalent performance on some questions, it seems that explanation feedback promotes the transfer of learning to a greater extent than correct answer feedback when assessed by novel inferential questions. The feedback learners receive relative to their performance on the retrieval practice activities may serve as a wake-up call to study different material, implement alternative study strategies, or spend more time getting acquainted with the material prior to the final assessment.

To better understand the value of feedback one can look at the work by Kang, McDermott, Roediger (2007) that explored varied retrieval practice formats relative to varied final outcome measures. This work yielded some contradictory findings to the earlier work by Duchastel & Nungester (1982; 1981; 1982). Study participants who utilized short-answer retrieval practice and received feedback outperformed those who utilized multiple-choice retrieval practice on final assessments, regardless of the final test format, suggesting that the more difficult the retrieval practice, the greater the benefit to retention. This finding supports
those earlier conclusions drawn by Glover (1989) and Carpenter & DeLosh (2006), though these earlier studies did not include feedback. It may be that with lower initial learning, feedback is necessary to realize benefits of retrieval practice (Pashler, Cepeda, Wixted, & Rohrer, 2005; Wenger et al., 1980). Additionally, it is important to note, in the study by Kang and colleagues, the performance feedback was provided immediately after participants completed each item, though this is not likely the circumstance in classrooms, where the teacher may grade student work and provide feedback several days later. Further research is warranted to understand the generalizability of these findings to classrooms where feedback is delayed (Kang et al., 2007; Kulik & Kulik, 1988). Furthermore, in these studies, the interval between retrieval practice and final assessment were relatively short as compared to those retention intervals typically required in educational settings.

In sum, the body of retrieval practice literature is somewhat limited by experimental design features related to the format of testing and assessment, provision of feedback, authenticity of content and materials, retention intervals, and implementation setting. An elegant example of a laboratory study which was designed to address several of the aforementioned concerns relative to question format and retention interval was conducted by Butler and Roediger (2007). In this study, laboratory materials were derived from college art history lectures. Over three days participants watched three 30-minute lectures recorded by an art history professor and completed learning activities (multiple-choice testing, short-answer testing, or reading a lecture summary). Counterbalancing and a within-subjects design allowed for manipulation of the type of retrieval practice and comparison to standard study, while controlling for the overall time participants were exposed to materials. This design also allowed for manipulation of the provision of feedback. Researchers utilized an educationally relevant retention interval of one
month to explore how long students might retain information delivered in a lecture before the final assessment. The findings were clear: One month after initial learning, participants who engaged in short-answer retrieval practice demonstrated superior retention of the targeted lecture material than did participants who engaged in standard study. Though this study was conducted in a simulated classroom, it provides evidence suggesting that retrieval practice can improve learner’s retention of lecture material through the use of easily implementable class activities.

With mounting evidence supporting the use of retrieval practice to promote learning in these simulated classroom experiments, psychologists began to contend that retrieval practice would be a useful device to promote classroom learning. As with all laboratory-based studies, it is important to verify the findings in real-life settings. Thus, researchers have recently begun to investigate the effects of retrieval practice in classrooms. Would retrieval practice promote learning with a variety of authentic materials? Would retrieval practice promote learning with diverse populations of students? How might retrieval practice and repeated study impact the transfer of facts and concepts to a variety of contexts, including integrated application of learning? Literature on the use of retrieval practice to promote learning on tasks of transfer seem to indicate that learners are able to transfer knowledge learned in one context to novel, yet parallel, problems (Butler, 2009, 2010; McDaniel et al., 2013). Ideally, educators would like to know that learners are able to flexibly transfer information they learn in quiz or study sessions and apply this information in final, summative assessments. In order to answer these questions and others, researchers continue to advance the laboratory findings on retrieval practice through studies of learners’ use of test-enhanced learning in real classroom settings.

To address the aforementioned types of shortcomings in authenticity, McDaniel, Anderson, Derbish, and Morrisette (2007) set out to discover if the benefits of learning through
retrieval practice would persist over authentic periods of time (intervals between initial learning and subsequent recall) in a real-life college course. Students enrolled in the online course, “Brain & Behavior,” and participated in self-paced learning activities consisting of short-answer quizzes, multiple-choice quizzes or reading review sheets. Retrieval practice improved participant performance on the unit exams, which were conducted three weeks after the retrieval practice activities took place. Retrieval practice also improved participant performance on the cumulative final exam, which was conducted approximately two weeks after the second unit exam. The short-answer retrieval practice quizzes promoted learning to a greater extent than did multiple-choice quizzes or reading review sheets. The structure of this self-paced online course was such that students self-initiated the timing of their retrieval practice, though the dates on which participants logged onto the course were monitored. Despite varied intervals between quizzes and unit exams, the benefits of retrieval practice were robust, suggesting the learning effects extend beyond simple regurgitation of previous quiz responses. The results of this study are compelling and suggest retrieval practice is a strategy that strongly promotes retention especially in courses with a heavy emphasis on recall of factual content.

Another primary example of authentic classroom investigation of laboratory findings comes from the work of Leeming (2002). Leeming explored the use of retrieval practice in the college-level psychology courses he taught. Students in his courses who participated in an “exam-a-day” low stakes retrieval practice showed improved retention of material on end-of-course exams, as well as higher course grades than those students who only participated in the standard assessment schedule of three to four tests per course. Leeming conducted this work because he was disappointed with the number of students in his classes who received D’s and F’s, despite a fair number of other students making high grades. He attributed the poor
performance of some to their lack of study rather than some inferior capability. This study allowed Leeming to explore whether a relatively simple change to the use of in-class time could aid learning in these poor performing students. Given the resultant improvement in semester grades, exam scores and positive student reactions, Leeming deemed the exam-a-day approach a success. Though material, retention intervals, and assessment format were all educationally relevant, one potential limitation of this investigation was that students volunteered to participate in the final assessment and were aware that their scores would not influence course grades.

In summary, the positive effects of retrieval practice have been observed as improved scores in science, technology, engineering, and math (STEM) fields, including biological psychology and statistics (Dobson, 2013; Lyle & Crawford, 2011; McDaniel, Anderson, et al., 2007). Even when measured with authentic assessments, as opposed to restrained laboratory created measures, researchers have documented improved scores in middle school history, social studies, science courses as well as the laboratory experimental measures (Carpenter, Pashler, & Cepeda, 2009; Carpenter, 2012; McDaniel et al., 2013; Roediger, Agarwal, McDaniel, & McDermott, 2011; Rohrer et al., 2010). This collective body of work provides promising indication that there is a value in translation of the laboratory studies to authentic learning environments with diverse learners and content. Though this work shows promise for the implementation of retrieval practice in authentic classroom settings, the potential benefits of retrieval practice will continue to require exploration across learning environments, unique characteristics of individual student learners, and type of target material or content.

Retrieval practice through spaced testing with feedback does in fact appear to promote more extensive learning of targeted concepts, even to the extent that retrieval practice can promote learning in unique applied contexts when the quizzed items are not identical to the
assessment (eg McDaniel et al., 2013; Rohrer et al., 2010). Two experiments conducted in a public middle school provide us with a better understanding of the benefits of retrieval practice activities which were integrated into ongoing instruction, delivered in authentic classrooms (McDaniel et al., 2013). Authentic material selected from real middle school science curricula were used to explore whether retrieval practice would promote deep learning, beyond simply retention of target facts, by enhancing students’ ability to transfer knowledge to successfully answer novel exam questions. In the first experiment, content was initially presented in one of three conditions: definition response, term response, and non-quizzed. Both quizzing conditions improved the exam performance to a greater extent than the non-quizzed condition. Students did better on the exam for items in which they were quizzed by providing a definition for a term (definition response) rather than the traditional classroom activity of providing a term for a definition (term response). In sum, the use of retrieval practice with feedback and spaced quiz schedule, enhanced performance on near-transfer items as compared to non-quizzing. The second experiment demonstrated that retrieval practice promoted transfer through the use of application questions, where students had to apply information taught in a concrete context during the study phase to an application of a principle in the assessment phase. Together these findings further extend laboratory findings to authentic classrooms, suggesting that learning can transfer to novel assessment forms and can promote application of principles into new contexts indicating that retrieval practice enhances rich learning, not just memorization or regurgitation as some educators might have supposed.

A noteworthy limitation of some classroom studies is that end-of-course assessments often utilize identical exam questions, or re-worded versions of the same questions, as those which have been used in the retrieval practice study conditions (e.g. Carpenter et al., 2009; Chan
et al., 2006; McDaniel, Agarwal, Huelser, McDermott, & Roediger, 2011; McDaniel et al., 2013; Roediger, Agarwal, et al., 2011). However, in many educational contexts, instructors and curriculum designers would frown upon the presentation of actual exam questions during study or review sessions. Therefore, educators may not be compelled by the experimental studies to implement retrieval practice in their classrooms.

Instead, educators may be compelled by studies that involve educators in the applied research. Agarwal, Bain, and Chamberlain (2012) reviewed applied research using retrieval practice in a public Midwestern middle school. A primary aim of this five plus year research endeavor, involving more than 1,400 students in 6th, 7th and 8th grades, along with nine classroom teachers, was to extend laboratory research on retrieval practice effect to authentic classrooms and materials. This in-depth exploration of the potential benefits of retrieval practice on long-term learning compared performance on quizzed material to non-quizzed material on chapter exams (two days after critical manipulation) and at end of semester (a few months after chapter exams). The series of studies from this unique collaboration among researchers and school administration, consistently demonstrated a retrieval practice effect—retention is better for quizzed than non-quizzed material. At end of semester and at the end of the school year, the retrieval practice effects remained, suggesting there are, in fact, long-term benefits of implementation of retrieval practice in applied settings with authentic classroom materials. A primary message stemming from this collaborative work (among a teacher, a principal, and a research scientist) was encouragement to continue implementation of applied research, in spite of the very real and unavoidable challenges including student absences, snow days, fire drills, and volumes of data to compile and organize.
So are we yet convinced to implement retrieval practice in university-level professional preparation programs? Though this work is promising, it does not yet confirm the effectiveness of retrieval practice in all classroom settings, with all learners, or all content types. Promising though, is the research from medical education programs. The potential similarities between education of pre-professional teachers of the deaf and medical education relate to the goal of preparing individuals for service professions. Both future educators and physicians need to acquire and retain large amounts of information (both conceptual and fact-based) and apply this knowledge in varied real-life scenarios. Educators and physicians both serve diverse populations, must think on their feet, must problem solve, must be good critical thinkers, and make judgments based on experience, reason, and evidence-based practices. A review of retrieval practice in medical education is presented below.

Investigation of the role of retrieval practice in medical education has continued to yield promise, specifically contributing to the literature regarding transfer and application of knowledge. Historically, medical education research has focused on assessment, though recently, evidence from medical education programs suggest that retrieval practice can promote clinical knowledge that will lead to improved expertise or application in real-life settings (Larsen, Butler, & Roediger, 2008). In medical education settings, ways to improve learning include design of retrieval practice questions which require effortful recall, use of feedback to aid retrieval practice, and frequent testing across a spaced schedule to promote better retention of targeted material. Overall, researchers have observed that retrieval practice promoted learning to a greater extent than repeated study across a range of delayed assessment intervals from two weeks to six months (Kromann, Jensen, & Ringsted, 2009). Larsen, Butler, Lawson, & Roediger (2012) explored degree of retention and medical students’ ability to transfer their knowledge to a
clinical application. Study conditions included students taking written tests, taking tests utilizing standardized patients (engaging with actors in a simulation lab), and reading a review sheet. The students’ final performance on a written test was compared to their final performance on simulation testing through the use of a standardized patient. In both forms of final testing, students who participated in the standardized patient and written test conditions outperformed those students who participated in the reading of a review sheet. This study provides evidence that either form of retrieval practice promoted learning to a greater extent than re-reading the review sheet. In fact, the standardized patient experience promoted learning to a greater extent than the written testing. Though the standardized patient experience appears to be quite effective, this is a costly experience and one that not every professional education program is able to access for students.

There is evidence that retrieval practice improves the learner's ability to retrieve rote information on future retrieval attempts and that this practice further expands the learner's mental model (Butler, 2009, 2010; Karpicke & Grimaldi, 2012). It is uncertain if retrieval practice will also enhance a learner's ability to integrate rote content when faced with a need to apply this information to a more complex, scenario-based question prompt. Previous research procedures had students study information, then quiz themselves via multiple-choice questions (Butler & Roediger, 2007; McDaniel, Wildman, & Anderson, 2012). This format provided the students with a high degree of support about the material that they were trying to remember. Other studies used a free-recall prompt, asking students to quiz themselves by writing down everything they could remember on a blank piece of paper, providing little support or structure to the students (eg, Zaromb & Roediger, 2010). Yet another study required students to generate responses by completing structured outlines, which provided some support in recalling the information
(Larsen, Butler, Lawson, & Roediger, 2012; Larsen, Butler, & Roediger, 2009). Importantly, the outcome assessments in these studies have matched the practice formats, with multiple-choice, free-recall, or outlining. In deaf education preparation programs, where opportunities to assess application of material is highly valued, these exams are often replaced with larger case study assignments, or open ended tasks requiring lesson or session planning. End-of-term comprehensive exams are also common at the graduate level of study.

The work by Larsen and colleagues in the field of medical education explored the use of case-based outcome measures and standardized patients to determine whether medical students could transfer knowledge that was quizzed in a structured way to an applied situation (Larsen et al., 2012, 2008, 2009; Larsen, Butler, & Roediger, 2013; Larsen & Dornan, 2013). However, this work primarily focused on retrieval practice activities and prompts that were highly supportive. Question prompts that are highly supportive provide an inherent structure by nature of their format. For example, a question stem which indicates how many key points the student needs to include in her response might have four blanks or bullets to the response. Multiple-choice questions could also be considered highly supportive in that learners have a finite number of responses from which to select the correct answer. A low support question prompt might be structured as a short-answer or essay question, whereby the learner is given a question or statement to address, without indication of how many key points to include nor how to structure the response. It is important to know whether different types of retrieval practice, those providing high versus low support, promote learning to varying degrees. Assessments that require integration and application of rote, or factual, knowledge are often low support in nature. It is important to understand if learners should be encouraged to engage in retrieval practice, of a matching format, that is low support in nature. Alternatively, it may be that by engaging in
higher support retrieval practice, learners are building stronger rote knowledge for which to draw upon to answer the lower support application assessment. Ultimately, these explorations will inform instructors the extent to which future deaf educators can apply knowledge acquired through retrieval practice on authentic assessment forms.

The simulated patient studies, along with exploration of retrieval practice among authentic medical education learning environments, are informative to our understanding of how we might promote real, deep learning with pre-professionals. We are reminded, however, that though retention of facts is not the sole goal of medical education, it is an important aspect of this professional preparation. In a cognitively provocative column recently published in Medical Education, two medical education experts, Douglas P. Larsen, Director for Medical Student Education for the Division of Pediatric Neurology, Washington University in St Louis and Tim Dornan, Professor of Medical Education, Faculty of Health, Medicine and Life Sciences, Maastricht University contemplate the value of retrieval practice and social interaction amongst medical education (Larsen & Dornan, 2013). Larsen suggests:

…the most practical use of this technique that I see is for educators to use it to plan for retention. So often retention is taken for granted until, when learners struggle, we realise [sic] we had assumed that initial learning was sufficient. When educators identify information which they want students to be able to remember and use over long periods of time, they should plan retrieval practice through written, verbal or activity-based (e.g. simulation or actual clinical encounters) methods. Though we typically think of test-enhanced learning in classroom settings, as medical educators we need to seek out and create opportunities for retrieval practice in the context of real-life experiences (2013, pp. 1239–1240).
Consideration of the value of retrieval practice among the context of real-life experiences is relevant for those responsible for pre-professional preparation of deaf educators as well. It will not be sufficient for future educators of the deaf to simply have an arsenal of memorized facts at their disposal, as impressive as that might be. Instead, might we consider the use of retrieval practice to promote durable learning of applied knowledge, ready for transfer to real-life experiences with children with hearing loss and their families?

Theoretical Rationale

There is a wealth of literature establishing the benefits of retrieval practice, yet the mechanisms at the root of these positive effects are less well understood. Most basically, it is thought that if a learner engages in retrieval during practice, then the learner is practicing those skills needed to retrieve information again in the future. In the following paragraphs, I will define the direct (unmediated) and indirect (mediated) effects on learning (Roediger & Karpicke, 2006b) spurred by retrieval practice, along with explanation of potential mechanisms responsible for such effects. Direct effects refer to those resulting from the act of retrieving itself. Each retrieval practice opportunity alters the encoded information, thereby enhancing one’s ability to reconstruct that knowledge again in the future. Indirect effects are those that stem from encoding processes occurring after participation in a retrieval practice activity, such as increased metacognitive awareness as a result of feedback. The indirect effects are worthy of consideration as they refer to enhancers of learning that are not related to the act of taking the test itself, but result from some other process such as motivation and self reflection. Together direct and indirect effects of retrieval practice support the use of this strategy in classroom environments to promote learning. I will discuss the mediator effectiveness hypothesis which helps to explain
how retrieval practice is thought to strengthen the links between existing memory cues as well as providing an opportunity to establish additional associated links with targeted information (Carpenter, 2011; Pyc & Rawson, 2010, 2012). According to the mediator effectiveness hypothesis, the retrieval practice needs to be effortful for the memory performance to benefit so the concepts of desirable difficulty and material appropriate difficulty will be discussed.

Additionally, I will describe the transfer appropriate processing theory, a derivative of material appropriate processing theory, which suggests the memory performance will benefit to the extent that the operations performed during the retrieval practice will be the same operations reinstated upon the final assessment. In a re-study or re-reading situation where learners might read over target information, the study activity may not necessitate active processing nor learner retrieval.

**Direct Effects.** The direct effects of retrieval practice stem from the finding that the act of taking a test or quiz enhances retention of material over the long term. These benefits, or direct effects, are not simply a side-effect of additional exposure to target material, indicating there must be some underlying process responsible, other than additional study. Roediger and Karpicke (2006b), describe this counterintuitive phenomenon as an example of the “Heisenberg uncertainty principle in psychology: Just as measuring the position of an electron changes that position, so the act of retrieving information from memory changes the mnemonic representation underlying retrieval— and enhances later retention of the tested information” (2006b, p. 182). Carpenter (2011) investigated the direct effects of retrieval practice through a word pair study. Participants were asked to study weakly related word pairs (e.g., “mother” – “child”). Next they participated in either additional study sessions or cued recall retrieval practice, where they were shown a cue from the pair of words and prompted to provide the word that had previously been paired with it. On the final recognition assessment, participants were prompted to recall the
target word by being presented with a novel, but related word (e.g., “father”). Participants who studied with cued recall retrieval recalled more target words than participants who received additional study. Carpenter suggests retrieval practice enhances retention of material by triggering elaborative retrieval processes: Retrieval practice activated related information during the encoding of the target words.

Pyc & Rawson (2010) propose the mediator effectiveness hypothesis as an explanation for the direct effectiveness of retrieval practice. This hypothesis suggests that retrieval practice improves memory as it supports the use of more effective mediators during the encoding process. Mediators are the key words, phrases, or concepts that link the cue and target. Those mediators generated during retrieval practice activities are more likely than mediators generated during restudy to be retrieved and decoded at subsequent trials, thereby increasing the likelihood that a target response will be recalled. To explore the mediator effectiveness hypothesis, researchers presented learners with Swahili-English word pairs for initial study followed by three additional opportunities for re-study (Pyc & Rawson, 2010). Prior to the restudy opportunities, half of the participants also engaged in cued recall retrieval practice. During the restudy periods, all participants were asked to generate a keyword mediator. Final assessment occurred one week following the final restudy period. Those participants who had engaged in cued recall retrieval practice were more likely than their peers who used restudy alone, to recall their mediators when prompted with a cue word. Those who used retrieval practice were also more likely to recall the target word when prompted with their mediator.

Karpicke & Blunt (2011) suggest that retrieval practice aids learners in differentiating highly useful versus less useful cues, which in turn promotes retention of knowledge and the ability to access it efficiently in the future. If mediators fail during encoding and practice, then
learners may shift to more effective mediators in future practice. This retrieval failure is thought only to occur during practice, not re-study. Thus, retrieval practice allows learners to strengthen memories when mediators are successfully retrieved during practice. As these links are strengthened, a learner’s ability to access and retrieve information is facilitated.

Introducing difficulty into learning improves long-term performance and transfer. Thus, to the extent that retrieval practice activities introduce difficulty, they should result in improved learning (McDaniel & Einstein, 2005). Historically, the introduction of difficulty into learning has been studied in a variety of forms including contextual interference (Battig, 1972), inconsistent/interfering outlines during study (Mannes & Kintsch, 1987), interleaved versus blocked training regimens for foreign vocabulary learning (Schneider, Healy, & Bourne Jr, 1998; Schneider, Healy, & Bourne, 2002; Schneider, Healy, Ericsson, & Bourne Jr, 1995), and generation of answers versus reading answers (McNamara & Healy, 1995). Early research on testing difficulty by Landauer and Bjork demonstrated that by successively increasing the difficulty of free-recall tests, learners would demonstrate improved long-term recall as compared to learners who experienced the succession of easier tests (R. A. Bjork & Landauer, 1978; Landauer & Bjork, 1978). Bjork synthesized all of these findings into the concept of “desirable difficulties” in learning: Difficulties and challenges for learners are desirable and should be introduced into instructional practice (E. L. Bjork & Bjork, 2009).

The material appropriate difficulty framework (McDaniel & Einstein, 2005) provides a fruitful start toward understanding the complex interplay of learning materials, learner characteristics, and desirability of difficulty for enhancing learning and retention. The three fundamental components of the material appropriate difficulty framework include:

1. *processing type of difficulty/learning task*—identify the type of processing that is
stimulated by the learning task; consider the degree to which the difficulty stimulates relational versus individual-item processing

2. **processing type afforded by target material**—the educator (cognitive engineer) must be sensitive to the type of processing afforded by the to-be-learned material

3. **overlap of processing between difficulty and target material**—the overlap between type of processing stimulated by difficulty and that encouraged by target material will determine the *desirability* of the difficulty

When the resultant processing is redundant, then the difficulty is not expected to significantly enhance retention (McDaniel & Einstein, 2005). Surveys have indicated that more often than practicing retrieval, students commonly utilize two particularly ineffective strategies during study, namely rereading and highlighting (Gurung, 2005; Karpicke et al., 2009; Kornell & Bjork, 2007). Additional time on these types of tasks are not likely as productive as engagement in practice or self-testing might be, given the potential for retrieval practice activities to promote increased processing of material. When different types of processing are stimulated by the task and material, then the difficulty becomes more desirable and will likely yield greater gains in retention.

Desirable difficulty is a relative construct. The desirability of difficulty depends on the fundamental contextual aspects of the learning environment, as well as the interaction of the target material and the learning task (E. L. Bjork & Bjork, 2009; McDaniel & Einstein, 2005). It seems prescriptions based on broad classes of desirable difficulty may not always be fruitful and there is no absolute taxonomy of difficulties which should be prescribed to enhance learning. Thus, it is important to consider the type of processing afforded by the introduction of a desirable difficulty. The transfer appropriate processing theory asserts that type of test task will influence...
the desirability of difficulty (Franks, Bilbrey, Lien, & McNamara, 2000; Morris, Bransford, & Franks, 1977). The mnemonic benefits of different orienting tasks will depend on the nature of the materials, characteristics of the learner, and type of criterial test used to assess retention (McDaniel, Friedman, & Bourne, 1978; Thomas & McDaniel, 2007).

In sum, retrieval practice activities that require immediate production of material produce better retention later on, as compared to immediate recognition tests or delayed initial tests, regardless of the final assessment format. Generating or producing material during study results in greater final retention than re-reading the material by establishing alternate retrieval routines or promoting elaborative processing. The theory of transfer appropriate processing, along with the material appropriate difficulty framework, would suggest that good performance is fostered when the student practices active retrieval, specifically when there exists a match between the initial and final processing of material (Franks et al., 2000; McDaniel et al., 1978; McDaniel, 1978; Morris et al., 1977). The study activities should match the requirements of the criterial test, with the study processes ideally instantiating those procedures that will be required when information is retrieved on a later occasion.

**Indirect Effects (Mediated).** In addition to those direct effects on learning, afforded by refining of mediators and cues, there are indirect effects of retrieval on learning (Karpicke & Grimaldi, 2012; Roediger & Karpicke, 2006a). These indirect effects refer to enhancers of learning that do not emerge from taking the test itself, but result from some other process, one which is likely influenced from encoding which takes place after the test (Dunlosky et al., 2013). Examples of these non-mediating effects include the metacognitive understanding or feedback afforded by the practice. If a student learned that she struggled to retrieve target knowledge during the practice session, she might allocate her study time differently or utilize alternative
study strategies. In this circumstance, students learn of the outcomes of their performance, namely how well they did on the retrieval practice attempt, and alter future study to focus on the material they might not have fully mastered.

Another example of an indirect effect of retrieval practice relates to the instructional strategies used by instructors in class. For example, if an instructor opts to utilize clicker systems to prompt retrieval during class, the use of this technology might be motivating for students and enhance learning indirectly by prompting students to engage in the lecture while participating with the clicker system. Or, if an instructor decides to implement frequent quizzing schedules throughout the semester, noting these on course syllabi, students might be encouraged to study continuously throughout the semester, instead of cramming study before end of semester exams.

