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Problem-Based Learning as a Tool to Facilitate Graduate Students' Understanding of Terminology and Evidence-Based Practice in Child Language Disorders

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Abstract

There have historically been a variety of diagnostic terms used to describe children with unexplained language disorders. Recently there has been some consensus around the use of the term developmental language disorder (DLD) however, students, in particular graduate students, need to be aware of the various terms that have historically been used so that they are able to successfully employ evidence-based practice (EBP). The current study used a Problem Based Learning (PBL) approach, based on a teaching module recently published by the authors (see Victorino & Magaldi, 2019), to teach students enrolled in a graduate program in Communication Sciences and Disorders (CSD) about the evolving terminology used to describe children with unexplained language disorders. Students' confidence in their understanding of the concepts surrounding the variety of terms used and confidence to seek evidence relating to children with unexplained language disorders was measured. Quantitative findings indicated increased student confidence after the PBL exercises on all areas measured, with the largest gains related to the nature of unexplained language disorders in children, and their ability to employ EBP. Qualitative findings also suggested the PBL exercises impacted students thinking about EBP. Implications for educators in CSD programs are discussed.

Keywords

Problem-based learning, Evidence-based practice, Terminology issues in child language disorders, Developmental Language Disorder

Cover Page Footnote

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Introduction

Unexplained language disorders are language disorders that are the primary problem and not a secondary characteristic of a broader cognitive, neurological or genetic diagnosis. Approximately 7% of 5-year-olds have an unexplained language disorder (Tomblin et al., 1997), which makes it nearly four times more common than autism spectrum disorder (Maenner et al., 2020). Children with unexplained language disorders receive speech/language therapy in schools and clinics nationwide. Yet, there is little, if any, consistency in the terms used to describe children with unexplained language disorders across the literature and in clinical practice. A study that examined the range of terms used in the literature over a 20-year period found 130 possible combinations of terms had been used at least once, with 33 terms used more than 600 times (Bishop, 2014). This lack of agreement has created a variety of problems for children with unexplained language disorders, for their families, for students and educators, and for the field at-large. This lack of consistent terminology use, referred to by Bishop (2014) as "diagnostic mayhem," prompted a multi-day meeting of researchers and clinicians to discuss and ultimately agree upon use of a single term to refer to children with unexplained language disorders. The term *developmental language disorder* (DLD) was proposed to refer to children with unexplained language disorders (Bishop et al., 2017). Although the recent agreement on the use of the term DLD to refer to children with unexplained language disorders is promising, the chaotic history of terminology use remains a real impediment to the successful implementation of evidence-based practice.

Evidence-based practice (EBP) as defined by the American Speech-Language-Hearing Association (ASHA) is an approach in which high-quality research evidence is integrated with practitioner expertise and client preferences to make clinical decisions (ASHA, n.d.). Accredited graduate programs in Communication Sciences and Disorders (CSD) in the United States are required to cover EBP in their student training as it is an important cornerstone of the field. The most recent standards for Accreditation of Graduate Education Programs in Audiology and Speech-Language Pathology published by the Council of Academic Accreditation (CAA) in 2017 highlight the importance of EBP in several standards for accreditation (CAA, 2017). The implementation of EBP requires that an individual examine the scientific literature for high-quality evidence to inform clinical decisions. However, the varied terminology used in the literature to refer to children with unexplained language disorders is often different within and among scientific journals and clinical publications. This can cause a variety of problems for clinicians and students seeking information to guide treatment decisions. The varied terminology used in the literature will make searching for evidence to inform clinical decisions a lengthy and inefficient process, as a comprehensive search for evidence will require conducting multiple searches using various search terms. This could have an overall impact on student confidence in scholarship as well as confidence in their ability to competently search the literature for evidence. Therefore, it is important for those teaching coursework in the area of child language disorders to be aware of these challenges and help students to navigate terminology differences in textbooks, journal articles, and clinical settings so that they can competently search the available literature. This will create well-prepared students who have the tools to efficiently and confidently seek out evidence related to children with unexplained language disorders.