In sum, it is anticipated that both the direct (unmediated) and indirect (mediated) effects of retrieval practice will aid learning. The desirable difficulties afforded by retrieval practice activities will promote effortful processing of target material. Theories of material appropriate difficulty and transfer appropriate process would support the notion that when learners engage in effortful processing, complementary to that processing required by the final criterial assessment, learning will improve to a greater extent than would stem from standard study practice. Learners may also benefit from retrieval practice activities, through increased metacognition and motivation to alter study as a result of retrieval practice feedback.

**Introduction to Experiments**

Teachers and professionals in deaf education can have the power to impact many others if they learn effective teaching practice as part of their early professional preparation programs. If retrieval practice can promote greater learning outcomes, it is a strategy worthy of further
investigation in this population. Previous research investigating retrieval practice has not fully explored the benefit to learners when implemented in authentic learning environments. This study sought to contribute to this void by investigating whether laboratory findings would translate to real classrooms, while addressing some of the shortcomings of previous work relative to the use of retrieval practice to improve performance on case-scenario assessments. This study was conducted to achieve the highest level of authenticity by working with educators to develop and utilize authentic materials in terms of quantity of information presented in a given lecture, and topics/content of materials. Furthermore, all study activities were embedded within real graduate classrooms following the typical course schedule for instruction and assessment of learning.

The current study includes two experiments. In Experiment 1, I explored whether requiring students to study material by taking quizzes enhances learning to a greater extent than by repeatedly reading review sheets as measured on authentic case-scenario assessments. I also investigated whether the type of quiz—low versus high support—affect performance on the final case-scenario assessment. In Experiment 2, I evaluated whether the benefit of retrieval practice could be realized when the final assessment format matched that of the retrieval practice format.

This study takes a novel approach by investigating the use of retrieval practice in an authentic adult learning environment with real course materials. Graduate students engaged in retrieval practice activities or repeated study within university courses using authentic course content. Performance was measured five weeks after initial teaching and initial learning activity (and two weeks after a second learning activity) in order to determine which study condition produced the highest performance on an in-class assessment. The findings of this study may have
important implications for pedagogical practices in the professional preparation of future teachers, as well as provide valuable information for researchers in cognitive psychology and beyond.

**Experiment 1**

The first experiment was designed to answer two questions: Would retrieval practice be a more effective learning strategy in an authentic learning environment with authentic course materials than repeated reading of study guides? Would certain types of retrieval practice (low-support/contextualized free-recall vs. high support/short-answer) provide more or less benefit to learners when assessed with scenario-based prompts? Prior research examining retrieval practice in classroom settings has examined final performance on multiple-choice and short-answer assessments, but has not explored performance on authentic criterion measures such as in-class case-scenario assessments (Dunlosky et al., 2013). Though retrieval practice is believed to promote fact learning (and transfer of information), it may also provide a benefit to learners who must recall facts yet integrate them into a cohesive case-scenario response. Scenario-based prompts are commonly used in deaf education teacher preparation programs to determine if pre-service teachers can apply knowledge in real-life situations prior to their actual teaching. For example, instructors might present students with a short description of a child or family situation. Then, instructors might ask students to identify relevant child and family goals along with strategies or resources which might facilitate achievement of the goals. This type of case-scenario prompt has been used in textbooks (for example, (Voss & Lenihan, 2013) and in professional development workshop offerings (Central Institute for the Deaf, 2013).
I hypothesized that retrieval practice (regardless of level of support provided by quiz format) would improve test performance more than reading a study guide for comparable lengths of time, which is consistent with current research findings (e.g., Carrier & Pashler, 1992; Roediger & Karpicke, 2006a). Though it was less clear which type of retrieval practice would most benefit learners, it was thought that low support retrieval practice might provide learners with a greater advantage than those using high support, as the low support practice matched the format of the final assessment. It was acknowledged that the opposite could in fact be true, that high support retrieval practice could put learners at an advantage over low support practice, as high support practice may aid learners in building a rich mental model of facts, upon which learners might draw in the future when asked to integrate these facts into a more cohesive applied response.

Method

Participants. Study participants were recruited from the Program in Audiology and Communication Sciences (PACS) Master in Deaf Education (M.S.D.E.) program. This two-year graduate program prepares students to teach children who are deaf or hard of hearing, ages birth through 12th grade. During the spring semester of 2013, all enrolled students (N=19) were invited to participate in the study.

The study was approved and granted exempt status as an educational study (#201211141) by the Washington University Institutional Review Board. All study activities were embedded in four required courses as part of the two-year training program curricula, as faculty deemed the content in line with course outcomes. All activities related to the study were conducted during the standard class times. All participants gave voluntary informed consent before participating in
the study. Students listened to a brief explanation of the study, received an information sheet and were invited to sign the consent form allowing their data to be analyzed for the purpose of this study. Students who opted not to sign the consent still participated in the activities; however, their data were not analyzed. Thus, following the consent process (via the information sheet), all students attended lectures and completed the follow-up learning activities and assessment as a requirement of their course instructors. Because these requirements for participation were part of the typical educational practices in the PACS program, activities included engagement in in-class instruction, note-taking, quizzing, and assessment of content knowledge presented during class lectures.

Researchers were blinded to the consent status of the students until the end of the semester. Eighteen of 19 students consented to allow their data to be analyzed for the study.

The students were not reimbursed for their effort. Students spent approximately six hours in study-related activities.

**Design.** This investigation utilized within-subjects design, with the following conditions: low support (LS) retrieval practice, high support (HS) retrieval practice and standard study (SS). Final performance was measured using a case-based scenario exam, administered five weeks after the initial teaching occurred, two weeks after the learning phase was completed. See Appendix A for a description of the counterbalancing of participants to study condition.

**Materials.** Novel materials were created to teach and assess learning for all aspects of the study. Materials used in Experiment 1 included: PowerPoint Lecture script and slides, lecture slide handout, low support quiz, high support quiz, review sheet and final assessment. These materials may be found in Appendices B, C, and D. The 30-minute lectures were scripted to ensure consistent delivery of content to all participants. The quizzes and review sheets used for
the initial and two-week delayed study activities were identical. The content utilized in this study covered three topic areas: Mandated Reporting of Child Maltreatment, Impact of Poverty on Brain Development, and Changing Communication Modalities. These topics were selected in collaboration with course instructors to ensure alignment with course outcomes. Furthermore, the deaf education program director reviewed course syllabi to ensure selected content was not already covered in other courses.

The low support quiz for each content area consisted of one contextualized free-recall prompt instructing the participants to document everything they could remember from the lecture. The low support retrieval practice prompts were:

- Provide a detailed explanation of the impact of poverty on brain development.
- Define and describe the relevant issues of mandated reporting of child maltreatment, including how this pertains to your role as a future educator of the deaf.
- Discuss the complex issue of altering a communication modality from a family’s initial choice/path. Be sure to address the role of the practitioner throughout this process.

The high support quiz for each content area was a series of short-answer questions. Some questions required recall of multiple key pieces of information. For these items, numbered lists or bullets indicated the number of critical facts necessary for full credit. For example, a high support prompt from the Mandated Reporting of Child Maltreatment topic area was:

What are three caregiver risk factors associated with increased rates of maltreatment?

A. _______________
B. _______________
C. ______________

The materials for the standard study condition were review sheets of key facts, one for each topic area. For example, the review sheet for Mandate Reporting of Child Maltreatment listed:

*Children of caregivers who abuse alcohol, abuse drugs, or experience domestic violence experience increased rates of child maltreatment.*

The final assessment included three essay prompts, one for each topic area. The final essay prompts provided a case scenario and asked the participants to write an essay detailing all relevant information they could recall. This is an authentic prompt similar to those currently used in the professional training program. The instructions for this assessment explicitly reminded participants that all information covered in the initial teaching session and further practiced through the various learning activities was relevant and should be included in their responses.

The test sheet presented the brief scenario at the top of the page. An example of this prompt from the topic of Mandated Reporting of Child Maltreatment is:

*You just attended a workshop on the topic of Child Maltreatment. Now you return to your school and are asked to give a training at the next faculty in-service day. What information would you tell your colleagues?*

The remainder of the page, and one additional page were left blank for the students to handwrite their response.

Following the completion of the final assessment, participants completed a brief questionnaire (Appendix E).

**Procedure.** The principal investigator delivered the lectures in person. In-class discussion was not permitted and lectures were scripted to standardize the information delivered.
Participants were allowed to write down any questions or comments and those were addressed at the end of the study. Participants received handouts of the slides and were instructed to take notes or listen attentively as they would during any other class. At the conclusion of each lecture, all handouts and notes were collected to limit outside study or reference to notes during follow-up activities.

Immediately following the lectures, students completed their first learning activity. Each participant received a folder containing instructions and materials for one of three activities: low support retrieval practice, high support retrieval practice or standard study (e.g., repeated reading of review sheet). Quizzing and studying occurred immediately after the lecture and one additional time at an interval of two weeks. Participants were given 15 minutes to complete each study activity. Generally, students were able to complete their responses, though some students did not. Participants in the quizzing conditions were asked to respond to the prompts and were encouraged to incorporate all of the material presented during the lecture, as their score would be based on how much information they used in their response. Students in the standard study condition were explicitly instructed not to quiz themselves with the review sheets so as to avoid confounding the study activities with the quizzing activities. They were instructed to read and re-read the review sheets as many times as they felt necessary to learn the material.

Two weeks after the initial lecture and immediate study activity, each student completed the same learning activity for a second exposure. Again, participants were given 15 minutes to complete the study activity. The students' pairings of topics and learning activities did not change between sessions.

Following completion of each 15-minute study activity, participants were given five minutes to receive feedback. Participants were given an envelope containing an answer sheet.
Those in the quizzing conditions scored their own quizzes by comparing their responses to the answer key. The participants’ self-scores were not used in data analysis, as the purpose of this activity was solely to provide feedback on the accuracy of their responses. Participants in the standard study condition received a second copy of the review sheet and were asked to read it again for five minutes to ensure they had equal opportunity for time on task.

The dependent variable was the proportion of facts participants included in a low support, scenario-based, final assessment. The final assessment included three essay prompts, one for each topic area. Students were given the prompts one at a time. This procedure was implemented to ensure that students spent 15 minutes on each essay prompt and not, for example 45 minutes on one prompt and no time on another. The principal investigator verbally explained the directions for the final assessment, distributed Prompt 1 (Mandated Reporting of Child Maltreatment) in a file folder, and instructed participants to open the folder and begin. At the end of the first 15-minute period, the participants were instructed to put their completed essay in the folder. Prompt 2 (Impact of Poverty on Brain Development) was distributed and participants were instructed to begin. After 15 minutes, the principal investigator again verbally asked students to stop writing, put their essay in the folder, before distributing the third and final prompt (Changing Communication Modalities). At the conclusion of the final 15-minute session, time was called. All participants were instructed to put their essays in the folder for collection.

Following the final assessment, participants completed a brief questionnaire (Appendix E) that was completed in less than ten minutes.

At the end of the experiment, students were thanked for their participation and debriefed. See Appendix F for a copy of the materials disseminated during the debriefing.
Results

Participant responses on study activities and the final assessment were scored using two different procedures. The first, Fact Count, was designed to objectively quantify the proportion of facts participants included in their response. The second, Standard Course scoring, was designed to quantify the extent to which primary learning objectives were achieved based on student responses. Two research assistants, blind to study condition, independently scored all data and came to consensus for each reported score.

When data were evaluated using the Fact Count protocol, quiz and final assessment responses were scored by counting the number of specific facts a participant utilized in their response. Fact Count rubrics (Appendix G) were created for each content area that exactly matched the information listed on the topical review sheets. Scores were not based on coherence of essay response, but instead on the count of pieces of information included in their response. The total number of facts used was divided by the potential number of facts presented in each lecture to yield a proportion of facts recalled. The proportion of facts recalled was calculated by counting the number of facts the participant included in her response divided by the total number of potential facts. The research assistants resolved all discrepancies through discussion. Scores utilized for data analysis and subsequently reported are resolved scores.

Data were evaluated using the Standard Course rubric (Appendix H) to approximate a more typical method of grading student essay responses. *A priori*, learning objectives were identified for each content area. Scorers rated each essay response on all learning objectives (3 to 4, depending on the content area). Ratings of 0, 1, or 2 were given, with 0 being that the learning objective was not addressed; 1 was awarded when the objective was partially addressed and 2 when it was sufficiently addressed. Earned points were totaled and divided by potential points to
yield a proportion score. This type of scoring is commonly used in authentic classrooms and is based on the Primary Trait Analysis approach to grading student work (Walvoord & Anderson, 2010). Two research assistants, blind to study condition, independently scored all data. The extent of inter-rater reliability on the Standard Course rubric was analyzed via the Kappa statistic (Cohen, 1988). Values between .40 and .60 are considered indicative of moderate agreement; values above .60 indicate substantial agreement (Landis & Koch, 1977). The unweighted Kappa was 0.468. The raters had 123 items in agreement out of 170 items scored. All discrepancies were resolved. Scores utilized for data analysis and subsequently reported are resolved scores. Results were considered significant at an alpha level of 0.05.

**Fact count scoring, learning phase.** The results of the learning phase, including immediate retrieval practice and 2-week delayed retrieval practice, are displayed in Table 1. Participants in the high support retrieval practice condition had greater mean performance on the immediate quiz (35.3%) than those participants in the low support condition (11.0%), as scored on the Fact Count rubric. This difference was significant $F(1, 17) = 49.73, p < 0.001$.

This pattern holds at the 2-week delayed quiz with those participants in the high support retrieval practice condition (11.7%) outscoring those participants in the low support retrieval practice condition (4.3%), as scored by the Fact Count rubric. Once again, this difference was significant, $F(1, 17)=34.94, p<0.001$.

**Fact count scoring, final assessment.** (Table 1.) Those participants who utilized high support retrieval practice achieved the highest mean performance on the case-scenario final assessment (9.66%), followed by those participants who utilized low support retrieval practice (8.47%). The lowest mean performance was observed for participants who utilized standard
study practices during the learning phase (6.82%). A repeated measures ANOVA revealed no statistically significant differences by study condition, $F(2, 34) = 0.94, p = 0.400$.

Mean performance by content area was also calculated. Students achieved highest scores on the topic of Mandated Reporting of Child Maltreatment (11.26%), followed by the Impact of Poverty on Brain Development (9.74%) and Changing Communication Modalities (3.95%). These differences were statistically significant, $F(2, 34) = 10.51, p < 0.001$.

To explore any effects of the counterbalancing order on final performance, a one-way ANOVA was calculated. The order in which participants experienced each study condition due to counterbalancing group assignment had a statistically significant effect on their final performance, $F(2, 17) = 4.46, p = 0.030$. Depending on the counterbalance grouping, final performance ranged from 6 to 13%.

**Standard course scoring, learning phase.** The results of the learning phase, including immediate retrieval practice and 2-week delayed retrieval practice, are displayed in Table 2. Participants in the high support retrieval practice condition achieved slightly higher mean scores on the immediate quiz (55.6%) than those participants in the low support condition (53.5%), as scored by the Standard Course rubric. This difference was not significant, $F(1, 17) = 0.08, p = 0.078$.

The pattern is reversed at the 2-week delayed quiz, with those participants in the low support retrieval practice condition achieving slightly higher mean scores (50.2%) than those participants in the high support retrieval practice condition (44.9%). This difference was not significant, $F(1, 17) = 0.76, p = 0.396$.

**Standard course scoring, final assessment.** (Table 2.) Those participants who utilized low support retrieval practice had the highest mean performance on the case-scenario final
assessment (74.1%), followed by those participants who utilized high support retrieval practice (72.2%). The lowest mean performance was observed for participants who utilized standard study practices during the learning phase (63.0%). A repeated measures ANOVA revealed no statistically significant differences by study condition, $F(2, 34) = 2.40, p = 0.106$.

Additionally, mean performance by content area was calculated. Of the three content areas, students achieved highest scores on the topic of Mandated Reporting of Child Maltreatment (75.9%), followed by equivalent performance on the topics of Impact of Poverty on Brain Development (66.7%) and Changing Communication Modalities (66.7%). As revealed by repeated measures ANOVA, none of these differences were statistically significant, $F(2, 34) = 1.88, p = 0.168$.

To explore any effects of the counterbalancing order on final performance, a one-way ANOVA was calculated. Counterbalancing order had no statistically significant effect on final performance when scored by the Standard Course rubric, $F(2, 17) = 0.04, p = 0.96$.

**Questionnaire.** (Appendix E.) Participants completed a questionnaire about their participation in the study following the completion of the final assessment. Students indicated the level of effort they put forth to attend to the material in class, the level of difficulty of content, and the level of difficulty of recall. No students reported that they studied outside of class for any content. Nor did any students report reviewing the material with others, for any content.

The questionnaire asked students to identify the level of effort they put forth to attend to in-class lectures. For students in the low support condition, 94% of students put forth *moderate* or *a lot* of effort to attend to material in class. For students in the high support condition, 83% put forth *moderate* or *a lot* with 11% putting forth *very little* and 6% putting forth no effort to
attend to material during class. Finally, 17 students (94%) in the standard study condition report putting forth *moderate* or *a lot* of effort to attend material in class.

The questionnaire requested information regarding the students’ perceptions of difficulty of the lecture content and the effort required to retrieve the information throughout the study. In each study condition, about half of the learners indicated that lecture content was *challenging* and/or *difficult*, while the other half of learners indicated the lectures were not challenging at all. When students were in the low support retrieval practice condition, more than half (56%) perceived the lecture content to be *challenging* and/or *difficult*. 39% of students indicated that the lecture content was *not difficult* and one student (6%) did not respond to this prompt. Likewise, when students were in the high support condition, 56% rated the lectures as *challenging* and/or *difficult*, with 44% of students indicating these lectures as *not difficult*. When students were in the standard study condition, 50% rated the lecture content to be *challenging* or *difficult*, whereas the other 50% rated it as *not difficult* at all. For all study conditions, the majority of learners rated their difficulty in recalling the content *challenging*. Several students rated the difficulty recalling to be *impossibly difficult*, and several students indicated it was *not difficult* at all.

In general, participants did perceive a difference in learning (and retention) among study activities. Participants were asked to comment regarding to what they attributed those differences. They were also asked to describe how they believed the activities influenced initial learning and final retention of material.

Participants expressed a clear preference for either retrieval practice experience (LS or HS) over repeated reading. Only one student indicated a preference for the standard study condition. 33% of students had difficulty articulating which retrieval practice condition was most beneficial to them. One student specifically documented her perceived benefit by engaging in the
combination of activities across content. Another student indicated a preference for the “brain dump” prompt afforded by the low support retrieval practice condition but had concern that this could have allowed her to practice incorrect information. 50% of students indicated a preference for high support retrieval practice citing the organizational structure of the material, the prompts and structured feedback sessions to follow the retrieval practice activity, and the repetitive nature of the activity as reasons why high support was preferred over low support or standard study. Finally, two students (11%) indicated a clear preference for the low support retrieval practice format. One of these students suggested that the low support prompt allowed her to feel more relaxed and had freedom to bring information into mind, whereas the high support created a sense of tension when recalling key points.

The majority of participants (“yes”=61%; “maybe”=28%; “no”=5%) indicated a willingness to use retrieval practice activities in their future classes. Furthermore, the majority of students agreed that either retrieval practice condition was preferred over standard study alone, as evidenced by this comment:

“There was certainly a difference in my retention of the information between the low and high retrieval practice activities. I firmly believe it is actually the application (writing down) of what I know and finding out what I don’t recall or what I am confused about and would like more explanation or clarification about. I feel I had much more to say in my final retention in the topic(s) I did the low and high support retrieval activities than I did with the standard study activity.”

Some students clearly expressed preference for the high support condition. Citing the organizational structure afforded by the high support prompts, one student commented:
“I recalled more from the high support because I could visualize [sic] the questions in almost an outline format. Low support was more jumbled. I couldn’t recall how I’d organized the information and did so differently each time. I study in a Q/A format so high support was best for learning.”

Another student expressed similar preference for the high support condition:

“The high support retrieval practice activity prompted me to remember things based on the wording of the questions. On the low support activity, I felt like I had to make up for the fact that I could only remember a few key details. The high support activity helped me retain more.”

Alternatively, some students expressed preference for the low support retrieval practice conditions, commenting on the level of anxiety as a factor,

“I think with the low support retrieval practice I was more relaxed because of the freedom which helped more of the information come to mind, whereas with the high support retrieval practice I was more tense trying to recall all key points which was more difficult.”

However, not all of the students could indicate a clear preference, suggesting that although retrieval practice was preferred over standard study, it was unclear if high or low support practice was better. Finally, one student’s reflection on the study-assessment match, or mismatch as it were, indicates a shift in perception. This student’s comment suggested that she was unsure of which retrieval practice condition aided her to the greatest extent,

“I thought I learned the most on the high support retrieval process over the low support (essays), but then answering the prompts today, I felt the most prepared for the low support retrieval practice since I had done a similar paper on it before. It forced me to
write the info I knew (the low support). After checking my work the first time (quiz), I realized the things I knew and areas of weakness. I think I internalized these areas more overall than the short answer quiz.”

Discussion

Initially, data scored using the fact count rubric yielded a floor effect. When data were reanalyzed using the Standard Course rubric, it appears that initial learning had occurred, though perhaps not to an extant that would satisfy course instructors and classroom educators. There were no statistically significant differences between study conditions for data scored using the Fact Count or Standard Course rubrics. Statistically, retrieval practice did not aid learning in this context with this population. However, on the data scored using the Standard Course rubric, the difference in mean percentage of information recalled was ten percentage points greater for those groups who studied with retrieval practice as compared to standard study. In the graduate classroom, ten percentage point differences on exams may result in differences in letter grades. These differences are certainly educationally significant to the students and their instructors, as they may also significantly impact students’ course grades.

Though the counterbalanced design was selected to guard against content differences, it does appear that both content type and counterbalancing order affected performance when data were scored using Fact Count rubric. These same differences were not observed when data was scored using the Standard Course rubric. This calls into question how each rubric is uniquely capturing learning. Analyses of group differences for both scoring rubrics indicate non-significant differences between study conditions.
Since retrieval practice is thought to be especially beneficial to enhance and strengthen retention and recall of content once it has been learned, its’ benefit is predicated on achieving sufficient initial learning. But how much initial learning is sufficient to realize benefit from retrieval practice? That question is difficult to answer at this time and instead prompts us to explore initial learning to a greater extent in future studies of this kind. In the context of this experiment, the material was delivered in one 30-minute lecture. Students were expected to learn the material from this initial content delivery alone. They were tested immediately following the initial lecture. Initial learning appeared poor for a fair number of participants, with the range of Fact Count scores from the retrieval practice condition extending from 11 to 35%. Since initial learning was poor, perhaps given a students’ lack of interest in the topic, limited motivation to attend to the lecture, or most likely, limited opportunity to actively engage with material, then it is possible that retrieval practice would have little to no benefit. If initial learning was modest or even great, as was observed for six learners who achieved between 44 to 57%, then retrieval practice could solidify the learner’s understanding of this content while increasing the possibility of future successful retrieval.

To further understand how the use of retrieval practice affected individual student performance I looked at individual differences for data scored using the Standard Course rubric. Because the Fact Count rubric yielded scores at floor, individual difference patterns are not reported here. It appears that 13 of 18 participants benefitted from retrieval practice activities, in that individual participants’ mean final performance for the retrieval practice condition was higher than their mean standard study condition. Seven participants realized their best performance in a low support retrieval practice condition; six participants realized their best performance in the high support retrieval practice condition. Alternatively, 5 of 18 participants
demonstrated highest mean performance in the standard study. It was difficult to find a clear performance pattern in those five participants who achieved their best scores in the standard study condition. Interestingly, these five participants were also those same participants with some of the lowest scores in the learning phase. One of these participants achieved performances in the 80 to 88% range across the board, potentially making her a high achieving outlier. One of these participants, who achieved her best score in the standard study condition, had a best score of 50%. The three other participants who had best scores in the standard study condition had mean scores of 50 to 83% across the board. It is possible that even without significant group differences, the use of retrieval practice could significantly support learning on an individual basis. Further exploration of individual differences is both warranted and necessary to understand if certain types of students benefit from retrieval practice to varying degrees.

Finally, in Experiment 1, the format of the final assessment prompts differed from the format of the prompts utilized in the study condition. There is a concern that the transfer of information from the format in which it was studied to a novel question prompt could have been responsible, in part, for the lack of benefit experienced by participants. Perhaps retrieval practice would have aided learners in fact recall alone, even though, overall, it did not appear to aid them in applying or integrating these facts into a case-scenario based response. Experiment 2 was designed to explore the benefit of retrieval practice on assessment forms that match study conditions.
Experiment 2

The second experiment was designed to evaluate whether high support retrieval practice aid learners to a greater extent than standard study on a high support final outcome.

Though no significant effect by study condition was found in Experiment 1, the assessment was all case-scenario, or low support. Given the robust effects of retrieval practice on learning in the extant literature, yet the lack of significant findings in Experiment 1, I was interested in exploring whether or not the benefit of retrieval practice could be realized in this population with these authentic materials when the assessment form was a direct match to the study quiz.