To address this issue, Victorino and Magaldi (2019) reviewed the evolving terminology in child language disorders and focused on instructional opportunities for faculty in CSD programs. We

proposed the use of Problem-Based Learning (PBL), a student-centered pedagogical approach in which a problem is identified, and students are guided to work cooperatively with one another to explore, research, and discuss to seek a solution(s). A core feature of PBL is that an instructor does not 'teach' using a traditional lecture-style format that is typical in most colleges and universities. Rather, they 'facilitate' learning by guiding students through a problem and encourage consideration of the causes and potential solutions (Strobel & van Barneveld, 2009). Problem-based pedagogy has been used in the teaching and learning community for decades. In the mid 1900s, John Dewey advocated that teachers encourage students to investigate and use methods to promote self-reflection (Delisle, 1997). The concept of teaching through student involvement and reflection evolved over the years and PBL became quite common in the training of medical students in the United States. More recently the use of PBL has expanded to other disciplines including CSD. According to the current standards for the Certificate of Clinical Competence in Speech-Language Pathology (ASHA, 2020), critical thinking and problem-solving skills are integral to CSD graduate student training, making PBL an excellent pedagogical strategy.

Although PBL's effectiveness has been studied extensively, particularly in the medical literature, its use in CSD is relatively new and unexplored. However, its focus on critical thinking and helping students to integrate theory and practice make it extremely well suited to CSD and to addressing the 'problem' that the inconsistent terminology use for children with unexplained language disorders and the implementation of EBP. Per the approach proposed in Victorino and Magaldi (2019), the current study used PBL to facilitate graduate students' understanding of diagnostic terminology in child language disorders, and subsequently measured students' perception of their understanding of the issues and their confidence in their ability to employ EBP**.** It aimed to quantify student learning outcomes associated with this model of instruction for graduate students in CSD. The current study used both quantitative and qualitative methods to answer the following questions:

1. What is the impact of the use of PBL on graduate students' confidence in their understanding of terminology issues associated with unexplained child language disorders?
2. What is the impact of the use of PBL on graduate students' confidence in their ability to employ EBP for children with unexplained language problems?

Method

Participants. The participants for this study were students enrolled in two sections of a graduate level course (CODS 6310, Language Disorders in School Aged Children and Adolescents) in The Department of Communication Disorders and Sciences at William Paterson University of New Jersey. Each of the authors taught a section of the course in Fall 2019. This study was approved by the institutional review board at William Paterson University and written consent was obtained from all participants. All students enrolled in the classes participated in the PBL exercises and assignments, however, they were given the opportunity to provide consent for any products of their class work and assignments to be used for research purposes. Of the 24 students enrolled across the two sections, all provided informed consent, and were thus included in the study.

Procedure. This study consisted of PBL activities as proposed in Victorino and Magaldi (2019). The activities included a total of six steps distributed across two class sessions. To facilitate

consistency between the two sections, the investigators met prior to each class session and created scripts and prompts to be presented via shared PowerPoint presentations. See Table 1 for an outline of PBL steps and how they were executed.

The first class included steps 1-3 of the PBL framework, including providing background information, identifying the problem to be examined, and generating and exploring learning issues related to the problem. Specifically, background information regarding the history of terminology use for unexplained language disorders was presented, and students participated in an active discussion in which a main problem was identified. In this case, both classes agreed that the lack of consistency in diagnostic terms was a problem for clinical practice. They proceeded to identify learning issues during in-class discussions. Learning issues were discussed and agreed upon as questions to include: What labels are being used in different settings as well as within and outside the discipline? How are the terms defined, and what are the similarities and differences? What is the quality of information found in the literature that is associated with the different labels?

After this first class, the students completed step 3 independently, wherein they investigated the learning issues via readings and written summaries. Some article suggestions were provided (see Table 1), and students were also directed to conduct their own literature searches related to the various terms they had encountered and identified in the first class. During the second class, the instructors facilitated discussion around the students' independent learnings (step 4), and guided students to synthesize information with peers (step 5). Following this class, the students completed the sixth and final step of the exercise by reflecting on the PBL process and the development of their knowledge around the topic.

Prior to and following the instruction and PBL activities, the students also completed a nine-item questionnaire (administered on paper, in class) to measure their perception of the nature of unexplained language disorders in children (items 1-3), the results of the problem of inconsistent terminology use (items 4-6) and students' confidence in their ability to conduct searches to support EBP (items 7-9). The questionnaire used a scale of 1-5 where **1**= not at all confident, **2** = somewhat confident, **3** = confident, **4** = very confident, and **5** = totally confident (full text of questionnaire items appear in Table 2).