In Experiment 2, only one type of retrieval practice was compared to standard study practice. Students participated in two learning conditions: completion of high support quizzes, and reading of study guides/review sheets. Students attended lectures on two topic areas, over two consecutive class sessions. Immediately following the lectures, students completed their first learning activity. Two weeks later, students completed the second learning activity. Finally, two weeks later, or five weeks after the initial teaching and immediate learning activity, students completed an assessment.

It was predicted that the high support retrieval practice would improve test performance to a greater extent than repeated reading of a study guide for comparable lengths of time. Since the results of Experiment 1 were not statistically significant, yet trended towards this pattern of benefit, it was hypothesized that a second experiment directly comparing retrieval practice-assessment matched quizzes to re-reading for study would yield significant findings consistent with extant literature.
Method

Participants. Study participants were recruited from the Program in Audiology and Communication Sciences (PACS) Masters in Deaf Education (M.S.D.E.) program, the same program as in Experiment 1. This two-year graduate program prepares students to teach children who are deaf or hard of hearing, ages birth through 12th grade. However, for Experiment 2, only the entering class of first-year M.S.D.E. students was invited to participate. At the time of Experiment 2, the second-year M.S.D.E. students had participated in Experiment 1 the prior semester, so were excluded from this study. During the fall semester of 2013, all enrolled students (N = 11) were invited to participate in the study.

Researchers were blinded to the consent status of the students until the end of the semester. All 11 students consented to allow their data to be analyzed for the study.

The students were not reimbursed for their effort. Students spent approximately four hours in study-related activities.

Design. This investigation utilized a within-subjects design, with the following two study conditions: high support (HS) retrieval practice and standard study practice (SS). Participants’ final performance was measured on a high support final assessment.

Counterbalancing allowed comparison of significance of performance across study condition and content. See Appendix I for the counterbalancing used in Experiment 2. Student participants were divided into two groups for assignment to content study condition match. All participants participated in each study condition (HS, SS) receiving instruction in two content areas.

Materials. Materials utilized in Experiment 2 were identical to those used in Experiment 1. However, only two topics were necessary for counterbalancing Experiment 2, thus
the content related to Changing Communication Modalities was dropped from study in
Experiment 2 in order to retain the most relevant instructional content. For Experiment 2, the
topics identified as both relevant to students’ course of study and missing from the curriculum
included: Mandated Reporting of Child Maltreatment & Impact of Poverty on Brain
Development. See Appendix J for the final assessment used in Experiment 2. See Appendix K
for the questionnaire participants completed following the final assessment, reflecting only two
study conditions and topic areas.

**Procedure.** The procedures in Experiment 2 were identical to Experiment 1, except
participants were only assigned to two learning conditions/content areas, not three. These
conditions were: high support retrieval practice and repeated study.

Additionally, the final outcome measure was an identical match to the retrieval practice
conditions, namely a high support prompt. Participants were given the final high support prompts
one at a time to ensure that students spent 15 minutes on each prompt and not, for example 30
minutes on one prompt and no time on the other. The primary investigator verbally explained the
directions for the final assessment, distributed prompt 1 (Mandated Reporting of Child
Maltreatment) in a file folder, and instructed participants to open the folder and begin. At the end
of the first 15-minute period, the participants were instructed to put their completed assessment
in the folder. Prompt 2 (Impact of Poverty on Brain Development) was distributed and
participants were instructed to begin. At the conclusion of the second 15-minute session, time
was called. All participants were instructed to put their assessments in the folder for collection.
Results

Scoring procedures in Experiment 2 were identical to those in Experiment 1. Results are presented separately for Fact Count and Standard Course scoring. Results were considered significant at an alpha level of 0.05.

Fact count scoring, learning phase. The results of the learning phase, including immediate retrieval practice and 2-week delayed retrieval practice are displayed in Table 3. Participants in the high support retrieval practice condition achieved slightly higher mean percentage correct on the immediate quiz (27.1%) than on the 2-week delayed retrieval practice (26.3%) as scored on the fact count rubric.

Fact count scoring, final assessment. Those participants who utilized high support retrieval practice had higher mean performance on the high support final assessment (29.4%) than did those who utilized standard study (22.4%). A repeated measures ANOVA indicated study condition did not significantly affect final performance $F(1, 10) = 1.64, p = 0.230$.

Mean performance by content area was also calculated. Students achieved higher scores on the topic of Mandated Reporting of Child Maltreatment (33.9%) than on the Impact of Poverty on Brain Development (17.9%). As revealed by repeated measures ANOVA, these differences were statistically significant, $F(1, 10) = 28.17, p < 0.001$.

To explore any effects of the counterbalancing order on final performance, a one-way ANOVA was calculated. Counterbalancing had a statistically significant effect on final performance, $F(1, 10) = 115.58, p < 0.001$. There were six participants in one group, with a mean final performance of 31%, as compared to five participants in the other group, with a mean final performance of 19.7%.
**Standard course scoring, learning phase.** The results of the learning phase, including immediate retrieval practice and 2-week delayed retrieval practice are displayed in Table 4. Participants in the high support retrieval practice condition achieved higher mean percentage correct on the immediate quiz (51.1%) than participants at the 2-week delayed retrieval practice (48.5%).

**Standard course scoring, final assessment.** (Table 4.) Those participants who utilized high support retrieval practice had higher mean performance on the high support final assessment (53.8%) than did those who utilized standard study (43.9%). This difference was not statistically significant, \(F(1, 10) = 0.84, p = 0.382\).

Comparison of content areas reveals the highest final performance for the topic of Mandated Reporting of Child Maltreatment (63.6 %), with mean performance for content from Impact of Poverty on Brain Development less (34.1%). A repeated measures ANOVA confirmed statistically significant differences on final performance by content area, \(F(1,10) = 22.77, p = 0.001\).

To explore effects of the counterbalancing order on final performance, a one-way ANOVA was calculated. Counterbalancing order revealed a statistically significant effect on final performance, \(F(1, 10) = 13.33, p = 0.005\). Again the groups were small given the total number of participants in Experiment 2. The group with five participants had mean final score of 35.8%, whereas the group with six participants had a mean final score of 59.7%.

**Questionnaire.** (Appendix K.) Participants completed a similar questionnaire as that used in Experiment 1, with questions regarding the third topic area (Communication Modality) and low support retrieval practice study conditions eliminated. Once again, no students studied outside of class, for any content; no students reviewed material with others, for any content.
The questionnaire asked students to identify the level of effort they put forth to attend to in class lectures. Students indicated identical ratings of their effort for both the retrieval practice (HS) study condition and standard study (SS) conditions, with 91% put forth moderate or a lot and 9% (n=1) putting forth very little effort to attend to material during class.

The questionnaire requested information regarding the student’s perceptions of difficulty of the lecture content and the effort required to retrieve the information throughout the study. When students were in the retrieval practice (HS) condition, 55% (n=6) rated the lectures as challenging and/or difficult, with 45% (n=5) of students indicating these lectures were not difficult. When students were in the standard study condition, the majority (82%, n=9) rated the lecture content as challenging, whereas the other 18% (n=2) rated it as not difficult at all. For both study conditions, the majority of learners rated their difficulty in recalling the content challenging. Several students rated the difficulty in recalling as impossibly difficult, and one student indicated it was not difficult at all.

Sixty-four percent (7/11) of participants reported a preference for the retrieval practice (HS) study over standard study (SS) with the remaining 36% indicating a preference for SS over HS. 82% (9/11) participants perceived that the retrieval practice (HS) study helped them to a greater extent than standard study (SS).

Participants were asked if they perceived a difference in learning (and retention) between the study activities, and if so, to what did they attribute those differences. Responses were mixed. Participants were also asked to describe how they thought the activities influenced their initial learning and final retention.

Only one student indicated that the standard study condition was the preferred study type.
“I feel that standard study was best for me.” Since this student did not provide any further explanation, it is unclear to what she attributes this advantage.

One participant attributed her perceived difference in learning to the two content areas, suggesting,

“…I feel like I read more of and/or understood the Mandated Reporting materials more so than the SES & Brain development material. I was able to recall the mandated reporting information much more easily.”

Several students attributed their perceived benefit of retrieval practice to their ability to write information during the study phase.

“I think I remember things better when I re-write them rather than re-read them“ and “I think that writing down the information helped me to remember it more than just reading it. It think that I did much better on the child maltreatment lesson because I was able to write it more.”

Another contends,

“Re-writing requires more effort, so I think it's better for learning and retention.

Standard study did not help with the final retention, the way high support retrieval did.”

One student attributed the perceived advantage afforded by retrieval practice to being exposed to quiz questions prior to the final exam. However, the participants were not told what format the final exam would take prior to the assessment. One student observed,

“I think the high support retrieval prepared me for the final assessment, by quizzing myself on the question that I needed to know, and I knew what was important by the questions asked.”
Finally, one student indicated quite simply, “re-reading didn't help as much because it wasn't engaging.”

The majority of participants (55% =Yes”; 36% = “Maybe”; 9% = “No”) indicated that they might be willing to participate in retrieval practice in future classes, with only one student indicating non-interest.

**Discussion**

Experiment 2 investigated the benefit of retrieval practice on assessment forms that matched study conditions. Based on prior research findings, I predicted that those participants who utilized high support retrieval practice during the learning phase would achieve higher scores when assessed on an identical final assessment than those participants who utilized standard study practices (re-reading) during the learning phase.

As was the case in Experiment 1, when the data were initially scored using the Fact Count rubric a floor effect was observed. Evidence that initial learning had occurred came when data were reanalyzed using the Standard Course rubric, though it is unlikely that learning to this extant would satisfy course instructors and classroom educators. Furthermore, initial learning was discrepant across the two content areas used for counterbalancing. Low initial learning is undesirable in investigations of retrieval practice, as it is not a primary strategy known to promote initial learning. The limited effect of retrieval practice observed in this study are consistent with other studies documenting limited effects with low initial learning (Butler, 2010; Hinze & Wiley, 2011). Retrieval practice is thought to promote retention and future recall of learned material, and feedback may enhance future retrieval through mediated or indirect effects. Thus, in order to observe the power of retrieval practice, we can look at the rates of forgetting.
over time, expecting to see that those who study with retrieval practice forget less of the material they have initially learned than those who use standard study practice. As was the case in this study, with low initial learning, we may not be able to observe different forgetting rates, as many participants start out at floor performance and have no room to demonstrate further decline in recall.

In Experiment 2, there were no statistically significant differences between study conditions, for data scored using the Fact Count or Standard Course rubrics. So, like in Experiment 1, we conclude statistically speaking, retrieval practice did not aid retention in this context with this population. However, as was the case in Experiment 1, on the data scored using the Standard Course rubric, the difference in mean percentage of information recalled varied by ten percentage points between those groups who studied with retrieval practice versus standard study. Readers are reminded yet again, that in the graduate classroom, ten percentage point differences on exams may result in differences in letter grades. These differences are certainly educationally significant, as they may also significantly impact students’ course grades.

Though the counterbalanced design was selected to guard against content differences, it does appear that both content-type and counterbalancing-order affected performance when data was scored using both rubric types. Analyses of group differences for both scoring rubrics indicate non-significant differences between study conditions.

The scoring with the Fact Count rubric yielded relatively low scores, again raising concern that there was insufficient initial learning to realize benefit from retrieval practice. Initial learning appeared poor for a fair number of participants, with the immediate and 2 week delayed Fact Count scores from the retrieval practice condition averaging between 26-27%. If initial learning was modest or even great, as was observed for six learners who achieved between 44-
57%, then retrieval practice could solidify the learner’s understanding of this content while increasing the possibility of future successful retrieval.

To further understand how the use of retrieval practice affected individual learner performance I looked at individual differences for data scored using the Standard Course rubric. Because the Fact Count rubric yielded scores at floor, individual difference patterns are not reported here. It appears that 6/11 participants benefitted from retrieval practice activities, in that individual participants’ mean final performance for the high support retrieval practice condition was higher than their mean standard study condition. Alternatively, 4/11 participants demonstrated higher mean performance on the standard study condition than the retrieval practice condition. One participant demonstrated equivalent mean final performance in the retrieval practice and standard study conditions. Interestingly, the five participants who had higher or equivalent performance in the standard study condition, than the retrieval practice condition, were also those same participants with some of the lowest scores in the learning phase. One possible explanation relates to the mechanism of retrieval practice benefit. It is clear that the benefit of retrieval practice comes after initial learning, namely in the retention of material over time. If learners did not sufficiently acquire the information initially, perhaps due to the discrepancies in topic or content difficulty, it would not be expected that retrieval practice would benefit their final performance. An alternative, and likely more plausible explanation, relates to the content and counterbalancing order. All participants who appeared to benefit from retrieval practice were those who studied the Mandated Reporting content using retrieval practice. All participants whose best scores were in the standard study phase were those who studied the Mandated Reporting content in that manner. Again, this is a clear indication that
there is an effect of content difficulty occurring in this study, despite the efforts to minimize such effects through a counterbalanced design.

The students who participated in Experiment 2 did so during the first semester of their graduate study (as opposed to participants in Experiment 1 who were in at least their second semester). Though the content was selected to specifically address topics not covered in other graduate courses, ideally guarding against any prior experience, it is possible that the participants’ general graduate school experience influenced their performance in this study. Perhaps the students had not yet participated in graduate level exams as this experiment was implemented in the early part of the semester. Without this experience with graduate school assessment, perhaps participants were influenced by test anxiety to a greater extent than their more experienced peers. Perhaps the content, which proved more difficult, Impact of Poverty on Brain Development, was less relevant to their current course experience than it might have been for students further along in the program. With greater context as to why this topic might be relevant to future educators of the deaf, participants might have been more motivated to attend to the lecture material.

It appears the possibility of finding significance of study type was masked by the imbalance of content or topic difficulty. The influence of materials and content differences are important to consider in future studies of retrieval practice in authentic learning environments. Though this limits our ability to make definitive interpretations regarding the effect of retrieval practice activities on similar final assessment forms, this experiment provides additional information regarding the promise of implementation of a mnemonic strategy in a classroom environment.
General Discussion

This project was designed to examine whether real world classroom learning could be enhanced through the use of retrieval practice. Retrieval practice was identified as a strategy which might aid learners in remembering more of the information taught through course lecture. Learners would then be required to demonstrate their retention by applying it in authentic assessment forms. Specifically, could instructors utilize retrieval practice through in class low-no stakes quizzing as a means to improve learner’s performance on typical assessment forms? In discussing the present findings, first, I consider the results of Experiments 1 and 2, as examples of research measuring the efficacy of retrieval practice implemented in authentic classrooms environments. Second, I consider potential limitations of the current research. Finally, I consider the educational implications of the present study.

Experiment 1 explored the extent to which three study conditions (low support retrieval practice, high support retrieval practice, and standard study) had on participant performance on a case-scenario final assessment. Though scoring with fact and Standard Course rubrics did not reveal statistically significant differences between study conditions, potentially educationally relevant trends were observed. Thirteen out of 18 participants appeared to benefit from their participation in retrieval practice activities. Overall, participants expressed a preference for retrieval practice activities over standard study. Since the final assessment format consisted of contextualized open-ended case-scenario prompts, it was necessary to further explore the effect of study condition on a high support, short-answer final assessment, to see if a match of study condition and final assessment yielded any significant differences in performance.

Experiment 2 was designed to explore whether or not the use of retrieval practice during
the learning phase would promote greater learning than standard study on a high support final assessment. In this experiment, the retrieval practice prompts directly matched the final assessment format. Again, significant differences by study condition were not observed, indicating that study type (high support retrieval practice versus standard study) did not significantly effect a participant’s final performance. Both content and counterbalancing group assignment significantly effected mean final performance in Experiment 2, potentially masking any influence of study condition. Yet again, the majority of participants indicated a preference for the retrieval practice study over standard study. In light of these findings, future exploration individual differences and the influence of retrieval practice on learning is warranted.

In sum, the primary purpose of this study was to examine whether retrieval practice could be used to improve learning in an authentic educational environment, using real content, and real materials. Despite the lack of statistical significance, the process of preparing for and conducting Experiments 1 and 2, along with the results of these investigations, provide important information. Despite the established benefits of retrieval practice on learning, implementation in educational practice is yet unclear: Does retrieval practice learning simply represent rote memorization of facts with little ability to transfer or apply that knowledge to new settings? How well does retrieval practice learning compare to, or support, other methods of active learning? Thus, it remains unclear whether or not we should scale up the use of retrieval practice in deaf education teacher preparation programs. Even so, the literature indicating the promise of retrieval practice remains strong. Individual faculty will need to determine the appropriateness of use embedding retrieval practice activities in their own courses, or the consider the extent to which they chose to promote individual student use of retrieval practice for outside of class study. At this time, it seems both low and high support retrieval practice may be beneficial to learners.
Limitations

In this study, I was unable to replicate previous findings that the use of retrieval practice produces improvements in learning over exposure controls. However, considering the plethora of literature documenting the benefits of retrieval practice over restudy, this was a valuable contribution to the extant literature, as this lack of significant finding leads to additional questions about the translation of laboratory research to authentic classroom environments. It is possible that retrieval practice does not actually have same effect with this population of future educators in this learning environment. It is also possible that this that this study was limited by several primary concerns described below. These limitations include: effects of materials and subsequent low initial learning, experimental restrictions on active engagement of learners, assessment and scoring procedures, and sample size.

The participants in this study demonstrated low overall initial learning. Retrieval practice may not serve primarily as a mechanism for facilitating initial learning. Low initial performance is associated with a failure to find benefit of retrieval practice (Hinze & Wiley, 2011). The failure to find benefit when associated with low initial test performance, suggests initial test performance may be a mediator of testing effects and warrants further study. Additionally, content area differences appear to have affected the final performance to the extent such that counterbalancing could not sufficiently overcome these discrepancies in material difficulty. High initial learning would have been desirable, to me as an educator and as a researcher. Obviously, educators want their teaching and lecturing to lead to high rates of learning. As a practicing educator for more than ten years, one might have imagined that I would have a good sense of
what the students in my classes were learning. However, the assessments I have conducted as an instructor were often after weeks or months from initial teaching, graded in a highly subjective manner, and constructed in a way that was open-ended enough that students could demonstrate their learning across a wide range of acceptable responses. This high level of subjectivity was something I was careful to guard against when initially designing these experiments. In fact, I was so concerned with designing materials that would be rigorous, and in my mind challenging, that I intentionally attempted to find a level of difficulty that would avoid ceiling effects. I prepared materials so that learners would demonstrate a range of responses from poor to excellent. I did not want everyone to achieve 100% recall, as this would not tell me anything about the power of the retrieval practice interventions. All of this aiming high essentially resulted in materials that were difficult beyond the level of desirable difficulty. More than the materials being difficult, I simply tried to teach too much content with too few exposures and too little learner engagement to achieve anything beyond measly initial learning.

In sum, high initial learning would have been desirable for two reasons: to ensure performance on the final assessment was above floor, and because learners must retrieve a reasonable amount of the to-be-retrieved information to demonstrate adequate benefit from this strategy (Butler & Roediger, 2007). Yet high initial learning was unachieved in both Experiment 1 and Experiment 2, making this a significant limitation of the study.

Does retrieval practice learning simply represent rote memorization of facts with little ability to transfer or apply that knowledge to new settings? Literature on the use of test-enhanced learning on tasks of transfer seem to indicate that learners are able to transfer knowledge learned in one context to novel, yet parallel, problems. However, in the experiments in this study, the neither the initial nor final question prompts, including the factual knowledge required to score
points on open-ended scenario prompts, were designed to be exactly parallel. Perhaps the degree of transfer required was too far to benefit from the retrieval practice study conditions. Future study might explore near transfer (i.e., high support retrieval practice to novel high support retrieval practice) before considering the benefit of high support retrieval practice to an entirely different assessment form, as was the case in Experiment 1.

It is also possible that the study participants were unaware that the facts they had been taught, and studied, were relevant to final assessment, despite explicit instruction to include all information they could recall from the previous lectures in their responses. Hinze & Wiley (2011) demonstrated benefits of retrieval practice on new question forms after a delay when initial learning stemmed from free-recall compared to fill-in-the-blank questions. Authors argued that the fill-in-the-blank responses only required retrieval of surface memories, not broader concepts. In the current study, perhaps the low support quiz only promoted fact recall in that context and perhaps the participants did not realize the final assessment required the recall of similar information. Butler (2010) found benefit of retrieval practice on novel transfer items using short-answer (cued recall) questions during initial and final learning. However, he did not use different question formats. Thus, it is unclear if transfer benefits would also be realized using open-ended free-recall and cued recall. Butler also found benefit of retrieval practice on transfer when participants were explicitly told that the final test was related to information learned during the initial sessions. (See also Chan, 2009). Studies by Gick and Holyoak (1980) and Bransford and colleagues (1986) demonstrated that learners’ conceptual knowledge remains “inert” when not explicitly told to use previously-learned information on novel items. Hence, the participants in this study were explicitly told to do so. Perhaps the students still did not heed this guidance, or as future research might reveal, quite simply did not find benefit from doing so.
It seems the potential benefit of retrieval practice may come from reinforcing, expanding, and enhancing learning after it has been initially acquired. Instructors must rely on their other virtual bag of teaching tricks, including creating engaging lectures, demonstrations, and experiences for the students in their classes. Furthermore, my goal was to design a study with as much experimental restraint as possible, while balancing as many elements of authenticity as I could address. For the purpose of these experiments, I made decisions about how material was initially presented that I would not likely have made if I had not been collecting data on these students as part of a rigorous experiment. Specifically, I limited the students’ abilities to ask questions, share stories, or make comments during the lecture. Students were asked to write their questions or comments on notecards so that I could address them at the end of the study during our debriefing. The lectures were scripted to ensure that each time they were given, all key facts were spoken or delivered to the students. This does not account for the basic pedagogical dilemma that I also experienced: Just because I said it from the front of the classroom does not mean it was received by the students, much less learned and added to their mental model of understanding. Though these procedures served to protect the integrity and consistency of the lecture, I believe they negatively affected the power of the initial teaching experience.

This study also limited any exposure of material during the interval between initial learning, retrieval practice, and final assessment. Butler (2010) suggests that a critical mechanism of the testing effect may be the successful retrieval of information during the initial learning session. Feedback provided to learners following each testing session remains important as it allows learners to correct errors and improve retrieval on subsequent test sessions. In this study, the procedures eliminated any opportunity to find indirect benefits of testing, such as increased motivation to study more or supplemental material as a result of the feedback delivered
in the learning phase. Further, the participants received feedback on their performance through a self-scoring activity. It is possible that all participants did not complete the scoring of their entire activity, or that the participants did not put forth sufficient effort to attend to the self-scoring activity, thereby limiting the benefit of the feedback activity. Therefore study procedures and design may have significantly limited the metacognitive benefit of retrieval practice (For more on the benefits of learning from feedback see Butler, Karpicke, & Roediger, 2008; Kornell, Hays, & Bjork, 2009; McDaniel & Fisher, 1991; Pashler et al., 2005).

Any exploration retrieval practice of learning must consider the ways in which learning is measured on the final assessment or criterial test. A major assumption held by some educators is that a learner’s ability to recall facts is reflective of an extensive mental model. Though this may be true, one’s ability to draw upon this mental model may complicate their ability to utilize the information held in memory. The scoring procedures used for grading final assessments also impact our ability to interpret the degree to which learners’ retained target material. Could a student achieve a high/reasonable score without drawing upon facts, but simply by constructing a coherent, logical response? The bigger question of course is how does one measure true learning? While format of the study activities might matter, the final assessment format might also matter. In part, this is a question of transfer. In part, this is a question of the validity of the final assessment in capturing learning. Perhaps learners could have found success on this final assessment without increased knowledge at all. Restated, perhaps learners would not realize an advantage on the final criterial assessment even if they retained increased numbers of facts.

In the interest of utilizing authentic assessment, and in order to get buy-in from faculty whose classes were offered for this study, scoring rubrics were designed to standardize scoring to the greatest extent possible. In the scoring with the Fact Count rubric, it was possible that one
aspect of learning may have been overlooked. Therefore, an additional scoring rubric (Standard Course) was designed to capture, albeit even more subjectively, conceptual learning according to the learning objectives. I argue that this approach, measuring both fact and key concept learning, allowed exploration of complementary constructs of learning. This will be an important consideration for future examination of retrieval practice in authentic classrooms. In this type of translational research, scoring and assessment will need to match practice, yet allow for rigorous evaluation of learning.

Scoring with the Fact Count rubric did not seem authentic to me nor to those instructors who allowed the study to take place within their courses, but it was selected initially as it was reasonably objective and based on extant literature. This type of scoring indicated that learners retained less than 20% of material taught in lecture. Unfortunately, when data were initially scored using a Fact Count rubric, we observed a floor effect. Perhaps the lack of significance was masked by this overall low amount of learning. Scores appeared low, so it was likely that learning was also low. My general sense, and that of the course instructors who were asked for feedback after reviewing some final assessment responses, was that learning had in fact occurred, but the mechanism for scoring was not capturing all the learning. Was it that scores were low because the rubrics were so objective and restrained that the scorers could not give credit to students for evidence of general learning, or for evidence of fact learning with some misattributed details? To address this concern, I designed an alternative scoring rubric, Standard Course, to capture the extent to which each participant’s response addressed the a priori primary learning objectives.

The scoring of data in this study raised concerns relative to grading in authentic classrooms. It became clear that how educators grade in practice differs from how data were to
be scored to ensure valid and consistent scoring of all participants. How educators assess and grade in practice might be quite different from how they were trained, or how we ought grade to ensure fair, reliable scoring of all student work. Furthermore, grading for the purpose of assigning exam and course grades differs from grading to determine recall of specific pieces of information. Initially, using a rigorous scoring procedure, based on extant literature and past research, all student responses were evaluated for the number of facts included. It was my sense, and that of several course instructors, that the fact count learning did not capture the full extent of student learning. For example, some of the student responses contained the very language delivered by me during the initial lectures or the very wording included on the lecture slides. Other student responses indicated a general sense of understanding but lacked the specificity of language required to award credit on the fact count rubric. These observations were the impetus for the development of a scoring rubric to capture a different construct of learning. In future studies with this population, setting, or course content, it may be important to assess learning from a broader view, in addition to the measurement of specific facts in order to fully appreciate the learner’s growth and potential benefit of retrieval practice.

The open-ended assessments like those used in this study are less objective precisely because there is more than one potential correct response. The inherent subjectivity of these assessment forms may undermine the ability to use them as reliable tools to assess knowledge across different content, learners, time intervals, etc. While this may be a discussion appropriate for another context, these assessments were chosen for this study because they are, in fact, the type of assessments utilized in real deaf education teacher preparation programs. Whether or not this is a best or evidence-based practice was beyond the scope of this study, but is presented for the reader’s contemplation in the Implications section.
In Experiment 2, the final assessment contained test questions identical to the quiz questions utilized in the study phase. Future research will need to include rephrased or new questions (initially non-tested items) during the final test to explore the effect of retrieval practice and isolate the possibility that learners were merely memorizing quiz questions. However, if pure memorization was a legitimate concern in either experiment, we might expect ceiling performance across conditions. This was not demonstrated, as performance ranged from approximately 6% to 74% accuracy across all conditions, with immediate feedback provided to participants during each aspect of the learning phase.

Finally, while the results of these experiments did not reach statistical significance, this was expected given the limited sample size. Sample sizes of 20 and 26, experiments 1 and 2 respectively, would have been necessary to obtain statistical power at the recommended .80 level (Cohen, 1988). Small sample sizes are common in research in deaf education and across all low incidence disabilities. Thus, research among the professional preparation programs which prepare teachers to serve this low-incidence population are also limited in sample size, as the number of educators entering this field is also modest. These small sample sizes should be acknowledged for their limitation on randomized controlled experimental designs, but researchers should be challenged to find innovative designs to optimize the potential for finding effects. Despite the limited sample, this work remains important to inform and evolve professional preparation of deaf educators, and to inform cognitive psychologists interested in the scholarship of teaching and learning.
Implications

The present study makes several contributions to the current literature on retrieval practice with relevant implications for educational practice. This work provides evidence of an investigation of retrieval practice in an authentic environment, namely a pre-professional deaf education teacher preparation program. The study did not replicate robust retrieval practice effects in a real-life classroom environment with real learners and authentic assessments of applied knowledge, requiring us to focus on the translation of research to practice. In addition, this study affirms the need for contemplation of effective pedagogical practices in instruction and assessment in deaf education. The results suggest that learners prefer retrieval practice, even when their performance does not differ statistically from non-retrieval practice conditions as evidenced by participant questionnaire responses. Finally, the study illuminates necessary next steps and methodological considerations for future research.

Previous research established the use of retrieval practice to promote learning in labs and some classrooms. Additionally, the retrieval practice literature suggests the possible transfer of fact to application learning (Butler, 2010; Carpenter, 2012; Rohrer et al., 2010). The present study used authentic materials and assessment forms to see if laboratory findings would translate to real classrooms. This was explored across real classrooms, with different learners, different content, typical course schedules, and authentic assessments. This study was conducted with consideration of achieving the highest level of authenticity, by using authentic materials in terms of quantity of information presented in a given lecture and content of lecture, while being embedded within real graduate classrooms following the typical course schedule for instruction and assessment of learning. Students did not participate in this study by consenting to additional out of course work or time commitments. Instead retrieval practice was embedded within
existing courses, and effects of this study condition were evaluated as part of standard graduate study. Furthermore, the retention intervals, or time between study and final assessment, were authentic as they followed the typical time span across a course syllabus, with instruction happening in condensed, content-rich lectures, and with assessment following several weeks later in the semester.

By identifying content areas that were relevant to the program, I had an opportunity to evaluate a powerful learning strategy and the possibility of promoting optimal retention in the context of real courses with real learners. With meticulous attention to scripting a lecture, matching study materials and final assessments to those scripts and learning objectives, there were no statistical differences by study condition, yet there were statistical differences by content area, despite careful counterbalancing.

Authenticity was also achieved in Experiment 1 through utilization of study-assessment mismatches; meaning novel question prompts were used to measure how much information was retrieved. In Experiment 1, the same question prompts were not used for the learning phase and final assessment. The use of a case-scenario prompt for the final assessment in Experiment 1 is a prime example of the attention to authenticity as the use of case study exemplars are common assessment form in educator preparation programs. They are thought to provide students with an opportunity to apply their learning in a more realistic way than directly asking to recall factual information. While the use of matched question forms from learning phase to final assessment are worthy explorations, and were utilized in Experiment 2, they are less authentic educationally. Instructors usually avoid exposing the learners to the exact question forms prior to the assessment. One potential pitfall of case-scenario assessments, or any contextualized free-recall open response type of prompt, is that with a wide range of reasonably acceptable correct
responses, the final assessment may or may not provide an opportunity for a student to demonstrate achievement of learning objectives, depending on how that student chooses to respond to the open-ended prompt.

If authentic final assessments require integration of knowledge in a scenario open-ended response, it is uncertain whether quiz questions, which match that format, would be more or less beneficial than more structured quiz questions, which promote retrieval of specific facts. Thus, it remains unclear which types of questions educators should use with their students to gain the most benefit from retrieval practice. The format of questions utilized in the retrieval practice conditions of Experiment 1—low versus high support prompts—did not appear to affect learning to a significant degree. Without observable differences in performance, educators might consider use of the retrieval practice format that is the easiest to construct or most preferred by learner. Both Experiment 1 and 2 suggest that retrieval practice can promote learning, as for some individual learners overall mean scores as well as the change in score from immediate practice to final assessment were greater for those using retrieval practice than not.

Finally, this study makes a unique contribution to the work on retrieval practice by implementing an investigation of this kind with a previously unstudied population of pre-professional educators. The potential cascade of impact is great: When effective teaching practices are used in teacher preparation programs, future teachers become familiar with these practices and may go on to utilize them in their own teaching. A sort of cross-pollination of literature research has occurred as a result of this investigation, namely bringing work of prominent cognitive psychologists together with highly specialized educators of the deaf to investigate the implementation and evaluation of research-based instructional strategies in practice. Innovative instructional strategies are a common topic of discussion in educator
preparation programs. By working with the university instructors to design and implement this study, and by debriefing the future teachers following their participation in this study, I contend this study has contributed to translating research-to-practice. These educators are now more aware of the important research happening in the field of cognitive psychology and of their important role in participatory research of this kind.

If the improvement of learning is a primary goal, should educators dedicate class time for retrieval practice in order to promote learning? The results from Experiment 1 and 2 do not give us a clear, complete answer to that question. However, these two experiments have contributed to our understanding of the potential use of retrieval practice in classrooms. While retrieval practice did not have a significant effect on learning in the current study, perhaps due to effects of the materials and low number of subjects, it has previously been demonstrated to have both direct and indirect effects on learning. Educators are encouraged to continue to explore the effect of retrieval practice on learning in their classrooms by incorporating frequent low-stakes testing into their instruction. Educators are encouraged to do so, as the amount of time necessary to implement such an instructional strategy is minimal compared to the potential gains in retention for certain learners.

It is educationally relevant, although not statistically significant, that the difference in learning as evidenced by final mean scores were discrepant enough to result in potential grade letter changes when retrieval practice was used for study. While study condition differences were not statistically significant, the group mean differences were enough to convince me that students would care to use retrieval practice if they thought it could benefit them. Students care about grades. Instructors care about grades. This is part of the culture of education. If retrieval practice gave even a slight advantage, potentially wholly from indirect effects relative to study behavior,
then it has the potential to impact learning to the extent that assessment scores could impact grade significance. Scores differing by ten percentage points are educationally relevant to students and faculty, even when not significant on inferential statistical tests. Instructors may hesitate to use retrieval practice in lieu of more common strategies to promote active engagement, such as small group work, discussion, or hands-on projects. However, plenty of research suggests retrieval practice is in fact a reasonable way of actively engaging learner processing (Agarwal et al., 2012; Karpicke & Blunt, 2011). Instructors may be more willing to implement these techniques in classrooms if they continue to see these results coming from their students, with their materials. Hence, this is one of the primary motives for investigating the use of retrieval practice in authentic classroom contexts. However, in order to execute this study amid a real classroom, with real learners, and real content, while optimizing experimental control, a fair amount of restriction was placed on the learner-instructor engagement. The instructor read from a script and asked learners to save questions for an end-of-experiment debriefing session. Learners did not self-select study activities. They were not actively engaged during the lecture, beyond their own personal investment and attention towards the lecturer’s delivery of content. There was a strict limit on any instructor-learner discourse during the experiment. All of these aspects make the experiment relatively inauthentic in regards to real classroom instruction. Future exploration of this topic might embed retrieval practice among other engaging instructional approaches.

Emerging literature suggests retrieval practice only enhances similar items across initial quizzes and final tests (Hinze & Wiley, 2011). The retrieval practice materials used in this study may not have engaged enough retrieval processes to enhance transfer of knowledge from low or high support quizzes to application in assessment. This study utilized both contextualized free-
recall and short-answer prompts in the retrieval practice materials in order to compare potential differences between low support (low preparation, easy for instructors) and high support prompts. The type of question prompt to be used for retrieval practice is an important consideration for the potential benefit each prompt type might provide to learners. Additionally, a valid concern with any instructor-created materials stems from the amount of time it takes to prepare and grade these types of materials. This balance of time and efficacy is a precise example of a consideration resulting from the translation of research findings acquired in labs with carefully constructed (or contrived) materials to authentic classroom environments.

Though retrieval practice might be really helpful for some courses, it might be difficult to implement in other courses. Perhaps the implementation of retrieval practice will differ depending on the nature of the course. For example, fact-based courses may already include more frequent assessment through multiple-choice prompts, whereas more theoretical courses include alternative forms of assessment, such as comprehensive papers or presentations. We still do not know if retrieval practice has the potential to aid one course type over another, just as it remains unclear if retrieval practice can aid learning of some content types to a greater extent than others. If we can continue to experiment with learning and instruction, we will learn more about learning and instruction. If we shy away from this type of applied, translational research, we will risk stagnation across our field.

One of the most exciting conclusions to draw from this work is the promise that research is possible in the deaf education pre-professional environment. While the type of retrieval practice did not indicate statistically significant differences, continued rigor in experimental investigation of this strategy is warranted among professional deaf education teacher preparation programs. One potential extension of this work is to identify the material currently being
assessed in pre-professional programs through multiple-choice or short-answer tests (e.g. Praxis, Certified Listening and Spoken Language Specialist Exam) to determine if retrieval practice could aid in this type of learning.

The rigorous exploration of the effects of our instructional practices raises concern for how we teach and measure learning. This study utilized material-rich, 30-minute lectures, which were consistent with standard teaching practice, though the present results serve to remind us this type of instruction may not be ideal for promoting deep initial learning. However, a content-rich 30-minute lecture, or three of them as was the case in Experiment 1, is still just a drop in the bucket compared to the vast quantity of material, spanning the breadth and depth of instruction embedded in an entire semester long course. I remind the readers that the lectures utilized in this study were typical and authentic. Instructors at the graduate level talk a lot, with the intention of transferring vast amounts of information in a short time period. An even more authentic lecture might be one with in which instructors organically follow students’ lead asking and answering questions while sharing of personal narratives to illuminate key points. The results of this study prompt us to pause and reflect on some important pedagogical considerations: Are we teaching in the best way?

The complexities of university level instructional pedagogical approaches also complicate the implementation of classroom-based research as well as the conclusions we can draw from such studies. In real classrooms, it is rare that one single instructional strategy is exclusively used; rather, most instructors utilize an overlapping constellation of instructional approaches. However, to preserve the rigor of an experimental design, the researcher and instructors had to agree on reasonable restrictions on typical instruction in order to optimize the chance of isolating an effect. As previously stated, university deaf education programs do not
typically use scripted curricula, leaving much autonomy to individual instructors. Instructional materials are most often created entirely by the course instructor, and recreated semester after semester as teaching practice evolves, policy changes, and learners’ experiences change. It is unlikely instructors would buy into any noble effort to create a corpus of multiple-choice questions that are both relevant and up-to-date. For example, professionals in the field of deaf education have expressed a fair amount of skepticism stemming from the efforts of one international professional organization that created a professional certifying exam and accompanying study materials. For years, instructors in these pre-professional programs had the autonomy to teach what content they deemed important while utilizing the instructional approaches they deemed valuable. Any attempts to alter this autonomy, or strive for mutual evidence-based reform will need to proceed with caution and thoughtfulness.

Since the results of this study indicate that question format, or quiz type, did not seem to effect learning to a significant degree, instructors may be able to use the retrieval format that is easiest to construct. It is unlikely that relevant textbooks in deaf education are accompanied by question banks or a companion website as they might in large enrollment courses in fields such as psychology, or other basic sciences. In deaf education programs, it seems that instructors create much of their own instructional materials, including lecture notes, PowerPoint handouts, or collections of assigned readings. An instructor’s decision to include retrieval practice in their classrooms may depend quite practically on the time she has available to develop necessary materials and assessments, along with any institutional guidelines or constraints.

As indicated by the participant comments on the follow-up questionnaire, learners are willing to use retrieval practice without knowledge of their own performance, as these responses were gathered immediately after the final assessment, without learner’s receiving feedback on
their final performance. These findings suggest potential promise for the scaling up of retrieval practice in the future, given that learners are generally accepting of this strategy. Learners indicate a preference for retrieval practice, even when their performance does not differ statistically from non-retrieval practice conditions.

The results from the questionnaires indicate that learners do in fact have opinions about the use of retrieval practice. We might capitalize on those learner opinions by adapting our classroom instruction. Instructors might consider dedicating class time to instructional strategies, such as retrieval practice, as these may in fact improve outcomes for learners. It remains important to consider in-class time an opportunity for enhancing learning, rather than simply disseminating information. The students ought not be limited to exclusively out-of-class learning and study. The questionnaire results imply that learners prefer retrieval practice, even when their performance does not differ statistically from non-retrieval practice conditions. Further exploration of individual learning differences may yet reveal potential promise for the scaling up of retrieval practice in the future, if learners are accepting of this strategy and realize its’ benefit to their own scores and grades.

The impact on future research is also a worthy one. It is difficult to conduct translational work, especially when the translation from laboratories requires implementation in real classrooms. Obviously, classroom research can be done elegantly and effectively (See the example from (Agarwal et al., 2012). To do this translational work effectively, one must secure strong collaboration between researchers and educators and carry out extensive preparation relative to the counterbalancing and experimental design. There are many practical considerations involved in preparing for research of this kind. In order to successfully implement a study of this kind, I had to enlist the support and buy-in from all levels of university faculty,
including the program director as well as the instructors responsible for course content. Throughout this process, the importance of participating in translational research has become very clear to me. Educators need both an adventurous spirit, along with the humility to critically review their own teaching practice, in order to open their classrooms to research. Along with the perceived risk involved in engaging in educational research, comes the promise that results may serve to improve one’s pedagogical practice. Getting practice-minded university instructors to buy into this sort of work was not without some effort, for it is risky for some instructors to relinquish their instructional time to research practices. Despite utilizing research articles as assigned readings and descriptions of evidence-based practices in our teaching of pedagogy to the pre-professional students, instructors may still feel leery of engaging in the very research that leads to those evidence-based practices.

A plethora of additional variables, yet unstudied, provide prospect for future exploration of the effects of retrieval practice in authentic learning environments. Though I was tempted to explore any number of additional variables, such as number of study sessions, interval between study practice, or assessment question prompts, given what I now know about the limitations of materials and measurement of learning, it seems these are all going to be worthy aims for future iterations of translational work on retrieval practice. Exploration of individual learner variables such as degree of prior knowledge, learning preferences, grade point average, and college entrance exam scores, may also yield important considerations for the general applicability and relevance of the use of retrieval practice. This study design limited my ability to fully explore these individual differences, but this type of exploration is certainly necessary for future investigation especially as educators consider the potential benefit of retrieval practice as a mnemonic enhancer for a variety of diverse learners.
Future studies could explore the effects of retrieval practice while significantly limiting the quantity of content initially taught. Though I defend my choice to prepare lectures that were chock full of content, I know this is not necessarily an ideal pedagogical practice. Instead, we need to provide students with repeated exposures to material, opportunities to engage, reflect, contemplate, and critique instructional content. Going forth, researchers might design materials which will allow for significant retrieval of content at the immediate exposure to retrieval practice activities, as the power of retrieval practice may in fact come in limiting forgetting of that content, rather than as an aid to initial learning. Secondly, researchers might consider increasing the number of retrieval practice opportunities, along with the corresponding exposure to content afforded by the standard study controls. With identified goals of authentic long-term retention of material (intervals of weeks and months), increased opportunities to retrieve will likely boost power of retention. Work by Pyc & Rawson (2010, 2012) has explored the desired frequency for optimal gain. Though no prescriptive conclusion has been derived from this work, it seems between five and seven opportunities, both spaced and effortful, are needed to achieve optimum benefit.

Finally, future study might focus on exploration of the extent of initial learning, along with the degree of forgetting, over a longer period of delay. In pre-professional preparation programs, we want learners to acquire and retain vast amounts of information during their time as a student. Then we want them to carry this knowledge with them for use during student teaching and eventually when they are employed in their real teaching position. When working with such diverse populations, it is conceivable that learners would not need to retrieve all of the facts or concepts previously learned on their first day of on-the-job teaching. The future professional may not even need to retrieve some of this information during their first month or
even year of practice. However, we do want them to retrieve it eventually. There is no doubt that there are other ways, beyond the use of retrieval practice, to enhance the strength of encoding or robustness of learning, namely exterior factors, such as quality professional development, experience teaching a colleague, or even experience explaining to a caregiver. Irrespective of these additional experiences that can enhance a pre-professional’s learning, in the most general sense, we want learners to retain the information they learn in university classes for a very long time. Future studies exploring the extent of interleaving and quantity of retrieval practice can help us identify how we might enhance both instruction and learning.

Given the results of this study, is retrieval practice recommended for use in university classrooms? The answer is likely, “Yes.” Will it remain important to monitor the effectiveness of retrieval practice implementation? Certainly. As an instructor considers the potential risk-benefit balance, one could conclude that the implementation of retrieval practice can take place without an impossible investment of time and effort. In this study, the use of retrieval practice did not harm learning. Though it might not be worth an instructor’s time to give students in-class time to reread their notes or review sheets, there is likely benefit of devoting in-class time to retrieval practice. Why? Those indirect effects of retrieval practice alone, which were not formally assessed in this study, including increased motivation to prepare, study, and change study based on feedback, show promise. If instructors can engage students in ten to fifteen minutes worth of class activities, which might boost their confidence through successful retrieval, or shake their confidence with unsuccessful retrieval attempts, then learners might be motivated to alter their out-of-class study practices. Additionally, a strong motivator to engage students in retrieval practice activities is the benefit the instructor would receive by having concrete data on student performance, during the formative learning phase. This type of performance data would be
enlightening to the course instructor allowing her to alter teaching as necessary. It may be
humbling for instructors to see learning quantified in this way, specifically how much, or how
little, learning is occurring as a result of their instruction. This type of formative assessment is
undeniable. Initial learning rates as low as some of those observed in this study would
significantly impact my own teaching if I had observed them from students in my courses. I
would have certainly revised my teaching, by building in greater redundancy or by exploring
alternative avenues of active engagement...all in the name of promoting student learning.
References


doi:10.1037/a0021204


doi:10.1111/medu.12274


doi:10.1207/S15328023TOP2903_06


Schneider, V. I., Healy, A. F., & Bourne, L. E. (2002). What is learned under difficult conditions is hard to forget: Contextual interference effects in foreign vocabulary acquisition, retention, and transfer. *Journal of Memory and Language, 46*(2), 419–440.


### Tables

#### Table 1. Experiment 1, Percentage Correct, Fact Count Scoring

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Note. Standard error in parentheses.

#### Table 2. Experiment 1, Percentage Correct, Standard Course Scoring

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Note. Standard error in parentheses.

#### Table 3. Experiment 2, Percentage Correct, Fact Count Scoring

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<td>Final</td>
</tr>
<tr>
<td>High Support Retrieval Practice</td>
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<td>29.4 (0.05)</td>
</tr>
<tr>
<td>Standard Study</td>
<td>-</td>
<td>22.4 (0.02)</td>
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Note. Standard error in parentheses.

#### Table 4. Experiment 2, Percentage Correct, Standard Course Scoring

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<th>Case Scenario</th>
<th>Learning Phase</th>
<th>High Support</th>
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Note. Standard error in parentheses.
## Appendix A

*Experiment 1 Counterbalancing*

<table>
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<tr>
<th>Low Support Retrieval Practice (LS)</th>
<th>Mandated Reporting of Child Maltreatment</th>
<th>Impact of Poverty on Brain Development</th>
<th>Changing Communication Modalities</th>
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</thead>
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<td>Group B</td>
<td>Group C</td>
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<tr>
<td>High Support Retrieval Practice (HS)</td>
<td>Group C</td>
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<tr>
<td>Standard Study (SS)</td>
<td>Group B</td>
<td>Group C</td>
<td>Group A</td>
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Appendix B.
Lecture Slides and Participant Handouts

Mandated Reporting of Child Maltreatment Lecture Slides

Learner Objectives:

- Understand professional responsibilities of being a mandated reporter
- Recognize signs and symptoms of abuse and neglect
- Describe the process of reporting suspected child abuse/neglect (CA/N)

Child Abuse Prevention and Treatment Act (CAPTA) Definition:

"Any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm"

Child Welfare Information Gateway (2007a)

*See state-specific definitions at http://www.childwelfare.gov/systemwide/laws_policies/state/

Definition of each category of abuse:

- Physical Abuse: "any non-accidental physical injury to the child"; can include striking, kicking, burning, or biting the child, or any action that results in a physical impairment
- Neglect: defined in terms of deprivation of adequate food, clothing, shelter, medical care, or supervision
- Psychological maltreatment: All States and territories except Georgia and Washington include emotional maltreatment as part of their definitions of abuse or neglect
- Sexual Abuse/Exploitation: "The employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; or The rape, and in cases of caretaker or interfamily relationships, statutory rape, molestation, prostitution, or other form of sexual exploitation of children, or incest with children"
Who are we talking about?

Child Maltreatment Report, 2011:
676,559 unique victims nationally

- Child risk factors:
  - The youngest children are the most vulnerable to maltreatment.
  - Children with disabilities are at increased risk.
  - Disability - 16% of victims

- Caregiver risk factors:
  - Alcohol abuse - 9.8% of victims
  - Drug abuse - 18.6% of victims
  - Domestic violence - 25.1% of victims

Why don't we report?

- Early Childhood (Melmed, 2004)
  - Lower social competence
  - Show less empathy
  - Have difficulty recognizing the emotions of others
  - More likely to be insecurely attached to their parents
  - Demonstrate deficits in IQ scores, language abilities and school performance

- School-aged (Wang, Holton, 2007)
  - Poor physical health: chronic fatigue, altered immune function, hypertension, sexually transmitted diseases, obesity
  - Social difficulties: insecure attachments with caregivers, which may lead to difficulties in developing trusting relationships with peers and adults later in life
  - Cognitive dysfunctions: deficits in attention, abstract reasoning, language development, and problem-solving skills, which ultimately affect academic achievement and school performance
  - Behavioral problems: aggression, juvenile delinquency, adult criminality, abusive or violent behavior
Barrier 1

- Disproportionate impacts on those with disabilities
  - CA/N is experienced by 9% of children without disabilities vs. 31% of children with disabilities (Sullivan & Knutson, 2000).

- Child fatalities
  - In 2011 – 1,545 children died from abuse
  - Impacts the young: 81.6% were under age four; Children less than one year have the highest rate of victimization.

Barrier 2

- What are the signs and symptoms?
  - Providers don’t feel confident about such signs to “trust their gut”

- Eliminate ignorance as an excuse for lack of reporting by learning the signs and symptoms.
  (Child Welfare Information Gateway, 2007a)

Barrier 3

- I don’t know how to make a report.

- In 2011, education, legal/law enforcement, social services, and medical personnel accounted for 57.6% of all reports.
  (Child Maltreatment Report, 2011)

- Most (87%) educators submit reports to school officials vs. Child Protective Services (CPS), with less than 30% of suspected cases subsequently shared with CPS.
  (Crosson-Tower, 2003)

Barrier 4

- I don’t think my report will make a difference.