The pre- and post- questionnaire also included two open-ended questions that asked students to provide the names of the terms that they knew of that are used to describe children with unexplained language disorders. They were also asked to indicate the one term they thought would be most beneficial to use when searching for evidence relating to children with unexplained language disorders, and to explain the reason for their choice. These open-ended questions were included to gauge students' knowledge prior to and following the PBL exercise in order to determine the potential impact of the PBL exercise.

Table 1

Steps in a PBL Framework, per Victorino and Magaldi (2019), and Their Practical Application to the Problem of Terminology Used for Unexplained Language Disorders

Steps in PBL Framework	Application
Step 1: Present a problem scenario (1st class session)	Background information was presented via Powerpoint presentation, including the usefulness of diagnostic categories, history of labels for children with unexplained language disorders referencing Bishop (2014) "diagnostic mayhem," and review of EBP decision making process, referencing https://www.asha.org/research/ebp/ and Gillam & Gillam (2006). Students discussed and came to a consensus regarding problem(s) associated with inconsistent terminology. The instructor entered student output on a blank slide in the presentation.
Step 2: Generate learning issues (1st class session)	Students were prompted to generate questions to explore in order to address the problem. As students brainstormed, the instructor listed the learning issues and questions on a blank slide in the presentation.
Step 3: Explore learning issues (1st class session and homework)	Students worked in small groups in class and completed a homework assignment before the next class session. The assignment as written in the shared PowerPoint presentation was: 1. Read papers posted on Blackboard, 2. Conduct literature searches, 3. Outside of class: discuss the issue with supervisors, SLPs, teachers; 4. Prepare a summary for next week, including sources. Papers posted for initial reading included Bishop (2014), Bishop et al. (2016, 2017), Gillam & Gillam (2006). *Note that since 2019, other useful papers on this topic have been published, including Leonard (2020) and Paul (2020).*
Step 4: Evaluate and discuss (2nd class session)	Students reported on their learnings. The instructors facilitated the discussion by presenting the learning issues and questions identified in class 1 as prompts and encouraging members from each small group to contribute.
Step 5: Synthesize information (2nd class session)	Students were guided to synthesize the outcomes of their own exploration with those of other classmates. The instructors prompted the discussion by identifying themes in the students' experiences involving literature searches, discussions with supervisors and other professionals, etc. Products of the discussions (steps 4-5) were transcribed live on a blank slide.
Step 6: Reflect (after 2nd class)	The final step involved the students independently reflecting on the assignment. Students were prompted to reflect on the development of their knowledge around the problem and the topics addressed, as well as on the PBL process itself. Written reflections were submitted after the second class.

Data Analysis. The data were analyzed to determine whether the use of PBL changed students' confidence in their understanding of the nature of unexplained language disorders, the terminology issues in child language disorders, and their own ability to employ EBP related to this population. The data collected in the study were not anonymous, as the materials were part of the normal course activities. The authors were the course instructors and were aware of which students provided the data. However, the data were de-identified prior to analysis, and did not include any information that could tie a single data point to an individual student.

Responses on the rating scales were analyzed for change post-instruction and active learning (denoted henceforth as pre- and post-PBL). Given that the dependent variable consisted of ordinal data from one group measured at two time points, the non-parametric Wilcoxon signed-rank test was used to analyze differences between pre- and post-PBL ratings.

Open-ended questions related to student reporting of the diagnostic labels they were aware of, as well as their choice of preferred labels were noted, tallied, and compared for pre- and post-PBL responses as well. Students' explanations of why they chose a particular label were analyzed using thematic analysis procedures. In particular, these open-ended responses were analyzed using the five-step thematic analysis procedures outlined by Castleberry and Nolan (2018), which involved the processes of compiling, disassembling, reassembling, interpreting, and concluding, described below.