- Maltreatment does not increase as a result of reporting
  - Less than 3% of reported cases result in children being removed from the home (Alvarez, et al, 2004)

- Most (76%) educators do not think that their administrators will support them if they made a CA/N report (Kenny, 2004).

- All states provide immunity to those professionals who report CA/N in good faith (Alvarez, et al, 2004).
Concerns remain, however:

- Insufficient CPS data collection and training concerning the documentation, recognition, and response to CA/N as experienced by children with disabilities (Alvarez et al., 2004; Hornor-Johnson, & Drum, 2006; Kendall-Tackett, Lyon, Tallaferrro, & Little, 2005)
- Re: sexual abuse - educational systems frequently disbelieve victims, and fail to effectively deal with perpetrators (Shakeshaft, 2004)

Mandated reporters - designated professions, generally with frequent contact with children, whose members are mandated by law to report child maltreatment

- Legal obligation to report if individual suspects 'or has reasons to' believe that a child has been abused or neglected

Physicians, medical examiners, coroners, dentists, chiropractors, optometrists, podiatrists, residents, interns, nurses, hospital and clinic personnel, or other health practitioners

- Daycare center workers or other child care workers, teachers, principals, or other school officials

Psychologists, mental health professionals, or social workers

- Ministers including clergy persons, priests, rabbis, Christian Science practitioners, or other persons serving in a similar capacity for any religious organization

- Juvenile officers, probation or parole officers, peace officers, law enforcement officials, or jail or detention center personnel

- Other persons with responsibility for the care of children

- Commercial film and photographic print processors, computer providers, installers, or repair persons, or Internet service providers

Fact Sheet: Recognizing child abuse and neglect: Signs and Symptoms.

http://www.childwelfare.gov/pubs/factsheets/signs.cfm

Child Welfare Information Gateway (2007b)
**Signs of Physical Abuse**
- Consider the possibility of physical abuse when the child:
  - Has unexplained burns, bites, bruises, broken bones, or black eyes
  - Has fading bruises or other marks noticeable after an absence from school
  - Seems frightened of the parents and protests or cries when it is time to go home
  - Shrieks at the approach of adults
  - Reports injury by a parent or another adult caregiver

**Signs of Neglect**
- Consider the possibility of neglect when the child:
  - Is frequently absent from school
  - Refuses to eat or to eat enough
  - Lacks needed medical or dental care, immunizations, or glasses
  - Is consistently dirty and has severe body odor
  - Lacks sufficient clothing for the weather
  - Absents alcohol or other drugs
  - States that there is no one at home to provide care

**Signs of Psychological Maltreatment**
- Consider the possibility of psychological maltreatment when the child:
  - Shows extremes in behavior, such as overly compliant or demanding behavior, extreme passivity, or aggression
  - Is either inappropriately adult (parenting other children, for example) or inappropriately infantile (frequently rocking or head-banging, for example)
  - Is delayed in physical or emotional development
  - Has attempted suicide
  - Reports a lack of attachment to the parent

**Signs of Sexual Abuse**
- Consider the possibility of sexual abuse when the child:
  - Has difficulty walking or sitting
  - Suddenly refuses to change for gym or to participate in physical activities
  - Reports nightmares or bedwetting
  - Experiences a sudden change in appetite
  - Demonstrates bizarre, sophisticated, or unusual sexual knowledge or behavior
  - Becomes pregnant or contracts a venereal disease, particularly if under age 14
  - Runs away
  - Reports sexual abuse by a parent or another adult caregiver

**Signs of Sexual Abuse**
- Consider the possibility of sexual abuse when the parent or other adult caregiver:
  - Is overly protective of the child or severely limits the child's contact with other children, especially of the opposite sex
  - Is uncooperative and isolated
  - Is jealous or controlling with family members
Take Action — Observe and Respond
(Child Welfare Information Gateway, 2007)

**OBSERVE**
- the child
- the parent
- the parent/child interactions

**RESPOND**
- Recognize and Respond!
  -Notify Child Protective Services (CPS), often referred to as the Children’s Division.

- Be sure you have:
  - the name of the child
  - the name of the parent(s)
  - the name of the alleged abuser
  - where the child can be located

- You will also be asked:
  - Is the child in a life-threatening situation now?
  - How do you know about the abuse/neglect?
  - Did you witness the abuse/neglect?
  - Were there other witnesses and how can they be contacted?

How do I report a suspected case of CA/N?

- Missouri: Toll-Free: (800) 392-3738
  [http://www.dss.mo.gov/cd/rptcan.htm](http://www.dss.mo.gov/cd/rptcan.htm)

- Illinois: Toll-Free: (800) 252-2873
  [http://www.state.il.us/dcf/child/index.shtml](http://www.state.il.us/dcf/child/index.shtml)

What should you do when you suspect abuse or neglect?

What if you’re unsure?

The National Childhelp Hotline:
1-800-4-A CHILD (1-800-422-4453)
[http://www.childhelp.org/hotline](http://www.childhelp.org/hotline)

Standards for Making a Report
(Rev. 10/14, 8/5/13, 1/25/12)
A report is required when:

- A reporter has reasonable cause to suspect that a child has been subjected to abuse or neglect.

- A reporter observes a child being subjected to conditions or circumstances that would reasonably result in abuse or neglect.

- A commercial film and photographic print, process, or electronic image or picture depicting a child engaged in an act of sexual conduct.
Do I have to identify myself?

- In MO, since 2004, mandated reporters may no longer make anonymous calls to the Hotline.
- If not a mandated reporter, consider identifying yourself.

How does maltreatment impact development and service delivery?

- Increased risk for population we serve
- Long term consequences (regardless of CA/N type):
  - Physical and psychological: brain damage, cognitive delay, emotional difficulty, depression, anxiety, manifestations as high risk behaviors which perpetuates physical health problems
  - Societal:
    - Direct costs: maintaining child welfare system, judicial, law enforcement, health, mental health costs
    - Indirect costs: juvenile and adult criminal activity, mental illness, substance abuse, domestic violence, under/unemployment, special education, increased use of health care system
  (Child Welfare Information Gateway, 2007c)
- Ignoring CA/N increase the length and impact of the abuse.
Mandated Reporting of Child Maltreatment Handout

Learner Objectives:
- Understand professional responsibilities of being a mandated reporter
- Recognize signs and symptoms of abuse and neglect
- Describe the process of reporting suspected child abuse/neglect (CA/N)

Child Abuse Prevention and Treatment Act (CAPTA) Definition:

"Any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm"

*See the specific definition at [Child Welfare Information Gateway][1] (2009a)

Definition of each category of abuse:

- Physical Abuse: "Any non-accidental physical injury to the child", can include biting, burning, burning, or injuring a child, or any act that results in a physical impairment.
- Neglect: defined in terms of deprivation of adequate food, clothing, shelter, medical care, or supervision.
- Psychological maltreatment: all states and territories named neglige and Washington include emotional maltreatment as part of their definitions of abuse or neglect.
- Sexual Abuse/Exploitation: "The employment, use, persuasion, inducement, enticement, or coaxing of any child to engage in, or any attempt to force any child to engage in, any sexual conduct, including, but not limited to, sexual intercourse, oral-genital, oral-anal, and/or genital-anal sex with another person, including a child

[1]: https://www.childwelfare.gov/pubs/online/onlinenosaes.asp
Who are we talking about?


65% of all victims nationally:

- **Children:**
  - The young, ages 0-17, are the most vulnerable to maltreatment.
  - 14,500 children are killed annually.
  - 26,000 die from child abuse.

- **Companion Risk Factors:**
  - Age: 5-14 is the most likely to be killed.
  - Race: 18% of victims are from the black race.
  - Economic status: 33% of victims.
Why don't we report?

I don't think this is a real problem
I don't know how to recognize child abuse and neglect (CA/N)
I don't know how to make a report
I don't think my report will make a difference

Barrier's

Daily On-hand (Mahmud, 2004)
Universal Social competence
Share knowledge
Have difficulty recognizing the emotions of others
Personal, academic, or social pressure
Demonstrates effects on academic, language abilities, and school performance
School aged (Wang, Kohn, 2007)
Poor play skills, chronic fatigue, altered immune function, hyperactivity, sexually transmitted disease, obesity
Cognitive and behavior difficulties associated with gang activities with young children and abuse, and families are diverse in their experience and expression of trauma
Dysfunctional family structure, triad dysfunction, and family activities
Counselling programs, support for children and families, and children's rights

Disproportionate impacts on those with disabilities
CA/N is experienced by 9% of children without disabilities vs. 31% of children with disabilities (Sullivan & Fruton, 2005).

Child fatalities
In 2013 – 1,345 children died from abuse
Impacts the young: 81.6% were under age four; Children less than one year have the highest rate of victimization.
What are the signs and symptoms? Providers don’t feel confident about such signs to “trust their gut.” Eliminate ignorance as an excuse for lack of reporting by learning the signs and symptoms. (Child Welfare Information Gateway, 2007)

In 2011, education, legal/ law enforcement, social services, and medical personnel accounted for 57.6% of all reports. (Child Maltreatment Report, 2011)

Most [87%] educators submit reports to school officials vs. Child Protective Services (CPS), with less than 10% of suspected cases subsequently shared with CPS. (Crosson-Tower, 2005)

Maltreatment does not increase as a result of reporting. Less than 3% of reported cases result in children being removed from the home (Alvarez, et al, 2004)

Most [76%] educators do not think that their administrators will support them if they made a CA/N report (Kenny, 2004).

All states provide immunity to those professionals who report CA/N in good faith (Alvarez, et al, 2004).
So I'm a mandated reporter... What does this mean?

- Mandated reporters: designated professions, generally with frequent contact with children, whose members are mandated by law to report child maltreatment
- Legal obligation to report if individual suspects or has reasons to believe that a child has been abused or neglected

MULTI PROFESSIONAL GROUPS REQUIRED TO REPORT

- Physicians, medical examiners, or coroners, dentists, chiropractors, optometrists, psychologists, counselors, social workers, hospital and clinic personnel, or other health professionals
- Teachers, school counselors, or school psychologists
- Day care workers or center directors
- Police officers, parking enforcement officers, school officers, long-term care facility workers, or other personnel with responsibility for the care of children
- Law enforcement officers, judges, or public officials
- Other persons with responsibility for the care of children
What are potential signs of CA/N?

- Fact Sheet: Recognizing child abuse and neglect: Signs and Symptoms
  - Child Welfare Information Gateway (2007b)

### Signs of Physical Abuse
- Consider the possibility of physical abuse when the child:
  - Has unexplained burns, lacerations, bruises, or tears
  - Has listening to the story when a child is afraid to talk
  - Has difficulty sleeping or eating
  - Has strange or new behavior patterns
  - Has a history of abuse as a child

### Signs of Neglect
- Consider the possibility of neglect when the child:
  - Is frequently absent from school
  - Has difficulty making friends
  - Has difficulty eating or sleeping
  - Has difficulty fitting in with others
  - Has been neglectful of personal needs
  - Has a history of neglect as a child

- Appears hungry, disheveled
- Appears neglected
- Appears neglected
- Appears neglected
- Appears neglected
- Appears neglected
Signs of Psychological Maltreatment

- Consider the possibility of psychological maltreatment when:
  - Child shows signs of withdrawal or isolation.
  - Child shows signs of aggression, defiance, or hyperactivity.
  - Child shows signs of anxiety or depression.
  - Child shows signs of regression (such as enuresis or regressing in age-appropriate behaviors).

Signs of Sexual Abuse

- Consider the possibility of sexual abuse when:
  - Child shows signs of fear or anxiety.
  - Child shows signs of regression (such as enuresis or regressing in age-appropriate behaviors).
  - Child shows signs of withdrawal or isolation.

Take Action—Observe and Respond

- Observe the child, the parent, and the parent-child interactions.
- Respond to any concerns or observations.
What should you do when you suspect abuse or neglect?

- Recognize and Respond
- Notify Child Protective Services (CPS), often referred to as the Children’s Division
- Be sure to have:
  - the name of the child
  - the name of the parent(s)
  - the name of the alleged abuser
  - where the child can be located
- You will also be asked:
  - Is the child in a life threatening situation now?
  - How do you know about the abuse/neglect?
  - Did anyone witness the abuse/neglect?
  - Were there other witnesses and how can they be contacted?

How do I report a suspected case of CA/NP?

- Missouri: Toll Free: (800) 392-3738
  [http://www.des.mo.gov/CDF/rdcn.htm](http://www.des.mo.gov/CDF/rdcn.htm)
- Illinois: Toll-Free: (800) 212-2873
  [http://www.state.il.us/dr/dchild/index.shtml](http://www.state.il.us/dr/dchild/index.shtml)

What if you’re unsure?

[The National Childhelp Helpline](http://www.childhelp.org/index.html)

A record is required when:
- A report has been received from a source that is outside the child’s home
- A report has been received from a child care provider who has reason to believe
  suspicion of abuse may exist
- A report is made by a health or welfare provider where the treatment or care
  exceeds the scope of the practice

112
Deaf and Hard of Hearing Children Helpline: 1-800-224-4453

The helpline is the first effort to reach out to those disabled youth and to individuals who are aware of what might be happening to a disabled youth in their lives.

Disabled youth can interface with the helpline counselor via texting and chat options.

Do I have to identify myself?

In MC, since 2004, mandated reporters may no longer make anonymous calls to the hotline.

If not a mandated reporter, consider identifying yourself.

How does maltreatment impact development and service delivery?

- Increased risk for population served
- Long-term consequences (regardless of CA/N type)
- Physical and emotional harm, depression, cognitive delay, emotional disturbance, anxiety, no reflection as high-risk factor, which can be
- Increased health problems
- Susceptibility, increased risk within systems, public, law enforcement, health, medical facilities
- Increased trust, less mandated intake, mental stress, environment change
- Increased risk, not only immediate, loss or alienation, increased use of mental health systems
- Long-term consequences of abuse

Impact of Poverty on Brain Development Lecture Slides

Impact of Poverty on Brain Development

Learner Objectives:

- Describe the influence of recent research findings from neuroscience on our understanding of the influence of SES on brain development
- Identify brain changes observed in subjects from low SES environments
- Discuss potential protective factors which may serve to minimize the deleterious effects of SES on brain development
- Reflect upon how these findings might impact our service delivery to deaf/hh populations living in low SES

How does poverty impact brain development?

- Poverty
  - restricted environments
  - early and chronic stress experiences
- Biological and psychosocial risk factors
  - physical and mental health
- Inequalities in cognitive and socioemotional development
- Threatens educational attainment and adult productivity

Brain Plasticity

- What have we learned from animal models?
  - Environment matters!
    - Structural and functional changes between animals exposed to deprived vs. enriched environments
- Neuroplasticity – a good thing, or a bad thing?

Limbic system: emotion, behavior, motivation, long-term memory, olfaction

Key Structures:

- Amygdala – episodic memory, attention, emotion
- Hippocampus – spatial memory, consolidation of short-term/long-term memory
Stress

- Epigenetics - no change in the underlying DNA, but non-genetic factors cause the genes to behave (or "express themselves") differently
- Chronic stress (AKA toxic stress) leads to remodeling of hippocampal circuitry.
- Experiences program genes through epigenetic modification.

Key Points

- Adversity in low SES includes: crowding, hunger, threats to mental and physical health, insecure attachments, etc.
- Deprived environments
- Chronic, toxic stress
- Brain areas impacted: Prefrontal cortex, hippocampus, and amygdala
- Mechanism of brain impact: Epigenetic changes
  - Similar childhood experiences could produce different outcomes, depending on genes.

Language and cognitive control are the developmental systems most at risk for children in poverty.

(Hackman, Farah, & Meaney, 2010; Hackman & Farah, 2009; Lipina & Colombo, 2009)
**What do we know about attention?**

- Networks:
  - Alerting – obtain and maintain alert state
  - Orienting – orienting to sensory stimuli
  - Executive – resolving conflict between responses
- Connectivity and control of these networks depends on environmental factors.
- Attention Training: computer tasks or classroom curricula with ADHD or low SES; “changing brain state”

**Impact of SES on Attention**

- Children from low SES have reduced attention!
- Diminished working memory
- Diminished inhibitory control
- Reduced speed and accuracy of alerting and executive networks

(Lipina et al, 2005 & Mezzacappa, 2004)

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**What do we know about numeracy?**

- Infants have innate skills to recognize quantity.
- Discrimination of Quantity:
  - Responses made by infants and adults are similar.
  - Timing differs:
    - Adult recognition at 250 ms
    - Infant recognition at 300 ms

**Impact of SES on Numeracy**

- Understanding quantity is a prerequisite for success in math.
- Children from low SES are deficient in:
  - reciting digits,
  - counting sets of objects,
  - counting up or down from a given number other than 1,
  - recognizing written numerals,
  - adding and subtracting,
  - comparing numerical magnitudes,
  - describe thinking and explain ideas in context of mathematical problem solving
What do we know about language and literacy?

- Language appears to be the system most at risk in children from low SES. (Hackman et al, 2010)

- Review:
  - Infants and adults utilize same structures for language development. (Wernicke and Broca’s areas)
  - Early acquisition involves different mechanisms than adult acquisition.

- Vocabulary, Phonemes, Reading

What do we know about vocabulary?

- Average vocabulary size of three year olds from professional families is more than twice as large as those on welfare. (Hart & Risley, 1999)

What do we know about phonemes?

- By 10 months - typically developing infants have sharpened representation of native phonemic distinctions and diminished ability to distinguish non-native phonemes. (Kuhl, 1994; Saffran, 2002)

- Exposure to language shapes phonemic structures.
  - Decoding and chunking
  - Reduced exposure to language rich environments in infancy may cause difficulty with phoneme perception.
What do we know about reading?

- Brain areas which translate visual words into sounds:
  - Visual word form area = left fusiform gyrus
  - Visual letters into sounds = left temporal-parietal junction*
  - *modulated by SES
- Children who have difficulty learning to read show little activation in these areas.

Impact of SES on Language and Literacy

- Children from low SES have diminished brain activation in areas related to phonological awareness.
- Children from higher SES had:
  - increased responses in left fusiform gyrus
  - greater hemispheric specialization in Broca's area
- Suggests - maturation of Broca's area and activation of key pathways related to language development are governed by early linguistic environments.
  

Summary

- Studies of attention, numeracy, and language/literacy point to root of school success as experiences of infancy.
- Explicit or implicit training in attention at preschool level may foster learning of wide variety of skills acquired in school – including literacy and numeracy.

Mediating influences: SES and Development

- Housing
- Access to healthcare
- Nutrition
- Teacher expectations/attitudes
- Parent expectations/styles
- Stimulating materials/experiences
- Health-relevant behaviors
- Allostatic load
- Brain Development
"Protecting young children from adversity is a promising, science-based strategy to address many of the most persistent and costly problems facing contemporary society, including limited educational achievement, diminished economic productivity, criminality, and disparities in health."

Garner et al. (2012, p. e228)

- Enhance caregiver-child relationships
  - Enhancement of home environment and maternal sensitivity can mediate impact of chronic stress.

---

**Optimizing Early Experiences**

Periods of high brain plasticity cause children to be ripe for learning in the early years.

This highly plastic window of opportunity also causes children to be more vulnerable to the effects of toxic stress.

(Garner et al., 2012; J. Shonkoff, Boyce, & McEwen, 2009)
Enhancing 'Parenting'  

"Parents and other caregivers who are able to form close, nurturing relationships with their children can foster resilience in them that protects them from many of the worst effects of a harsh early environment."

Paul Tough (2012, p. 28)

- Prevent double jeopardy – increase parental responsivity for children with disabilities
- Enrich parent-child communication by helping parents: increasing their responsivity, contingency, joint attention, and provision of frequent syntactically complex and lexically rich child directed talk.
  (Hoff, 2006)

Summary

- Poverty = restricted environment and toxic stress
- Differences in brain and behavior – varying by age and degree of impact
- It’s complicated!
- SES is influenced by income, education, occupation, etc
- Many influences and many opportunities for intervention.

Enhancement of caregiver-child relationships will buffer developing children from the adverse effects of poverty.

Learning 'Activity'
Impact of Poverty on Brain Development Handout

2/28/14

How does poverty impact brain development?

- Poverty
  - Nutritional deficiencies
  - Permanent and short-term experiences
- Biological and psychological risk factors
  - Physical and mental health
  - Inequalities in cognitive and socioemotional development
  - Threatens educational attainment and adult productivity

- Brain system: emotion, behavior, motivation, language, memory, cognition

Key Structures:
- Amygdala: anxiety, memory, emotion, motivation
- Hippocampus: memory, consolidation of short-term memory
Brain Plasticity

- What have we learned from animal models?
- Environment matters!
- Structural and functional changes between animals exposed to enriched vs. deprived environments
- Neuronal plasticity - a good thing, or a bad thing?

Stress

- Epigenetics - no change in the underlying DNA, but non-genetic factors cause the genes to behave (or "express themselves") differently
- Chronic stress (aka toxic stress) leads to remodeling of hippocampal circuitry
- Experiences program genes through epigenetic modifications.

Toxic Stress Details Healthy Development

Center on the Developing Child  Harvard University
What do we know about attention?

- Networks:
  - Alerting: initiate and maintain alert state
  - Orienting: orienting to sensory stimuli
  - Executive: resolve conflict between responses
- Connectivity and control of these networks depend on environmental factors.
- Attention training: computer tasks or classroom curricula with ADHD or low SES, "changing brain state"
### Impact of SES on Attention

- Children from low SES have reduced attention!
- Diminished working memory
- Diminished inhibitory control
- Reduced speed and accuracy of alerting and executive networks

(Leone et al., 2001 & Morenocco, 2004)

### What do we know about numeracy?

- Infants have innate skills to recognize quantity.
- Discrimination of Quantity:
  - Responses made by infants and adults are similar.
  - Timing differs.
  - Adult recognition at 250 ms
  - Infant recognition at 500 ms

### Impact of SES on Numeracy

- Understanding quantity is a prerequisite for success in math.
- Children from low SES are deficient in:
  - Reading digits,
  - Counting sets of objects,
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  - Recognizing written numerals,
  - Adding and subtracting,
  - Comparing numerical magnitudes,
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- Language appears to be the system most at risk in children from low SES. (Hackman et al., 2010)
- Infants and adults utilize same structure for language development. (Wernicke and Broca's areas)
- Early acquisition involves different mechanisms than adult acquisition.

What do we know about vocabulary?

- Average vocabulary size of three-year-olds from professional families is more than twice as large as those on welfare. (Hart & Risley, 1995)

Mothers' Speech and Child Vocabulary

Source: Penney et al. (1982)
What do we know about phonemes?

- By 10 months, typically developing infants have sharpened their ability to distinguish phonemes. (Kuhl, 1991; Saffran, 2002)
- Exposure to language shapes phonemic structures.
- Decoding and chunking
- Reduced exposure to language-rich environments in infancy may cause difficulty with phoneme perception.

What do we know about reading?

- Brain areas which translate visual words into sounds:
  - Visual word form area - left fusiform gyrus
  - Visual letters into sounds - left temporo-parietal junction
  - Hypothesized by Ullman
- Children who have difficulty learning to read show little activation in these areas.

Impact of SES on Language and Literacy

- Children from low SES have diminished brain activation in areas related to phonological awareness.
- Children from higher SES had:
  - Increased responses in left fusiform gyrus
  - Greater hemispheric specialization in Broca's area
- Suggests: maturation of Broca's area and activation of key pathways related to language development are governed by early linguistic environments.

(Kovel et al., 2002; Klesius et al., 2006)
Summary

- Studies of attention, numeracy, and language/literacy point to roots of school success as experiences of infancy.
- Explicit or implicit training in attention at preschool level may foster learning of wide variety of skills acquired in school—including literacy and numeracy.

Mediating Influences: SES and Development

Implications for Practice

- "Protecting young children from adversity is a promising, science-based strategy to address many of the most persistent and costly problems facing contemporary society, including limited educational achievement, diminished economic productivity, criminality, and disparities in health."
- Enhance caregiver-child relationships
  - Enhancement of home environment and maternal sensitivity can mediate impact of chronic stress.
Implications for Practice

- Key factors to include in early childhood programs include:
  - the expertise of staff and their capacity to build warm, positive, responsive relationships with young children
  - small class sizes with high adult-to-child ratios; age-appropriate materials in safe physical settings
  - language-rich environments
  - consistent levels of child participation

Optimizing Early Experiences

Periods of high brain plasticity cause children to be ripe for learning in the early years.

- This highly plastic window of opportunity also causes children to be more vulnerable to the effects of toxic stress.
  
  (Gunn et al., 2012; J. Shonkof, Rhue, & McDow, 2013)
Enhancing Parenting

“Parents and other caregivers who are able to form close, nurturing relationships with their children can foster resilience in them that protects them from many of the worst effects of a harsh early environment.”

Feinberg (2013, p. 28)

- Prevent double jeopardy — increase parental responsibility for children with disabilities
- Enrich parent-child communication by helping parents increase their responsiveness, contingency, joint attention, and provision of frequent syntactically complex and linguistically rich child-directed talk.

Summary

- Poverty = restricted environment and toxic stress
- Differences in brain and behavior = varying age and degree of impact
- It’s complicated
- SES is influenced by income, education, occupictions, etc.
- Many influences and many opportunities for intervention
- Enhancement of young children’s development as a buffer for developing children’s social development (poverty, etc.)

Learning Activity

[Further content not visible]
Changing Communication Modalities Lecture Slides

Changing Communication Modes

Learner objectives:

- Describe the rhetorical challenge of the terms, options, approaches, modes, choices, and opportunities faced when choosing a communication option;
- Identify questions that should be asked by families and the needs that must be considered regarding the selection/determination of communication option;
- Identify the audiological and hearing sensory technology needs and issues that should be addressed, along with the range of auditory-functioning, speech, language, cognitive tests and protocols which might be considered for determining a child’s communication status.

What do we mean by “communication opportunities”? 

- Decision making: process of problem solving that leads to a plan of action after consideration of the alternatives.
- Communication opportunities = “the alternatives”
- Parents make a decision about how a family will communicate.
- The process: parents making choices from the alternatives.
  - This is NOT making a choice between right and wrong.
What communication opportunities are available to families?

<table>
<thead>
<tr>
<th>Spoken Language</th>
<th>Visual Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Visual Cues</td>
<td>+ Signs</td>
</tr>
<tr>
<td>AV (acoustics)</td>
<td>Cued Speech</td>
</tr>
<tr>
<td>(non-verbal)</td>
<td>(used language)</td>
</tr>
<tr>
<td>MCE</td>
<td>TC</td>
</tr>
<tr>
<td>ASL</td>
<td>SimCom</td>
</tr>
<tr>
<td>Auditory-Oral</td>
<td></td>
</tr>
<tr>
<td>(oral)</td>
<td></td>
</tr>
<tr>
<td>Auditory-verbal</td>
<td></td>
</tr>
<tr>
<td>(audible)</td>
<td></td>
</tr>
</tbody>
</table>

What factors influence selection of a communication opportunity?

- Availability of education options
- Language used in home
- Family involvement
- Presence of additional disabilities
- Internal and external influences on parent choice
- Age of ID and intervention
- Speech 
- Literacy
- Speech intelligibility
- Hearing aids and Q5
- Hearing status
- Community resources

What factors influence parental decision making, attitudes, and knowledge?

"No one placement is best for all children who are deaf or hard of hearing. Any individual child will do best when the placement meets his or her needs." — "My Baby’s Hearing", BTNRH

- Child Factors
  - Age of child: young vs. old
  - Hearing loss status: age at ID, degree
- Influence of Professionals
  - 90% of parents indicated they were influenced by a professional; received one-sided beliefs from professionals (Young, 2002)

Do parent choices vary based on where they received advice?

- Social Constructionism — social interchange is the basis of people’s knowledge of the world and how they construct meaning
  - Interactions lead to shared agreements.
  - Shared agreements are regarded as "truth" or "fact".
  - The way we make meaning of the world comes from our attempts at understanding interactions with others.
How does the issue of "time" impact a family's decision-making process?

- Do parents understand implications of communication choices?
- Are parents overwhelmed?
- Are parents being pressured to make quick decisions?

"Safety net" Parents develop partnerships. Gain confidence. Overall willingness to evaluate how family is doing, adjust course if necessary

So they picked a path... now what?

What can a professional do during this decision-making process?

- Three things parents need during the decision making process:
  1. **Encouragement** to take time to explore issues and understand child's unique needs
  2. **Support** from good listeners and others who have made the journey before
  3. **A bias detector**, to appreciate the opinion-giver's perspective

How do we monitor success?

- Choose an option and stick with it for 6-12 months.
- Systematic and regular assessment of:
  - progress/lack of progress in communication abilities of child
  - desires of family for easier and more abundant communication among members
  - change (progression) in hearing sensitivity
  - choice of family of alternate technology
  - identification of special sensory or cognitive needs
What is diagnostic therapy or diagnostic teaching?

- Diagnostic teaching: assessment strategy in which two or more instructional conditions are compared to determine which is most effective.
- Diagnostic Early Intervention Program (DEIP), (Moeller & Condon, 1994)
  - Goal: help parents become informed decision makers

What influences success in a given communication opportunity?

- Age factors
- Type and degree of hearing loss
- Cognitive status/Deafness
- Type, timing and use of technology
- "Family fluency"
- SES
- Caregiver and educator sensitivity to child’s communication behaviors

What outcomes should be monitored/measured?

- Auditory skill development
  - According to auditory hierarchy
- Speech
  - Sound repertoire
  - Intelligibility

What are the key indicators to determine if a child is “on course” with communication development?

- For all children
  - Receptive
  - Quality of I
- If applicable:
  - Wear time
  - Progression
  - Speech soc.
  - Sign language

Note: Good language does not equal good speech!
What is a typical rate of progress?

- Target: (at least) 1 year growth in 1 year + me!

What are typical benchmarks?

- Cochlear implant users?
  - "Flat" serial audiograms in the mild hearing loss range?
  - Improving speech perception measures?
  - Improving fluency in ASL or sign system?
  - YES/NO

- Children using listening and spoken language?
  - Improving speech perception measures?
  - YES/NO

- Children using a visual/manual approach?
  - Improving fluency in ASL or sign system?
  - YES/NO

"Major improvement in language."

Using the 'Red Flags' approach to progress monitoring

- Why identify red flags?!
  - Acquisition of listening is a developmental process, one skill is dependent on acquisition of previous skill!
  - Delays in development can lead to long term deficits (AKA undesirable outcomes)!
  - Red flags help providers notice particular skills!

Factors related to the severity of the concern:

- Length of delay!
- Number of skills delayed!

Raise 1 red flag if:

- Child is more than three months delayed on a given skill!

Raise 2 red flags if:

- Child is more than six months delayed on a given skill!

Red Flags

- McConkey Robbins!
Red'Flags'

One flag responses:
- Pay attention to specific skill
- Speaking to parents
- Checking EI equipment
- Examining whether prerequisite skills are adequately established
- Assess environment has created need for child to use skill
- Use different materials
- Increase frequency of training towards skill
- Find opportunities child has to practice skill
- Write a plan of action
- Check monthly for three months

Two flag responses:
- Reaching one flag responses
- Contact EI center to consider programming changes
- Changing teaching methods or techniques
- Consultation with colleague
- Refer to specialist for suitable expert opinion

How'do'you'have''this'conversation''with'parents?''

"Partnerships with parents have the capacity to enrich us and teach us...many professional models can work when they are based in respect and optimism."

Moeller & Condon, 1998

1. Express concern regarding slow progress relative to other children with similar characteristics
2. Present idea for specific plan of action
3. Discuss whether or not child has full-time device use

What'are'some'special'considerations?''

Rate of progress may be complicated by:
- ANSD
- Autism
- Learning Disabilities
- Concomitant Disabilities
- Others??

Wrap'Up'

What kind of professional will you be?
- Respectful of family choice,
- Optimistic but reasoned,
- Keeper of DATA, DATA, DATA!
Changing Communication Modalities Handout

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What do we mean by “communication opportunities”?

- Decision making: process of problem solving that leads to a plan of action after consideration of the alternatives.
- Communication opportunities = “the alternatives”
- Parents make a decision about how a family will communicate.
  - The process: parents making choices from the alternatives
  - This is NOT making a choice between right and wrong.

What communication opportunities are available to families?

What factors influence selection of a communication opportunity?

- Social economic status
- Language used in the family
- Ethnic background
- Age of the child
- Environmental influences on parents' choice
- Spouse involvement
- Teaching philosophy
- Community involvement

(Graves & O'Gara, 2003)
What factors influence parental decision making, attitudes, and knowledge?

- "No one placement is best for all children who are deaf or hard of hearing. Any individual child will do best when the placement meets his or her needs." - "My Baby's Hearing", BTNR
- Child Factors
  - Age of child: young vs. old
  - Hearing loss status: age at ID, degree
- Influence of Professionals
  - 60% of parents indicated they were influenced by a professional; received one-sided beliefs from professionals (Tsang, 2002)

Do parent choices vary based on where they received advice?

- Social Constructionism - social interchange is the basis of people's knowledge of the world and how they construct meaning
  - Interactions lead to shared agreements.
  - Shared agreements are regarded as "truth" or "fact".
  - The way we make meaning of the world comes from our attempts at understanding interactions with others

How does the issue of "time" impact a family's decision making process?

- Do parents understand implications of communication choices?
- Are parents overwhelmed?
- Are parents being pressured to make quick decisions?

- "Safety net" Parents develop partnerships, gain confidence. Overall willingness to evaluate how family is doing, adjust course if necessary
What can a professional do during this decision making process?

ROAD WORK AHEAD

1. Encouragement to take time to explore issues and understand child's unique needs
2. Support from good listeners and others who have made the journey before
3. A bias detector to appreciate the opinion giver's perspective

So they picked a path... now what?

How do we monitor success?

- Choose one path and stick with it for 6-12 months
- Systematic and regular assessment of:
  - progress of child's communication skills and abilities
  - desires and family interactions
  - communication among family members
  - change in progression of auditory awareness
  - choice of family and/ or alternative technology
  - identification of special sensory or cognitive needs
What is diagnostic therapy or diagnostic teaching?

- Diagnostic teaching: assessment strategy in which two or more instructional conditions are compared to determine which is most effective.
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  - Goal: help parents become informed decision makers

What influences success in a given communication opportunity?

- Age factors
- Type and degree of hearing loss
- Cognitive status/Deaf
- Type, timing and use of technology
- “Family fluency”
- SES
- Competency and educator sensitivity to child’s communication behaviors

What outcomes should be monitored/measured?

- Auditory skill development
  - Consistency with auditory response
  - Accuracy
  - Speech
  - Motor speech
  - Understanding
  - Word recognition
  - Sentence level
  - Language usage

- Language development
  - Consistency with language usage
  - Accuracy
  - Grammar
  - Vocabulary
  - Language usage

- Auditory-language development
  - Consistency with auditory-language usage
  - Accuracy
  - Grammar
  - Vocabulary
  - Language usage
What are the key indicators to determine if a child is "on course" with communication development?

- Functional Level
- Acceptable
- Quality
- Application
- Word Fluency
- Progression
- Speech
- Sign Language

What is a typical rate of progress?

Target:
(at least)
1 year of growth in 1 year

What are typical benchmarks?

<table>
<thead>
<tr>
<th>Cochlear Implant Users</th>
<th>Children Learning to Listen and Talk</th>
<th>Children Using Sign Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES/NO</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
<tr>
<td>Children using a visual/manual approach</td>
<td>Improving fluency in ASL or sign system</td>
<td>YES/NO</td>
</tr>
</tbody>
</table>
Using the 'Red Flags' approach to progress monitoring

- Why identify red flags?
  - Unusual delays in a child's development may mean a child is not developing as expected.
  - Developmental delays may indicate underlying issues.
  - Red flags help providers notice potential issues earlier.

- Factors relating to the severity of the concern:
  - Length of delay
  - Number of skills delayed
  - Scale of concern: Red Flags

- Raise 1 red flag:
  - Child is more than three months delayed on a given skill
- Raise 2 red flags:
  - Child is more than six months delayed on a given skill

Red Flags:

- One flag responses:
  - Need to monitor skill
  - Need to monitor areas
  - Need to monitor progress
  - Need to monitor
  - Need to monitor areas
  - Need to monitor

- Two flag responses:
  - Need to monitor skill
  - Need to monitor skill
  - Need to monitor
  - Need to monitor
  - Need to monitor
How do you have this conversation with parents?

- Partnerships with parents have the capacity to enrich us and teach us. More professional models can work when they are based in respect and optimism.
  - Modell & Candon, 1998

  1. Express concern regarding slow progress relative to other children with similar characteristics.
  2. Present ideas for specific plans of action.
  3. Discuss whether or not child has full-time device use.

What are some special considerations?

- Rate of progress may be complicated by:
  - ADHD
  - Autism
  - Learning Disabilities
  - Concurrent Disabilities
  - Others?

Wrap Up

- What kind of professional will you be?
  - Respectful of family choice.
  - Optimistic but measured.
  - Keeper of data, data, data!
Appendix C.
Materials Used in Experiments 1* and 2**

Low Support Prompt - Mandated Reporting of Child Maltreatment*, **

Instructions: Please be very thorough in answering the following prompt(s). Do your best to incorporate ALL of the material that was learned on this topic during the lecture. ALL of the material is applicable to the prompt – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write CLEARLY and in an ORGANIZED manner so that we can accurately score your response. Do not simply list information. Your answer should flow logically. Use the back if needed. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: _________________

END TIME: _________________

Define and describe the relevant issues of mandated reporting of child maltreatment, including how this pertains to your role as a future educator of the deaf.
Instructions: Please be very thorough in answering the following questions. Do your best to incorporate all of the material that was learned on this topic during your lecture. All of the presented material is applicable to the questions – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write clearly and in an organized manner so that we can accurately score your responses. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: _______________________

1. What is the definition of child maltreatment according to the Child Abuse Prevention and Treatment Act (CAPTA)?

2. To whom is mandated reporter obligated to report?

3. What are the key elements of the four categories of abuse, according to federal law?
   i. Physical Abuse:
   ii. Neglect:
   iii. Psychological maltreatment:
   iv. Sexual Abuse/Exploitation:
4. What is the most common form of child maltreatment?

5. What are four barriers which may prevent an individual from reporting suspected child maltreatment?
   i. Barrier 1:
   
   ii. Barrier 2:
   
   iii. Barrier 3:
   
   iv. Barrier 4:

6. What is the most tragic consequence of child maltreatment?

7. What are two child risk factors associated with increased rates of maltreatment?
   a.
   
   b.

8. What are three caregiver risk factors associated with increased rates of maltreatment?
   a.
   
   b.
   
   c.
9. According to the legal definition, when is a mandated reporter required to make a report?

10. What individuals are considered mandated reporters according to Missouri law? (List the categories of professions, or give one example from each category.)
   a.
   b.
   c.
   d.
   e.
   f.
   g.

11. What are the potential signs of physical abuse?
   a. Consider the possibility of physical abuse when the child:
      i.
      ii.
      iii.
      iv.
      v.
   b. Consider the possibility of physical abuse when the parent or other adult caregiver:
      i.
      ii.
      iii.
      iv.
12. What are the potential signs of neglect?
   a. Consider the possibility of neglect when the child:
      i. 
      ii. 
      iii. 
      iv. 
      v. 
      vi. 
      vii. 
   b. Consider the possibility of neglect when the parent or other adult caregiver:
      i. 
      ii. 
      iii. 
      iv. 

13. What are the potential signs of psychological maltreatment?
   a. Consider the possibility of psychological maltreatment when the child:
      i. 
      ii. 
      iii. 
      iv. 
      v. 
   b. Consider the possibility of psychological maltreatment when the parent or other adult caregiver:
      i. 
      ii. 
      iii. 
14. What are the potential signs of sexual abuse?
   a. Consider the possibility of sexual abuse when the child:
      i.
      ii.
      iii.
      iv.
      v.
      vi.
      vii.
      viii.
   b. Consider the possibility of sexual abuse when the parent or other adult caregiver:
      i.
      ii.
      iii.

15. Who are the vast majority of maltreatment perpetrators?

16. What is the contact number for the Childhelp Hotline?
17. During the reporting process, what information will be asked of the person making the report?
   i. 
   ii. 
   iii. 
   iv. 

18. What are four additional questions you might be asked by the Children's Division worker during a report?
   i. 
   ii. 
   iii. 
   iv. 

19. Why might SLPs, audiologists, or teachers of the deaf be well positioned to recognize when a child is experiencing maltreatment?

20. What are two ways we can reduce the incidence, duration, and impact of maltreatment experienced by children with disabilities?
   a. 
   b. 

END TIME: _______________________
Review Sheet - Mandated Reporting of Child Maltreatment*, **

**Review Sheet**

Please re-read the attached review sheet at least one more time.

You will have approximately five minutes to re-read this review sheet.

When the time is called, please answer the question at the bottom of this page by filling in a YES or NO.

Did you re-read this review sheet (YES or NO)? ______________
Child maltreatment is defined by the Child Abuse Prevention and Treatment Act (CAPTA) as, "Any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm."

All 50 States, the District of Columbia, and the U.S. Territories have mandatory child abuse and neglect reporting laws that require certain professionals and institutions to report suspected maltreatment to a child protective services (CPS) agency.

Most States recognize four major types of maltreatment: physical abuse, neglect, psychological maltreatment, and sexual abuse. Although any of the forms of child maltreatment may be found separately, they also can occur in combination.

- Physical Abuse: “Physical abuse is generally defined as "any non-accidental physical injury to the child" and can include striking, kicking, burning, or biting the child, or any action that results in a physical impairment of the child.”
- Neglect: “Neglect is frequently defined in terms of deprivation of adequate food, clothing, shelter, medical care, or supervision.”
- Psychological maltreatment: emotional maltreatment
- Sexual Abuse/Exploitation: "The employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; or The rape, and in cases of caretaker or interfamilial relationships, statutory rape, molestation, prostitution, or other form of sexual exploitation of children, or incest with children"

Neglect is the most common form of child maltreatment.

Four barriers which may prevent an individual from reporting suspected child maltreatment include:
Barrier 1: It’s not a real problem. I don’t believe CA/N is a common or sufficiently important problem to warrant my attention.

Barrier 2: I don’t know how to recognize the signs and symptoms of CA/N. What are the signs and symptoms? I don’t feel confident about such signs to “trust our gut”

Barrier 3: Lack of Awareness of Reporting Procedures; I don’t know how to report CA/N.

Barrier 4: Skeptical of impact of report. I don’t think my report will do any good.

Child fatalities are the most tragic consequence of child maltreatment.

Young children and those with disabilities experience increased rates of maltreatment.

Children of caregivers who abuse alcohol, abuse drugs, or experience domestic violence experience increased rates of child maltreatment.

Mandated reporters have a legal obligation to report if individual suspects or has reasons to believe that a child has been abused or neglected.

According to Missouri law the following individuals are considered mandated reporters:

- (MEDICAL/HEALTH PROFESSIONALS) Physicians, medical examiners, coroners, dentists, chiropractors, optometrists, podiatrists, residents, interns, nurses, hospital and clinic personnel, or other health practitioners
- (CHILDCARE/EDUCATION) Daycare center workers or other child care workers, teachers, principals, or other school officials
- (MENTAL HEALTH) Psychologists, mental health professionals, or social workers
- (CLERGY/RELIGIOUS) Ministers including clergypersons, priests, rabbis, Christian Science practitioners, or other persons serving in a similar capacity for any religious organization
- (LAW ENFORCEMENT) Juvenile officers, probation or parole officers, peace officers, law enforcement officials, or jail or detention center personnel
- (OTHER CATCHALL) Other persons with responsibility for the care of children
• (COMPUTER/TECHNOLOGY) Commercial film and photographic print processors; computer providers, installers, or repair persons; or Internet service providers

○ Consider the possibility of physical abuse when the child:
  ▪ Has unexplained burns, bites, bruises, broken bones, or black eyes
  ▪ Has fading bruises or other marks noticeable after an absence from school
  ▪ Seems frightened of the parents and protests or cries when it is time to go home
  ▪ Shrinks at the approach of adults
  ▪ Reports injury by a parent or another adult caregiver

○ Consider the possibility of physical abuse when the parent or other adult caregiver:
  ▪ Offers conflicting, unconvincing, or no explanation for the child's injury
  ▪ Describes the child as "evil," or in some other very negative way
  ▪ Uses harsh physical discipline with the child
  ▪ Has a history of abuse as a child

○ Consider the possibility of neglect when the child:
  ▪ Is frequently absent from school
  ▪ Begs or steals food or money
  ▪ Lacks needed medical or dental care, immunizations, or glasses
  ▪ Is consistently dirty and has severe body odor
  ▪ Lacks sufficient clothing for the weather
  ▪ Abuses alcohol or other drugs
  ▪ States that there is no one at home to provide care

○ Consider the possibility of neglect when the parent or other adult caregiver:
  ▪ Appears to be indifferent to the child
  ▪ Seems apathetic or depressed
  ▪ Behaves irrationally or in a bizarre manner
  ▪ Is abusing alcohol or other drugs

○ Consider the possibility of psychological maltreatment when the child:
  ▪ Shows extremes in behavior, such as overly compliant or demanding behavior, extreme passivity, or aggression
  ▪ Is either inappropriately adult (parenting other children, for example) or inappropriately infantile (frequently rocking or head-banging, for example)
  ▪ Is delayed in physical or emotional development
  ▪ Has attempted suicide
  ▪ Reports a lack of attachment to the parent
Consider the possibility of psychological maltreatment when the parent or other adult caregiver:

- Constantly blames, belittles, or berates the child
- Is unconcerned about the child and refuses to consider offers of help for the child's problems
- Overtly rejects the child

Consider the possibility of sexual abuse when the child:

- Has difficulty walking or sitting
- Suddenly refuses to change for gym or to participate in physical activities
- Reports nightmares or bedwetting
- Experiences a sudden change in appetite
- Demonstrates bizarre, sophisticated, or unusual sexual knowledge or behavior
- Becomes pregnant or contracts a venereal disease, particularly if under age 14
- Runs away
- Reports sexual abuse by a parent or another adult caregiver

Consider the possibility of sexual abuse when the parent or other adult caregiver:

- Is unduly protective of the child or severely limits the child's contact with other children, especially of the opposite sex
- Is secretive and isolated
- Is jealous or controlling with family members

The vast majority of maltreatment perpetrators are the child's parents (more than 80%).

The Childhelp Hotline is 1-800-4-A-CHILD.

While making a report, the child protective services worker will likely ask you to provide:

- the name of the child
- the name of the parent(s)
- the name of the alleged abuser
- where the child can be located
You will also be asked to answer:

- Is the child in a life-threatening situation now?
- How do you know about the abuse/neglect?
- Did you witness the abuse/neglect?
- Were there other witnesses and how can they be contacted?

SLPs, audiologists, or teachers of the deaf are all examples of professionals who interact regularly with children and their caregivers and may have the opportunity to observe signs/symptoms of abuse. They are well positioned to observe and respond as these providers understand the limits of a child’s language skills in expressing current and past events.

Through observation (of child, parent, and their interactions) and response (making reports to Child Protective Services), we can reduce the incidence, duration, and impact of maltreatment experienced by children with disabilities.
Low Support Prompt – Impact of Poverty on Brain Development*, **

*Instructions: Please be very thorough in answering the following prompt(s). Do your best to incorporate ALL of the material that was learned on this topic during the lecture. ALL of the material is applicable to the question(s) – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write CLEARLY and in an ORGANIZED manner so that we can accurately score your response. Do not simply list information. Your answer should flow logically. Use the back if needed. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: _______________________
END TIME: __________________________

Provide a detailed explanation of the impact of poverty on brain development.
Instructions: Please be very thorough in answering the following questions. Do your best to incorporate ALL of the material that was learned on this topic during the lecture. ALL of the presented material is applicable to the questions – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write clearly and in an organized manner so that we can accurately score your responses. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: ______________________

1) What are two primary challenges associated with poverty which result in cognitive and social emotional inequalities as well as the threat to educational attainment and adult productivity?
   a)
   b)

2) What are the primary functions of the limbic system?
   a)
   b)

3) What are two key structures within the limbic system?
   a)
   b)
4) How has the study of animal models and use of fMRI imaging informed our understanding of neural-plasticity?

5) What is epigenetics?

6) How is the role of epigenetics pertinent to discussion of SES status and brain development?

7) What is the impact of chronic stress exposure on brain development?

8) By what mechanism are these changes thought to occur?

9) What aversive situations might be present in low SES situations which could expose children to early and chronic stress?
   a) 
   b) 
   c)
10) What brain regions or networks are particularly sensitive to stress and can promote adaptation to adversity?
   a)
   b)
   c)

11) What are the three attentional networks and their roles? (Name the network and the role. 6 total items)
   a) ______________________________ network -
   b) ______________________________ network -
   c) ______________________________ network -

12) What is the primary function of the executive network?

13) What are the primary effects of SES on attention?
   a)
   b)
   c)

14) What requisite skill do children need in order to learn arithmetic operations?
15) What are the differences in numerical proficiency seen in preschoolers of low SES?
   a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 

16) What brain structures do children and adults use for language acquisition?
   a) 
   b) 

17) How do the vocabularies of children from differing low vs. higher SES backgrounds compare?

18) Why is the development of phonemic discrimination a concern for children from low SES environments?
19) What is the common root of school success, across the areas of attention, literacy, and numeracy?

20) What are the potential mediators of SES disparities on brain development?
   a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 
   h) 

21) What is meant by the term “allostatic load”?

22) What is one science based strategy which can promote child development?

23) How can we promote resilience and/or mediate the impact of chronic stress?
24) What are the key factors to include in early childhood programs to mitigate the deleterious effects of poverty?
   a)
   b)
   c)
   d)
   e)

25) Why do the investment dollars have the greatest impact when targeted toward the youngest children?

26) How do early positive experiences, ascertained through nurturing caregivers and stimulating environments, influence early brain development?

27) How do early adverse experiences impact longitudinal developmental and health outcomes?
28) What is currently thought to be the most promising intervention for young children with adverse experiences?
Review Sheet - Impact of Poverty on Brain Development *, **

Review Sheet

Please re-read the attached review sheet at least one more time.

You will have approximately five minutes to re-read this review sheet.

When the time is called, please answer the question at the bottom of this page by filling in a YES or NO.