The thematic analysis procedure included multiple layers to identify themes that respondents identified as being important to their understanding of EBP and the current trends in diagnostic categorization of children with language disorders. The qualitative analysis of the open-ended responses began with one of the investigators compiling the students' responses into a single organized document. Next, the student responses were reviewed and disassembled by each of the investigators separately, whereby the responses were taken apart and pieces were grouped into central categories. The reviewers then met to discuss the categories and to generate coding terms. Concurrently, a research assistant was trained in content analysis and instructed to review each student's anonymized response closely and color-code words or phrases associated with the suggested categories. She was also encouraged to identify additional categories, as appropriate. Upon completion of the research assistant's coding, the investigators reviewed the codes and terms assigned to them, and any discrepancies or differences of opinion were discussed until a consensus was reached. When this process was complete, the codes were tallied for frequency and proportion of use in pre- versus post-PBL responses.

The next layer of analysis involved reassembling the data, whereby specific codes were put into context to create more general themes. The investigators independently reviewed the coding system with the goal of finding patterns to help illustrate the larger themes being conveyed. Again, any differences of opinion were discussed, and consensus was reached. These procedures are in keeping with qualitative data analyses that funnel from a large amount of particular/specific data to a smaller set of more general themes that can be visualized and interpreted (Creswell & Poth, 2017).

Results

Quantitative Findings. Student responses to the Likert scale questionnaire, both pre- and post-PBL are shown in Table 2. Related-samples Wilcoxon signed-rank tests indicated that post-PBL responses were significantly higher than pre-PBL responses on all items, indicative of increases in student confidence. The largest differences were apparent for items 1, 2, 3, 8 and 9, with post-PBL rating increases equal to or greater than one on the ordinal scale of 1-5. Items 1-3 measured students' confidence related to their knowledge of the nature of unexplained language disorders. All three items averaged below 3.0 prior to the PBL exercise, indicating a lack of confidence or self-perceived knowledge. Following the PBL exercise, ratings in those areas increased by more than one point indicating that more students felt "very" to "totally confident" about their understanding of and familiarity with the nature of unexplained language disorders. Ratings on questions 8 and 9 related to students' ability to employ EBP. Ratings on question 8 increased by one point from a mean of 3.08 (average confidence) to a mean of 4.08 (very confident). Ratings on question 9 increased by more than a point from a mean of 2.42 (below average confidence) to 3.88 (nearing "very confident"). Items 4 – 7 had smaller increases, increasing by less than one-point post-PBL. However, the highest ratings overall, both pre- and post-PBL, were on items 4 and 5, which measured students' perceived understanding of the benefits and challenges of applying diagnostic terms for children with unexplained language disorders. The lowest ratings overall were on item 6, which had to do with students' confidence in selecting and applying diagnostic labels in a clinical setting.

Diagnostic Label Choices. Students were asked to list all diagnostic labels they were aware of that could be used for children with otherwise unexplained language disorders. Pre-PBL, a total of ten terms were named by the 24 students. All 24 students mentioned *SLI*, and 21 of the 24 mentioned *DLD*. In addition to those, seven students listed *language learning disability (LLD)*, five named *intellectual disability,* three listed the general term *language disorder,* three listed *language delay*, and the labels *dyslexia, receptive language disorder, expressive language disorder, and mixed expressive-receptive language disorder* were each mentioned once. Post-PBL, the total number of terms listed increased to 21 - a more than 100% increase - indicating that conducting the PBL exercises increased the students' awareness of diagnostic terms. Table 3 shows the labels that were listed on the post-PBL questionnaire, with their corresponding frequencies.

Next, students were asked to respond to the question, "What is the one term you think would be most beneficial to use when searching for evidence relating to children with unexplained language disorders?". Pre-PBL, students chose *SLI* with the greatest frequency (n = 12, or 50%), followed by *DLD* (n = 6, or 25%). A total of 5 possible terms were identified, including the additional terms *intellectual disability* (*n* = 2), *developmental* (*n* = 2), and *language learning disorder* (*n* = 1). Post-PBL, that list became shorter, with 16 students choosing *SLI (66%)*, seven choosing *DLD (29.17%)*, and one choosing *language-learning disability*.