Did you re-read this review sheet (YES or NO)? ______________
The circumstance of poverty is associated with restricted (or diminished) environments and exposure to early and chronic stress. Restricted environments and exposure to chronic stress impact both the brain and body resulting in inequalities in cognitive and social emotional development. These inequalities can threaten the child’s educational attainment and adult productivity.

The limbic system is primarily responsible for control of one's emotional life and formation of memories. The amygdala and the hippocampus are two key structures within the limbic system.

Animal models along with fMRI imaging has informed our understanding of neuroplasticity and reinforced that early environmental experience impacts brain development. Brain circuits develop with more or less specificity depending on the complexity or enrichment of the environment.

Epigenetics is the study of genes expression (cellular phenotype) caused by mechanisms other than changes in the underlying DNA sequence. More simply put, there are non-genetic factors (environmental or experiential factors) which cause genes to express themselves differently in different people.

Epigenetics pertains to discussion of SES status and brain development as variations in early experience, can directly influence the gene expression and behavior. Since poverty impacts a child’s early environmental experience and exposure to stress, poverty can impact how a child’s genes manifest (epigenetics). Epigenetic changes underlie the long-term impact of early experiences.

Chronic stress leads to remodeling of hippocampal circuitry including loss of dendrites, loss of synapses, and suppression of neurogenesis. Epigenetic modifications are the mechanism responsible for brain changes from chronic stress exposure.
Children in poverty experience adversity resulting from deprived environments and chronic or toxic stress. Sources of the adversity which lead to this environmental deprivation and stress include: crowding in living arrangements, hunger/food insecurity, threats to mental/physical health, limited attachment/parental interactions, etc.

The prefrontal cortex, hippocampus, amygdala are all sensitive to stress and can promote adaptation to adversity. These are interactive networks which allow people to cope with aversive situations - like those present in low SES situations.

There are three attentional networks. The alerting network is responsible for obtaining and maintaining the alert state. The orienting network orients individuals to the sensory stimuli. The executive network aids in resolving conflict between responses and helps to regulate thoughts and feelings.

The executive system (prefrontal cortex), responsible for attention, is one of the primary areas of the brain impacted by poverty. Children from low SES situations have diminished working memory and have difficulty limiting distracting information (inhibitory control). Children from low SES also have reduced speed and accuracy of alerting and executive attentional networks.

Learning of math operations depends heavily on early ability of child to understand quantity.

Children of low SES demonstrate the deficits in numerical proficiency in areas of: reciting digits, counting sets of objects, counting up or down from number other than 1, recognizing written numerals, adding/subtracting, comparing numerical magnitudes, and problem solving.

Infants and adults use similar brain structures for language development, namely: Wernicke and Broca’s areas. Children and adult likely utilize different mechanisms for
language acquisition, as evidenced by neural plasticity and reorganization which is possible in infancy.

Children from professional families have average vocabularies more than twice as large as those children from low-income families. This results in a 30 million word difference by preschool. Child vocabulary is also heavily influenced by the amount of child directed talk provided by mothers.

Phonemic discrimination, beyond it’s utility for learning multiple languages, is important for later efficient use of spoken and written language (fluency). Children in poverty have difficulty with decoding and chunking, which may result from their reduced exposure to language rich environments.

Studies of attention, literacy, and numeracy point to the root of school success as experiences of infancy.

The potential mediators of SES disparities in socioemotional and cognitive development include: nutrition, access to health care, housing, stimulating materials/experiences, parent expectation and styles, teacher expectations/attitudes, health relevant behaviors, and allostatic load.

The term allostatic load refers to the physiological consequences of chronic exposure to heightened neural responses from repeated or chronic stress. It is used to explain how frequent activation of the body’s stress response, essential for managing acute threats, can in fact damage the body in the long run.

Protecting young children from adversity is a promising, science-based strategy to combat the deleterious effects of poverty. We can promote resiliency and mediate the impact of chronic stress by enhancing the caregiver-child relationship.
Key factors to include in early childhood programs to mitigate the deleterious effects of poverty include: Expertise of staff and capacity to build warm, positive, responsive relationships with young children, small class sizes with high adult-child ratios, age appropriate materials in safe physical settings, language-rich environments, consistent levels of child participation.

According to James Heckman, since the adverse impact of poverty stems from lack of early stimulation, later remediation strategies may have less of a lasting impact or be wholly ineffective. The greatest return on investment is possible for anti-poverty programming when the intervention is provided earlier in life during time of greatest neuroplasticity.

Early positive experiences, ascertained through nurturing caregivers and stimulating environments can build and reinforce important neural pathways relating to language development and executive functioning.

Early adverse experiences weaken neural pathways. The number of traumatic events in a child’s life is proportional to the risk for medical and social difficulties as an adolescent and adult.

Enhancement of supportive relationships among educators, parents, and young children is currently thought to be the most promising intervention for young children with adverse experiences. Enhanced relationships will serve to buffer developing children from the adverse effects of poverty.
Low Support Prompt – Changing Communication Modalities*

*Instructions: Please be very thorough in answering the following prompt(s). Do your best to incorporate ALL of the material that was learned on this topic during the lecture. ALL of the material is applicable to the question(s) – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write CLEARLY and in an ORGANIZED manner so that we can accurately score your response. Do not simply list information. Your answer should flow logically. Use the back if needed. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: _______________________
END TIME: _______________________

Discuss the complex issue of altering a communication modality from a family’s initial choice/path. Be sure to address the role of the practitioner throughout this process.
**Instructions:** Please be very thorough in answering the following questions. Do your best to incorporate all of the material that was learned on this topic during your lecture. All of the presented material is applicable to the questions – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write clearly and in an organized manner so that we can accurately score your responses. You will have 15 minutes to complete this activity, so budget your time accordingly.

<table>
<thead>
<tr>
<th>START TIME: ______________________</th>
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<tbody>
<tr>
<td>1. What are &quot;communication opportunities&quot; with regards to children with hearing loss?</td>
</tr>
<tr>
<td>2. What are the similarities and differences between the medical model and the sociocultural model of early hearing detection and intervention?</td>
</tr>
<tr>
<td>a. Sociocultural -</td>
</tr>
<tr>
<td>b. Medical/Audiological -</td>
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<tr>
<td>3. What are the internal and external influences on parents’ choice of method of communication for their children who are deaf/hh?</td>
</tr>
<tr>
<td>a.</td>
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<td>c.</td>
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<tr>
<td>d.</td>
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<tr>
<td>e.</td>
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<td>f.</td>
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</tbody>
</table>
4. What two factors can complicate a parents' task of selecting the most appropriate communication option for their child?
   a.
   b.

5. What is the definition of social constructionism?

6. How does the issue of "time" impact a family's decision-making process?

7. What is the “safety net” as it relates to parental decision-making?

8. What are three things a parent needs during their decision making process?
   a.
   b.
   c.

9. What are three historical tools that have been used to aid families in their decision making process?
   a.
   b.
   c.
10. How long should a family “stick with” a communication choice before attempting a different opportunity?

11. When individuals are questioning the communication choice, what factors should be systematically and regularly assessed?
   a.
   b.
   c.
   d.
   e.

12. What outcomes should be monitored/measured?
   a.
      i.
      ii.
      iii.
         1.
         2.
         3.
         4.
   b.
   c.
   d.
      i.
      ii.
      iii.
13. What are the key indicators to determine if a child is "on course" with communication development:
   a. For all children:
      i. 
      ii. 
   b. if applicable:
      i. 
      ii. 
      iii. 
      iv. 

14. What is the most critical child outcome to measure, regardless of communication modality?

15. What is diagnostic therapy or diagnostic teaching?

16. What is the primary goal of The Diagnostic Early Intervention Program (DEIP), out of Boys Town National Research Hospital?

17. What are typical benchmarks for the following types of users?
   a. cochlear implant users?
      i. 
   b. children using a listening and spoken language approach?
      i. 
   c. children using a visual/manual approach to communication?
      i.
18. What is the necessary rate of progress required to close the communication gap?

19. What is a risk of remaining exclusively dedicated to one particular communication modality, even when it doesn’t appear to be working for a child/family?

20. In the red flag monitoring approach, clinicians combine what two things?
   a. 
   b. 

21. Why should professionals try to identify red flags?

22. What are the two factors that relate to the severity of concerns identified through the “red flag” approach?
   a. 
   b. 

23. When should the clinician raise an initial red flag?

24. When should a clinician raise two red flags?

25. What are the “one flag” responses according to McConkey Robbins?
   a. 
   b. 
   c.
26. What are three examples of “two flag” responses according to McConkey Robbins?
   a. 
   b. 
   c. 
   d. 
   e. 

27. What are three tips for professionals who need to approach families about lack of progress?
   a. 
   b. 
   c. 

28. What special circumstances, experienced by children with hearing loss, may necessitate exceptions or adapted expectations regarding communication options?
   a. 
   b. 
   c. 
   d.
Review Sheet - Changing Communication Modalities *

Review Sheet

Please re-read the attached review sheet at least one more time.

You will have approximately five minutes to re-read this review sheet.

When the time is called, please answer the question at the bottom of this page by filling in a YES or NO.

Did you re-read this review sheet (YES or NO)? _______________
Types of communication methods a parent can choose to educate and converse with their deaf and hard of hearing children are referred to as “communication opportunities.” These can include spoken or visual languages, or combination of both on a continuum.

There are both similarities and differences between the medical model and the socio-cultural model of early hearing detection and intervention, with differing terminology amongst these models. The socio cultural model includes beliefs that hearing loss can become part of the cultural aspect of an individual’s life (associated with signing). The audiological or medical model views hearing loss as a medical defect, to be repaired, more likely to support interventions which lead to inclusion in mainstream society (associated with assistive technology and spoken language).

The internal and external influences on parents’ choice of method of communication for their children who are deaf/hh include:

- Language used in home
- Family involvement
- Age of identification and enrollment in intervention
- Literacy
- Community resources
- Hearing status
- Availability or use of hearing aids and CIs
- Speech intelligibility
- Presence of additional disabilities
- Availability of later educational options

The parents’ task of selecting the most appropriate communication option for a child can be complicated by the age of the child and the influence of professionals.

Social constructionism suggests that social interchange is the basis of people’s knowledge of the world and how they construct meaning. Interactions between people over time can lead to shared agreements which are then regarded as “truth” or “fact” even though they do not stem from an objective view of the world. Therefore, the way in which individuals make meaning of the world do not come from own attempts at understanding, but from interactions with others.

Time is an issue which impacts parent choice. Infants are being identified early, and parents may feel pressured to make decisions as quickly as possible so as not to lose precious time. Parents may not have the time to fully understand the implications of the different communication options.

With time, confidence in decision making grows. As parents take the time to reflect on the child’s progress, parents will confirm their decisions, or be led to adjust them. The “safety net” refers to the willingness of families and team members to evaluate how the child is doing, and to adjust the course if needed.
Three things parents need during this decision making process:
1) encouragement to take the time needed to explore the issues and to understand the child’s unique needs,
2) support from good listeners and others who have made the journey before
3) a bias detector – allowing parents to recognize that few opinions are without some bias.

Historically, several evaluation tools have been used to aid families in their decision making process. While these are no longer used today, they include:
   1. Deafness Management Quotient (Downs, 1974)
   3. Spoken Language Predictor (SLP) Index (Geers & Moog, 1987)

Families are recommended to choose an option and “stick with it” for at least six to twelve months. Then, along with the professionals, they ought assess the child's progress with the communication option(s) they have selected.

When individuals are questioning the communication choice, it is time for systematic and regular assessment of:
   • progress/lack of progress in communication abilities of child
   • desires of family for easier and more abundant communication among members
   • change (progression) in hearing sensitivity
   • choice of family of alternate technology
   • identification of special sensory or cognitive needs

The outcomes to measure and monitor includes:
1. Audiologic management – as foundation to LSL programs
   a. Aggressive assessment – aided and unaided thresholds, speech perception measures, acoustic immittance
   b. Aggressive management of sensory aids – earmold acoustics
   c. FM/IR systems in conjunction with CIs/Has
   d. Unaided R and L,
   e. Aided binaural, R HA, L HA
   f. CI/HA testing – CI only, CI and HA, HA only
   g. Bilateral CIS – both, R CI, L CI
2. Listening skills/auditory development
3. Speech sound repertoire/speech intelligibility – (if applicable for selected communication option)
4. Language and Literacy status
   a. Receptive language comprehension
   b. Expressive language comprehension
   c. Literacy Development – early reading skills, reading comprehension, overall literacy status

Key indicators to determine if a child is "on course" with communication development:
e. For all children:
   i. Receptive and Expressive Language
   ii. Quality of Life

f. if applicable:
   i. Wear time of CIs or Has (if applicable)
   ii. Progression through auditory hierarchy (if in LSL program)
   iii. Increases and changes in speech sound production
   iv. Sign language/sign system

Language status is the most critical child outcome to measure, regardless of communication modality. Language status is applicable to all communication options and allows us to know if child can express needs/wants, with multiple caregivers/communication partners.

Diagnostic therapy or diagnostic teaching is an assessment strategy in which two or more instructional conditions are compared to determine which is most effective. This way of measuring skills frequently, often involves complete longitudinal videotape sampling, “formal” diagnostic measures addressing auditory, speech, language, and cognition; and use of “informal” diagnostic tools; Assessment of parents is key as well.

A noteworthy diagnostic teaching program was called The Diagnostic Early Intervention Program (DEIP), at Boys Town National Research Hospital, had a primary goal of helping parents to become informed decision makers.

A typical benchmark for cochlear implant users include “flat” serial audiograms in the mild hearing loss range (yes/no).

A typical benchmark for children using a listening and spoken language approach would include improving speech perception measures (yes/no).

A typical benchmark for children using a visual/manual approach to communication would include improving fluency in ASL or sign system (yes/no).

A child is making a necessary rate of progress to close the communication gap, when they achieve at least 1 year's growth in 1 year's time.

Acquisition of listening is a cumulative developmental process – in which one skill depends on acquisition of previous skill. Remaining exclusively dedicated to one particular communication modality, even when it doesn't appear to be working for a child/family, can cause delays in listening development lead to long term delays and long term delays lead to life long deficits – undesirable outcomes.

The Red Flags Approach, by McConkey Robbins, is a great example of an established protocol for using data to inform progress monitoring for children with cochlear implants.
A red flag helps the clinician pay attention to or notice a particular skill (not for diagnosis of condition or statement of permanent disability). In the red flag monitoring approach - Clinicians combine *clinical experience/intuition* with *test information/evaluation*.

In the red flag approach, two factors relating to severity of concern include:
- Length of delay
- Number of skills delayed

The greater number of skills that are delayed at an interval, the more substantial the concern.

If child is more than three months delayed on given skill, raising an initial red flag is appropriate. A delay of six months requires two red flags to be raised.

Examples of one flag responses include:
- Pay attention to specific skill
- Speaking to parents,
- Checking CI equipment
- Examining whether prerequisite skills are adequately established
- Assess environment has created need for child to use skill
- Use different materials
- Increase intensity of training towards skill
- Tally opportunities child has to practice skill
- Write a plan of action
- Check monthly for three months

Examples of two flag responses include:
- Repeating one flag responses
- Contact CI center to consider programming changes
- Changing teaching method or techniques
- Consultation with colleague
- Refer to specialists for outside expert opinion

Three tips for professionals who need to approach families about lack of progress include:
1. Express concern regarding slow progress relative to other children with similar characteristics
2. Present an idea for specific plan of action
3. Discuss whether or not child has full time device use

Certain special circumstances experienced by children with hearing loss, may necessitate exceptions or adapted expectations regarding communication options. These include:
- ANSD,
- Austim,
- Learning Disabilities
- Multiple Disabilities
Appendix D
Experiment 1 Final Assessments

Case-Scenario Final Assessment, Mandated Reporting of Child Maltreatment

Final Assessment:

Instructions: Please be very thorough in answering the following prompt(s). Do your best to incorporate ALL of the material that was learned on these topics during the lecture and follow-up activities. ALL of the material is applicable to the question(s) – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write CLEARLY and in an ORGANIZED manner so that we can accurately score your response. Do not simply list information. Your answer should flow logically. Use the back if needed.

Attached you will find your first of three prompts. You will have 15 minutes to answer each prompt. I will make an announcement when the first 15 minutes have passed at which time you will place this prompt/response in the folder and receive the second prompt.

Please monitor your time accordingly. Write the time you begin and complete each prompt at the top of the page where indicated.
Prompt 1:

You have recently attended a workshop on the topic of “Mandated Reporting of Child Maltreatment” to fulfill continuing education requirements. Following the workshop, you reflect on your learning and decide that this content is of value to your colleagues at the private elementary school for children with hearing loss where you teach. You secure an opportunity to create a similar workshop for your colleagues at an upcoming professional development day. What information will you include in your workshop? Consider your audience when preparing this talk, to ensure your colleagues understand their responsibility as mandated reporters.
Prompt 2:

You work for the local school district and facilitate the transition meetings from early intervention (Part C) to early childhood services (Part B). Many of the families transitioning into your program come from early intervention programs where they have previously identified communication modalities and are well on their way to communicating and educating their children. However, in a brief phone conversation at which time you and the parent were arranging schedules for an upcoming building tour, the parent expressed some concern about the “finality” of their initial decision and inquired about the possibility of changing communication modes. Since you have scheduled a face-to-face visit where you will have plenty of time to address this parent’s concerns, you decide to prepare your response. What will you share with this parent about the possibility of changing communication modalities?
Case-Scenario Final Assessment, Changing Communication Modalities

Start time: _____________
End time: ______________

Prompt 3:

You work as an early intervention provider for children with hearing loss in an urban/suburban setting, where you serve many families who live in poverty. One family has been struggling lately and you have been in frequent communication with another member of their IFSP team to collaborate and coordinate your services. In recent conversations with another therapist on the team, you make reference to your knowledge of the impact of poverty on the developing brain. The therapist is interested in learning more from you so you arrange a 30 min conference call so that you can share your knowledge with her. What information do you plan to share with this therapist, recognizing that like you, she will serve children with disabilities and their caregivers who live in poverty?
Appendix E
Experiment 1 Participant Questionnaire

Regarding the topic of “Mandated Reporting of Child Maltreatment”:
Did you study outside of class?
YES or NO
Did you review with others?
YES or NO
How much effort did you put forth to attend to and learn this material during class?
NONE, VERY LITTLE, MODERATE, A LOT
How difficult was this content?
NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT

Regarding the topic of “Impact of Poverty on Brain Development”:
Did you study outside of class?
YES or NO
Did you review with others?
YES or NO
How much effort did you put forth to attend to and learn this material during class?
NONE, VERY LITTLE, MODERATE, A LOT
How difficult was this content?
NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT

Regarding the material topic of “Changing Communication Modalities”:
Did you study outside of class?
YES or NO
Did you review with others?
YES or NO
How much effort did you put forth to attend to and learn this material during class?
NONE, VERY LITTLE, MODERATE, A LOT
How difficult was this content?
This study compared three learning activities:

- **Standard Study** (re-reading key content from the study sheet)
- **High Support Retrieval Practice** (the short-answer quiz which provided structure for your response)
- **Low Support Retrieval Practice** (the free-recall or open ended prompt which asked you to write an essay about what you remember)

Regarding the learning activities:

Which learning activity did you prefer?

STANDARD STUDY, HIGH SUPPORT RETRIEVAL PRACTICE, LOW SUPPORT RETREIVAL PRACTICE

Which learning activity helped you learn the best?

STANDARD STUDY, HIGH SUPPORT RETRIEVAL PRACTICE, LOW SUPPORT RETREIVAL PRACTICE

Did you feel that there was a difference in your learning and retention (remembering) between the high versus low support retrieval practice activities? If so, why do you think there was difference? How do you think these activities influenced your initial learning and final retention?
Would you be willing to participate in retrieval practice activities (like those in either quiz condition) in your future classes? Why or why not?

YES, NO, MAYBE

Additional comments relevant to this study:

Thank you for your participation over the past 4 weeks.
Appendix F

Debrief Materials

Thank you for your attention and effort over this semester. Here are some resources I’ve utilized in the development of content for this study. I’ve also included a Practice Guide including strategies to improve student learning published by the US Department of Education. In addition to the citations listed here, you can find pdfs of selected documents at the following link: https://www.dropbox.com/sh/pacagb0czy81zhu/fDLB_CnTOL.

Mandated Reporting


**Impact of Poverty on Brain Development**


**Changing Communication Modalities**


**Improving Learning – Cognitive Psychology Applied to Education**


**Appendix G**

*Fact Count Scoring Rubrics*

**CONTENT:** Mandated Reporting  
**SCORER:** __________________________  
**SUBJECT ID:**

<table>
<thead>
<tr>
<th>Scoring</th>
<th>Fact (each box worth one point)</th>
<th>Comments/Notes:</th>
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<tbody>
<tr>
<td></td>
<td>Child maltreatment is defined by the Child Abuse Prevention and Treatment Act (CAPTA) as, &quot;Any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm.&quot;</td>
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<td>All 50 States, the District of Columbia, and the U.S. Territories have mandatory child abuse and neglect reporting laws that require certain professionals and institutions to report suspected maltreatment to a child protective services (CPS) agency.</td>
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<td>Four types of maltreatment: Physical Abuse: “Physical abuse is generally defined as &quot;any non-accidental physical injury to the child&quot; and can include striking, kicking, burning, or biting the child, or any action that results in a physical impairment of the child.”</td>
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<td>Neglect: “Neglect is frequently defined in terms of deprivation of adequate food, clothing, shelter, medical care, or supervision.”</td>
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<td>Psychological maltreatment: emotional maltreatment</td>
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<td>Sexual Abuse/Exploitation: “The employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; or The rape, and in cases of caretaker or interfamilial relationships, statutory rape, molestation, prostitution, or other form of sexual exploitation of children, or incest with children”</td>
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<td>Neglect is the most common form of child maltreatment.</td>
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<td>Four barriers which may prevent an individual from reporting suspected child</td>
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<td></td>
<td>Barrier 1: It’s not a real problem. I don’t believe CA/N is a common or sufficiently important problem to warrant my attention.</td>
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<td>Barrier 2: I don’t know how to recognize the signs and symptoms of CA/N. What are the signs and symptoms? I don’t feel confident about such signs to “trust our gut”</td>
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<td>Barrier 3: Lack of Awareness of Reporting Procedures; I don’t know how to report CA/N.</td>
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<tr>
<td>maltreatment include</td>
<td>Barrier 4: Skeptical of impact of report. I don’t think my report will do any good.</td>
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<tr>
<td>Child fatalities are the most tragic consequence of child maltreatment.</td>
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</table>
| Highest rates of Maltreatment | Young children  
those with disabilities |
| Children of caregivers (who do this…) have increased rates of maltreatment | abuse alcohol.  
abuse drugs.  
experience domestic violence |
| Mandated reporters have a legal obligation to report if individual suspects or has reasons to believe that a child has been abused or neglected. |
| According to Missouri law the following individuals are considered mandated reporters: | (MEDICAL/HEALTH PROFESSIONALS) Physicians, medical examiners, coroners, dentists, chiropractors, optometrists, podiatrists, residents, interns, nurses, hospital and clinic personnel, or other health practitioners  
(CHILDCARE/EDUCATION) Daycare center workers or other child care workers, teachers, principals, or other school officials  
(MENTAL HEALTH) Psychologists, mental health professionals, or social workers  
(CLERGY/RELIGIOUS) Ministers including clergypersons, priests, rabbis, Christian Science practitioners, or other persons serving in a similar capacity for any religious organization  
(LAW ENFORCEMENT) Juvenile officers, probation or parole officers, peace officers, law enforcement officials, or jail or detention center personnel  
(OTHER CATCHALL) Other persons with responsibility for the care of children  
(COMPUTER/TECHNOLOGY) Commercial film and photographic print processors; computer providers, installers, or repair persons; or Internet service providers |
| Consider the possibility of physical abuse when the child: | Has unexplained burns, bites, bruises, broken bones, or black eyes  
Has fading bruises or other marks noticeable after an absence from school  
Seems frightened of the parents and protests or cries when it is time to
<table>
<thead>
<tr>
<th>Consider the possibility of physical abuse when the parent or other adult caregiver:</th>
<th>Offers conflicting, unconvincing, or no explanation for the child’s injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describes the child as &quot;evil,&quot; or in some other very negative way</td>
</tr>
<tr>
<td></td>
<td>Uses harsh physical discipline with the child</td>
</tr>
<tr>
<td></td>
<td>Has a history of abuse as a child</td>
</tr>
<tr>
<td>Consider the possibility of neglect when the child:</td>
<td>Is frequently absent from school</td>
</tr>
<tr>
<td></td>
<td>Begs or steals food or money</td>
</tr>
<tr>
<td></td>
<td>Lacks needed medical or dental care, immunizations, or glasses</td>
</tr>
<tr>
<td></td>
<td>Is consistently dirty and has severe body odor</td>
</tr>
<tr>
<td></td>
<td>Lacks sufficient clothing for the weather</td>
</tr>
<tr>
<td></td>
<td>Abuses alcohol or other drugs</td>
</tr>
<tr>
<td></td>
<td>States that there is no one at home to provide care</td>
</tr>
<tr>
<td>Consider the possibility of neglect when the parent or other adult caregiver:</td>
<td>Appears to be indifferent to the child</td>
</tr>
<tr>
<td></td>
<td>Seems apathetic or depressed</td>
</tr>
<tr>
<td></td>
<td>Behaves irrationally or in a bizarre manner</td>
</tr>
<tr>
<td></td>
<td>Is abusing alcohol or other drugs</td>
</tr>
<tr>
<td>Consider the possibility of psychological maltreatment when the child:</td>
<td>Shows extremes in behavior, such as overly compliant or demanding behavior, extreme passivity, or aggression</td>
</tr>
<tr>
<td></td>
<td>Is either inappropriately adult (parenting other children, for example) or inappropriately infantile (frequently rocking or head-banging, for example)</td>
</tr>
<tr>
<td></td>
<td>Is delayed in physical or emotional development</td>
</tr>
<tr>
<td></td>
<td>Has attempted suicide</td>
</tr>
<tr>
<td></td>
<td>Reports a lack of attachment to the parent</td>
</tr>
<tr>
<td>Consider the possibility of psychological maltreatment when the parent or other adult caregiver:</td>
<td>Constantly blames, belittles, or berates the child</td>
</tr>
<tr>
<td></td>
<td>Is unconcerned about the child and refuses to consider offers of help for the child’s problems</td>
</tr>
<tr>
<td></td>
<td>Overtly rejects the child</td>
</tr>
<tr>
<td>Consider the possibility of sexual abuse when the child:</td>
<td>Has difficulty walking or sitting</td>
</tr>
<tr>
<td></td>
<td>Suddenly refuses to change for gym or to participate in physical activities</td>
</tr>
<tr>
<td></td>
<td>Reports nightmares or bedwetting</td>
</tr>
<tr>
<td></td>
<td>Experiences a sudden change in appetite</td>
</tr>
<tr>
<td>Consider the possibility of sexual abuse when the parent or other adult caregiver:</td>
<td>Is unduly protective of the child or severely limits the child’s contact with other children, especially of the opposite sex</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Is secretive and isolated</td>
</tr>
<tr>
<td></td>
<td>Is jealous or controlling with family members</td>
</tr>
</tbody>
</table>

The vast majority of maltreatment perpetrators are the child’s parents (more than 80%).

The Childhelp Hotline is 1-800-4-A-CHILD.

While making a report, the child protective services worker will likely ask you to provide:

- the name of the child
- the name of the parent(s)
- the name of the alleged abuser
- where the child can be located

You will also be asked to answer:

- Is the child in a life-threatening situation now?
- How do you know about the abuse/neglect?
- Did you witness the abuse/neglect?
- Were there other witnesses and how can they be contacted?

SLPs, audiologists, or teachers of the deaf are all examples of professionals who interact regularly with children and their caregivers and may have the opportunity to observe signs/symptoms of abuse. They are well positioned to observe and respond as these providers understand the limits of a child’s language skills in expressing current and past events.

How can we reduce the incidence, duration, and impact of maltreatment experienced by children with disabilities?

- observation (of child, parent, and their interactions)
- response (making reports to Child Protective Services)

Total: _____ / 77
<table>
<thead>
<tr>
<th>Scoring</th>
<th>Fact (each box worth one point)</th>
<th>Comments/Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Challenges associated with poverty, which threaten educational attainment and adult productivity.</td>
<td>restricted (or diminished) environments exposure to early and chronic stress</td>
</tr>
<tr>
<td></td>
<td>The limbic system is primarily responsible for</td>
<td>control of one's emotional life formation of memories</td>
</tr>
<tr>
<td></td>
<td>Two key structures within the limbic system:</td>
<td>amygala</td>
</tr>
<tr>
<td></td>
<td>Animal models along with fMRI imaging has informed our understanding of neuroplasticity and reinforced that early environmental experience impacts brain development. Brain circuits develop with more or less specificity depending on the complexity or enrichment of the environment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Epigenetics is the study of genes expression (cellular phenotype) caused by mechanisms other than changes in the underlying DNA sequence. More simply put, there are non-genetic factors (environmental or experiential factors) which cause genes to express themselves differently in different people.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Epigenetics pertains to discussion of SES status and brain development as variations in early experience, can directly influence the gene expression and behavior.</td>
<td></td>
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<tr>
<td></td>
<td>Chronic stress leads to remodeling of hippocampal circuitry including loss of dendrites, loss of synapses, and suppression of neurogenesis.</td>
<td></td>
</tr>
</tbody>
</table>
Epigenetic modifications are the mechanism responsible for brain changes from chronic stress exposure.

| Aversive situations present in low SES environments which expose children to early and chronic stress include: | crowding in living arrangements |
| hunger/food insecurity |
| threats to mental/physical health |
| limited attachment/parental interactions |

Which brain regions are sensitive to stress, can promote adaptation to adversity, and are interactive networks which allow people to cope with aversive situations?

- prefrontal cortex
- hippocampus
- amygdala

Three attentional networks and their roles

| ROLE - is responsible for obtaining and maintaining the alert state. |
| The orienting network |

| ROLE - orients individuals to the sensory stimuli. |
| The executive network |

| ROLE - aids in resolving conflict between responses and helps to regulate thoughts and feelings |

Executive system (prefrontal cortex), responsible for attention, is one of the primary areas of the brain impacted by poverty.
| Primary Effects of SES on Attention               | diminished working memory  
difficulty limiting distracting information (inhibitory control).  
reduced speed and accuracy of alerting and executive attentional networks. |
| Learning of math operations depends heavily on early ability of child to understand quantity. |
| Children of low SES demonstrate the deficits in numerical proficiency in areas of: | reciting digits, , , and.  
counting sets of objects,  
counting up or down from number other than 1,  
recognizing written numerals  
adding/subtracting.  
comparing numerical magnitudes  
problem solving |
| Infants and adults use similar brain structures for language development, namely: | Wernicke  
Broca's areas |
| Children from professional families have average vocabularies more than twice as large as those children from low-income families. This results in a 30 million word difference by preschool. Child vocabulary is also heavily influenced by the amount of child directed talk provided by mothers. |
| Phonemic discrimination, beyond it's utility for learning multiple languages, is important for later efficient use of spoken and written language (fluency). Children in poverty have difficulty with decoding and chunking, which may result from their reduced exposure to language rich environments. |
| Studies of attention, literacy, and numeracy point to the root of school success as experiences of infancy. |
| The potential mediators of SES disparities in socioemotional and cognitive development include: | nutrition,  
access to health care |
The term allostatic load refers to the *physiological consequences of chronic exposure to heightened neural responses from repeated or chronic stress*. It is used to explain how frequent activation of the body’s stress response, essential for managing acute threats, can in fact damage the body in the long run.

Protecting young children from adversity is a promising, science-based strategy to combat the deleterious effects of poverty.

We can promote resiliency and mediate the impact of chronic stress by *enhancing the caregiver-child relationship*.
<table>
<thead>
<tr>
<th>Key factors to include in early childhood programs to mitigate the deleterious effects of poverty include</th>
<th>Expertise of staff and capacity to build warm, positive responsive relationships with young children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>small class sizes with high adult-child ratios,</td>
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<tr>
<td></td>
<td>age appropriate materials in safe physical settings,</td>
</tr>
<tr>
<td></td>
<td>language-rich environments</td>
</tr>
<tr>
<td></td>
<td>consistent levels of child participation</td>
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</tbody>
</table>

According to James Heckman, since the adverse impact of poverty stems from lack of early stimulation, later remediation strategies may have less of a lasting impact or be wholly ineffective. The greatest return on investment is possible for anti-poverty programming when the intervention is provided earlier in life during time of greatest neuroplasticity.

Early positive experiences, ascertained through nurturing caregivers and stimulating environments can build and reinforce important neural pathways relating to language development and executive functioning.

Early adverse experiences weaken neural pathways. The number of traumatic events in a child’s life is proportional to the risk for medical and social difficulties as an adolescent and adult.

Enhancement of supportive relationships among educators, parents, and young children is currently thought to be the most promising intervention for young children with adverse experiences. Enhanced relationships will serve to buffer developing children from the adverse effects of poverty.

Total: _________ / 61
Types of communication methods a parent can choose to educate and converse with their deaf and hard of hearing children are referred to as “communication opportunities.” These can include spoken or visual languages, or combination of both on a continuum.

There are both similarities and differences between the medical model and the socio-cultural model of early hearing detection and intervention, with differing terminology amongst these models. The socio-cultural model includes beliefs that hearing loss can become part of the cultural aspect of an individual’s life (associated with signing).

The audiological or medical model views hearing loss as a medical defect, to be repaired, more likely to support interventions which lead to inclusion in mainstream society (associated with assistive technology and spoken language).

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<td></td>
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<tr>
<td></td>
<td>The internal and external influences on parents’ choice of method of communication for their children who are deaf/hh include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Language used in home</td>
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<td></td>
<td>Family involvement</td>
<td></td>
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<tr>
<td></td>
<td>Age of identification and enrollment in intervention,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>literacy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>community resources</td>
<td></td>
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<tr>
<td></td>
<td>hearing status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>availability or use of hearing aids and CIs,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>speech intelligibility,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>presence of additional disabilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>availability of later educational options.</td>
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<tr>
<td></td>
<td>The parents’ task of selecting the most appropriate communication option for a child can be complicated by:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>age of the child</td>
<td></td>
</tr>
<tr>
<td></td>
<td>influence of professionals</td>
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</tbody>
</table>
Social constructionism suggests that *social interchange is the basis of people’s knowledge of the world and how they construct meaning*. Interactions between people over time can lead to shared agreements which are then regarded as “truth” or “fact” even though they do not stem from an objective view of the world. Therefore, the way in which individuals make meaning of the world do not come from own attempts at understanding, but from interactions with others.

Time is an issue which impacts parent choice. Infants are being identified early, and parents may feel pressured to make decisions as quickly as possible so as not to lose precious time. Parents may not have the time to fully understand the implications of the different communication options.

With time, confidence in decision-making grows. As parents take the time to reflect on the child’s progress, parents will confirm their decisions, or be led to adjust them. The “safety net” refers to the willingness of families and team members to evaluate how the child is doing, and to adjust the course if needed.

### Three things parents need during this decision making process:

1. **Encouragement** to take the time needed to explore the issues and to understand the child’s unique needs;
2. **Support** from good listeners and others who have made the journey before;
3. **Bias detector** – allowing parents to recognize that few opinions are without some bias.

Families are recommended to choose an option and “stick with it” for at least six to twelve months. Then, along with the professionals, they ought assess the child’s progress with the communication option(s) they have selected.

When individuals are questioning the communication choice, it is time for systematic and regular assessment of:

- progress/lack of progress in communication abilities of child
- desires of family for easier and more abundant communication among members
- change (progression) in hearing sensitivity
- choice of family of alternate technology,
- identification of special sensory or cognitive needs
The outcomes to measure and monitor include:

**MAIN IDEA: Audiologic management** – as foundation to LSL programs
- Aided thresholds
- Unaided thresholds,
- Speech perception measures,
- Acoustic immittance,
- FM/IR systems in conjunction with CIs/Has,
- Aided binaural, R HA, L HA,
- Bilateral CIS – both, R CI, L CI;

**MAIN IDEA: Listening skills/auditory development**

**MAIN IDEA: Speech sound repertoire/speech intelligibility** –

**MAIN IDEA: Language and Literacy status:**
- Receptive language comprehension,
- Early reading skills,
- Reading comprehension,
- Overall literacy status

**Key indicators to determine if a child is "on course" with communication development:**

For all children:
- Receptive Language
- Expressive Language

If applicable:
- Progression through auditory hierarchy (if in LSL program),
- Sign language/sign system

**Language status** is the most critical child outcome to measure, regardless of communication modality. Language status is applicable to all communication options and allows us to know if child can express needs/wants, with multiple caregivers/communication partners.
**Diagnostic therapy or diagnostic teaching** is an assessment strategy in which two or more instructional conditions are compared to determine which is most effective. This way of measuring skills frequently, often involves complete longitudinal videotape sampling, “formal” diagnostic measures addressing auditory, speech, language, and cognition; and use of “informal” diagnostic tools; Assessment of parents is key as well.

A noteworthy diagnostic teaching program was called The Diagnostic Early Intervention Program (DEIP), at Boys Town National Research Hospital, had a primary goal of helping parents to become informed decision makers.

A typical benchmark for cochlear implant users include “flat” serial audiograms in the mild hearing loss range (yes/no).

A typical benchmark for children using a listening and spoken language approach would include improving speech perception measures (yes/no).

A typical benchmark for children using a visual/manual approach to communication would include improving fluency in ASL or sign system (yes/no).

A child is making a necessary rate of progress to close the communication gap, when they achieve at least 1 year’s growth in 1 year’s time.

Acquisition of listening is a cumulative developmental process – in which one skill depends on acquisition of previous skill. Remaining exclusively dedicated to one particular communication modality, even when it doesn’t appear to be working for a child/family, can cause delays in listening development lead to long term delays and long term delays lead to life long deficits – undesirable outcomes.

A red flag helps the clinician pay attention to or notice a particular skill (not for diagnosis of condition or statement of permanent disability).

<table>
<thead>
<tr>
<th>In the red flag monitoring approach clinicians combine:</th>
<th>clinical experience/intuition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>test information/evaluation</td>
</tr>
</tbody>
</table>
In the red flag approach, two factors relating to severity of concern include:

<table>
<thead>
<tr>
<th>Length of delay</th>
<th>Number of skills delayed</th>
</tr>
</thead>
</table>

If child is more than three months delayed on given skill, raising an initial red flag is appropriate.

A delay of six months requires two red flags to be raised.

Examples of one flag responses include:

- Pay attention to specific skill,
- Speaking to parents,
- Checking CI equipment,
- Examining whether prerequisite skills are adequately established
- Assess environment has created need for child to use skill,
- Use different materials,
- Increase intensity of training towards skill,
- Tally opportunities child has to practice skill
- Write a plan of action
- Check monthly for three months

Examples of two flag responses include:

- Repeating one flag responses,
- Contact CI center to consider programming changes,
- Changing teaching method or techniques,
- Consultation with colleague,
- Refer to specialists for outside expert opinion

Three tips for professionals who

1. Express concern regarding slow progress relative to other children with similar characteristics
2. Present an idea for specific plan of action

3. Discuss whether or not child has full time device use

<table>
<thead>
<tr>
<th>Certain special circumstances experienced by children with hearing loss, may necessitate exceptions or adapted expectations regarding communication options. These include:</th>
<th>ANSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autism</td>
<td>Learning Disabilities</td>
</tr>
<tr>
<td>Multiple Disabilities</td>
<td></td>
</tr>
</tbody>
</table>
# Appendix H  
Standard Course Scoring Rubrics

**CONTENT:** Mandated Reporting  
**SCORER:** ____________________________  
**SUBJECT ID:**

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>SCORE</th>
<th>Relevant HS questions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understand professional responsibilities of being a mandated reporter.</td>
<td>0</td>
<td>1, 2, 5, 9, 10, 19, 20</td>
</tr>
<tr>
<td>2. Recognize signs and symptoms of abuse and neglect.</td>
<td>0</td>
<td>3, 4, 6, 7, 8, 11, 12, 13, 14, 15</td>
</tr>
<tr>
<td>3. Describe the process of reporting suspected child abuse/neglect (CA/N)</td>
<td>0</td>
<td>2, 9, 16, 17, 18,</td>
</tr>
</tbody>
</table>

**AWARDED POINTS**  

| POTENTIAL POINTS | /6 |

**Proportion**
CONTENT: Poverty
SCORER: ________________________
SUBJECT ID: ________________________

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>SCORE</th>
<th>Comments/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the influence of recent research findings from neuroscience on our understanding of the influence of SES on brain development.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 4, 5, 6, 8, 11, 12, 13, 14, 15, 17, 18, 21,</td>
</tr>
<tr>
<td>2. Identify brain changes observed in subjects from low SES environments.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 2, 3, 7, 9, 10, 16,</td>
</tr>
<tr>
<td>3. Discuss potential protective factors which may serve to minimize the deleterious effects of SES on brain development.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 19, 20, 22, 23, 26, 28</td>
</tr>
<tr>
<td>4. Reflect on how these findings might impact our service delivery to deaf/hh populations living in low SES.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 1, 24, 25, 27, 28</td>
</tr>
</tbody>
</table>

AWARDED POINTS

POTENTIAL POINTS /8

Proportion
### Learning Objective

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>SCORE</th>
<th>Comments/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the rhetorical challenge of the terms, options, approaches, modes, choices, and opportunities faced when choosing a communication option;</td>
<td>0 1 2</td>
<td>Relevant HS questions: 1, 2, 3, 4, 5, 6, 7, 8, 9,</td>
</tr>
<tr>
<td>2. Identify questions that should be asked by families and the needs that must be considered regarding the selection/determination of communication option.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 3, 6, 7, 8, 9, 27</td>
</tr>
<tr>
<td>3. Identify the audiologic and hearing sensory technology needs and issues that should be addressed; along with the range of auditory-functioning, speech, language, cognitive tests and protocols which might be considered for determining a child’s communication status.</td>
<td>0 1 2</td>
<td>Relevant HS questions: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AWARDED POINTS</th>
<th>POTENTIAL POINTS</th>
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<td>/6</td>
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Proportion
### Appendix I

**Experiment 2 Counterbalancing**

<table>
<thead>
<tr>
<th></th>
<th>Mandated Reporting of Child Maltreatment</th>
<th>Impact of Poverty on Brain Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Support Retrieval Practice (HS)</td>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td>Standard Study (SS)</td>
<td>Group B</td>
<td>Group A</td>
</tr>
</tbody>
</table>
Appendix J
Experiment 2 Final Assessments

High Support Final Assessment, Mandated Reporting of Child Maltreatment

Final Assessment:

Instructions:
You will have 15 minutes to complete the assessment for each topic area. I will make an announcement when the first 15 minutes have passed at which time you will place this assessment in the folder and receive the second one.

Please monitor your time accordingly. Write the time you begin and complete each assessment where indicated.

Please be very thorough in answering the following questions. Do your best to incorporate ALL of the material that was learned on this topic during the lecture. ALL of the presented material is applicable to the questions – so do not leave anything out that you can remember. You will be scored based on how much of the information you use. Please write clearly and in an organized manner so that we can accurately score your responses. You will have 15 minutes to complete this activity, so budget your time accordingly.

START TIME: _______________________

1. What is the definition of child maltreatment according to the Child Abuse Prevention and Treatment Act (CAPTA)?
2. To whom is mandated reporter obligated to report?

3. What are the key elements of the four categories of abuse, according to federal law?
   a. Physical Abuse:
   b. Neglect:
   c. Psychological maltreatment:
   d. Sexual Abuse/Exploitation:

4. What is the most common form of child maltreatment?

5. What are four barriers which may prevent an individual from reporting suspected child maltreatment?
   a. Barrier 1
   b. Barrier 2:
   c. Barrier 3:
   d. Barrier 4:

6. What is the most tragic consequence of child maltreatment?

7. What are two child risk factors associated with increased rates of maltreatment?
   a.
   b.
8. What are three caregiver risk factors associated with increased rates of maltreatment?
   a. 
   b. 
   c. 

9. According to the legal definition, when is a mandated reporter required to make a report?

10. What individuals are considered mandated reporters according to Missouri law? (List the categories of professions, or give one example from each category.)
    a. 
    b. 
    c. 
    d. 
    e. 
    f. 
    g. 
11. What are the potential signs of physical abuse?

a. Consider the possibility of physical abuse when the child:
   
i.
   
   ii.
   
   iii.
   
   iv.
   
   v.

b. Consider the possibility of physical abuse when the parent or other adult caregiver:
   
   v.
   
   vi.
   
   vii.
   
   viii.

12. What are the potential signs of neglect?

a. Consider the possibility of neglect when the child:
   
   i.
   
   ii.
   
   iii.
   
   iv.
   
   v.
   
   vi.
   
   vii.
c. Consider the possibility of neglect when the parent or other adult caregiver:
   i. 
   ii. 
   iii. 
   iv. 

13. What are the potential signs of psychological maltreatment?
   a. Consider the possibility of psychological maltreatment when the child:
      i. 
      ii. 
      iii. 
      iv. 
      v. 
   b. Consider the possibility of psychological maltreatment when the parent or other adult caregiver:
      i. 
      ii. 
      iii.
14. What are the potential signs of sexual abuse?

   a. Consider the possibility of sexual abuse when the child:
      i. 
      ii. 
      iii. 
      iv. 
      v. 
      vi. 
      vii. 
      viii.

   b. Consider the possibility of sexual abuse when the parent or other adult caregiver:
      i. 
      ii. 
      iii.

15. Who are the vast majority of maltreatment perpetrators?

16. What is the contact number for the Childhelp Hotline?
17. During the reporting process, what information will be asked of the person making the report?

v.

vi.

vii.

viii.

18. What are four additional questions you might be asked by the Children's Division worker during a report?

v.

vi.

vii.

viii.

19. Why might SLPs, audiologists, or teachers of the deaf be well positioned to recognize when a child is experiencing maltreatment?

20. What are two ways we can reduce the incidence, duration, and impact of maltreatment experienced by children with disabilities?

 a.

 b.

END TIME: __________________________
1) What are two primary challenges associated with poverty which result in cognitive and social emotional inequalities as well as the threat to educational attainment and adult productivity?
   a) 
   b) 

2) What are the primary functions of the limbic system?
   a) 
   b) 

3) What are two key structures within the limbic system?
   a) 
   b) 

4) How has the study of animal models and use of fMRI imaging informed our understanding of neural plasticity?
5) What is *epigenetics*?

6) How is the role of epigenetics pertinent to discussion of SES status and brain development?

7) What is the impact of chronic stress exposure on brain development?

8) By what mechanism are these changes thought to occur?

9) What aversive situations might be present in low SES situations which could expose children to early and chronic stress?
   
a)
   
b)
   
c)
10) What brain regions or networks are particularly sensitive to stress and can promote adaptation to adversity?
   a) 
   b) 
   c) 

11) What are the three attentional networks and their roles? (Name the network and the role. 6 total items)
   a) ___________________ network:
   b) ___________________ network:
   c) ___________________ network:

12) What is the primary function of the executive network?

13) What are the primary effects of SES on attention?
   a) 
   b) 
   c) 

14) What requisite skill do children need in order to learn arithmetic operations?
15) What are the differences in numerical proficiency seen in preschoolers of low SES?
   a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 

16) What brain structures do children and adults use for language acquisition?
   a) 
   b) 

17) How do the vocabularies of children from differing low vs. higher SES backgrounds compare?

18) Why is the development of phonemic discrimination a concern for children from low SES environments?
19) What is the common root of school success, across the areas of attention, literacy, and numeracy?

20) What are the potential mediators of SES disparities on brain development?
   a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 
   h) 

21) What is meant by the term “allostatic load”? 

22) What is one science based strategy which can promote child development? 

23) How can we promote resilience and/or mediate the impact of chronic stress?
24) What are the key factors to include in early childhood programs to mitigate the deleterious effects of poverty?

a) 

b) 

c) 

d) 

e) 

25) Why do the investment dollars have the greatest impact when targeted toward the youngest children?

26) How do early positive experiences, ascertained through nurturing caregivers and stimulating environments, influence early brain development?

27) How do early adverse experiences impact longitudinal developmental and health outcomes?
28) What is currently thought to be the most promising intervention for young children with adverse experiences?

END TIME: ______________________
Appendix K
Experiment 2 Participant Questionnaire

This study compared two learning activities:
- **Standard Study** (re-reading key content from the study sheet)
- **High Support Retrieval Practice** (the short-answer quiz which provided structure for your response)

This study involved two topic areas:
- Mandated Reporting of Child Maltreatment
- Impact of Poverty on Brain Development

Please respond to the following questions by circling the most appropriate response and/or writing additional comments as required.

**Regarding the topic of “Mandated Reporting of Child Maltreatment”:**
Did you study this material outside of class?
- YES or NO

Did you review this material with others?
- YES or NO

How much effort did you put forth to attend to this material during class?
- NONE, VERY LITTLE, MODERATE, A LOT

How difficult to understand did you find this content during the presentation/lecture?
- NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT

How difficult to recall did you find this content during the follow-up learning activities?
- NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT
Regarding the topic of “Impact of Poverty on Brain Development”:

Did you study this material outside of class?
YES or NO

Did you review this material with others?
YES or NO

How much effort did you put forth to attend to this material during class?
NONE, VERY LITTLE, MODERATE, A LOT

How difficult to understand did you find this content during the presentation/lecture?
NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT

How difficult to recall did you find this content during the follow-up learning activities?
NOT DIFFICULT AT ALL, CHALLENGING BUT DO-ABLE, IMPOSSIBLY DIFFICULT

Regarding the format of learning activities:

Which learning activity did you prefer?
STANDARD STUDY
HIGH SUPPORT
RETRIEVAL PRACTICE

Which learning activity helped you learn the best?
STANDARD STUDY
HIGH SUPPORT
RETRIEVAL PRACTICE

Did you feel that there was a difference in your learning and retention (remembering) between the study activities (high support retrieval practice vs. standard study)? If so, why do you think there was there a difference? How do you think these activities influenced your initial learning and final retention?
Would you be willing to participate in retrieval practice activities in your future classes? Why or why not?

YES, NO, MAYBE

Additional comments relevant to this study:

Thank you for your participation over the past 5 weeks.