Table 2

Contents of the Likert Scale Questionnaire, Including Pre- and Post-PBL Responses and Results of Wilcoxon Signed-Rank Tests

Item	Pre-PBL *M* (*SD*)	Post-PBL *M* (*SD*)	*z*	*p*
1. I have a good understanding of the nature of unexplained language disorders in children.	2.46 (.72)	3.88 (.53)	4.215	.000
2. I am familiar with the various terms used in the literature to describe children with unexplained language disorders.	2.67 (.82)	4.34 (.64)	4.179	.000
3. I have an understanding of the current trends in terminology to describe children with unexplained language disorder.	2.92 (.88)	4.21 (.78)	3.904	.000
4. I have an understanding of the benefits of using diagnostic labels for researchers, clinicians and families.	3.88 (.80)	4.63 (.56)	3.106	.002
5. I have an understanding of the challenges that the range of diagnostic terms used to describe children with unexplained language disorders pose for researchers, clinicians, and families.	3.71 (.95)	4.63 (.58)	3.099	.002
6. I am confident that I could select the appropriate diagnostic label for a client with an unexplained language disorder.	2.08 (.83)	3.17 (.92)	3.266	.001
7. I have the tools necessary to competently apply the principles of evidence-based practice (EBP) when working with children with unexplained language disorders.	2.87 (.95)	3.67 (.76)	3.043	.002
8. I am able to conduct a literature search to find evidence to answer clinical questions related to children with unexplained language disorders.	3.08 (.78)	4.08 (.72)	3.943	.000
9. I understand the most useful search terms to use when seeking evidence relating to children with unexplained language disorders.	2.42 (.97)	3.88 (.95)	3.913	.000

Note. Item number, text, pre- and post-PBL means (*M*) and standard deviations (*SD*) for responses to all 9 items. Total $n = 24$, z = standardized test statistic, p = significance for paired sample Wilcoxon signed-rank test.

Table 3

Labels for Otherwise Unexplained Language Disorders, per Student Report Post-PBL (n = 24 students)

Label / Diagnostic Term	Frequency
Developmental Language Disorder (DLD)	24
Specific Language Impairment (SLI)	23
Language (based) Learning Disability (LLD)	18
Expressive/Receptive Language Disorder	12
Communication Impaired	10
Language Disorder	8
Language Impairment	6
Primary Language Impairment	6
Developmental Language Delay	4
Language Delay	4
Developmental Dysphasia	4
Late Talker	4
Speech-Language Disorder	3
Speech, Language, & Communication Needs	3
Selective Mutism	3
Communication Disorder	1
Language Disorder in absence of concomitant factors	1
Language Difficulty	1
Autism Spectrum Disorder (ASD)	1
Attention Deficit-HyperactivityDisorder (ADHD)	1
Speech-Language Impairment	1

Qualitative Findings. Following their choice of label, students were asked to answer an open-ended question explaining their choice. Student responses were typically one to three sentences in length. As noted previously, thematic analysis was used to identify concept categories and to distill them into themes. When the data were disassembled, in order to create meaningful groupings, 11 categories were identified. These included: *EBP, Quantity, Time, Clinical Terms, Acceptance, Specificity, Appropriateness, Benefit, Relevance, Professional,* and *Personal Experience*. In the next stage, the data were reassembled and the 11 content categories were consolidated into five distinct themes. These included *Evidence, Professional Practice, Currency, Appropriateness,* and *Personal Experience.* Figures 1 and 2 show the relative proportion of student responses assigned to these themes pre- and post-PBL.

Figure 1

Proportion of Themed Student Responses, Pre-PBL

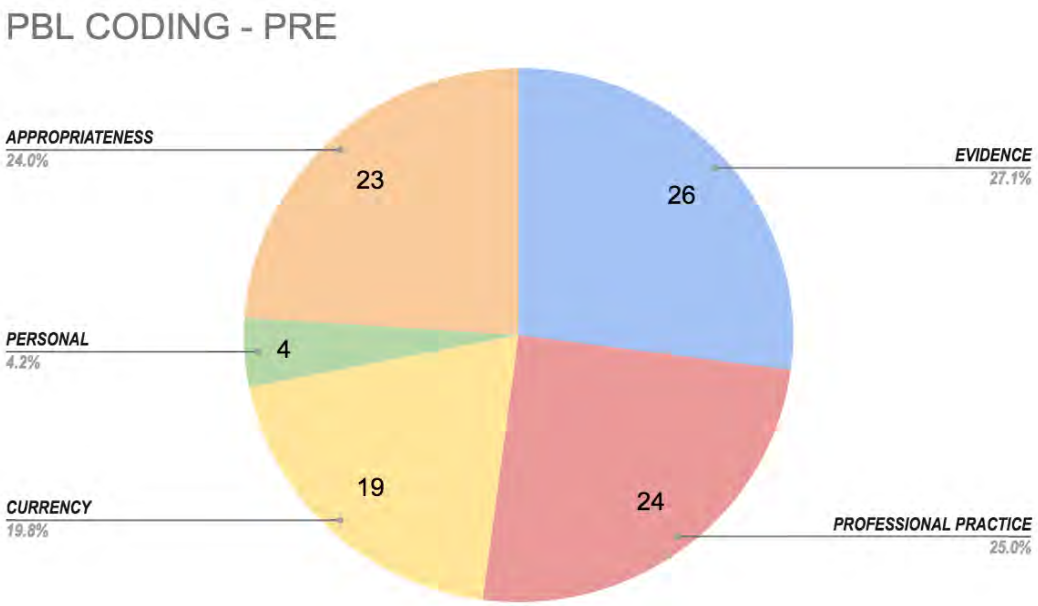
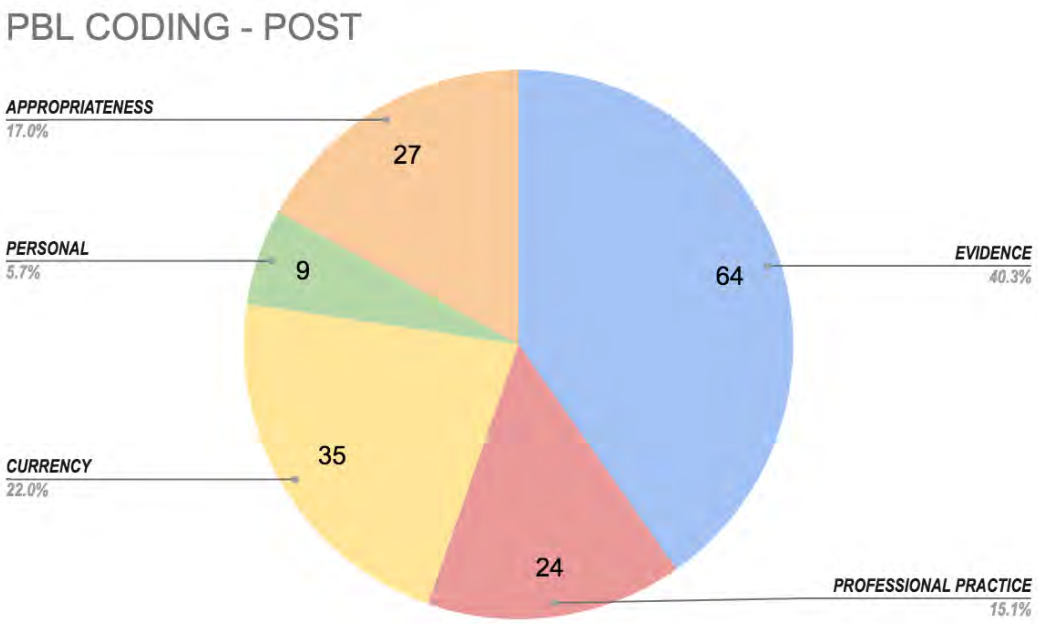


Figure 2

Proportion of Themed Student Responses, Post-PBL



Evidence. The theme of *Evidence* was created to encompass responses that had initially been coded as "EBP." Responses related to this theme included words and phrases such as *research, evidence, journals, literature*; or phrases that suggested searching for information. Pre-PBL, 26 of 96 total coded terms (27%) related to this theme. For example, one student noted, "Because SLI is the term that was originally used as a diagnostic term and in research, **there is most likely more literature on this term**." Another student stated, "DLD since it is the "new" term that researchers are using, so **newer literature should include this term**." Post-PBL, the percentage of responses related to evidence increased to 40% (64 of 159 total coded terms). For example, students stated, "During my Google scholar searches, **I found more articles** with the term SLI than DLD. The **greater amount of articles with SLI is good for researchers to further the field**;" "I think specific language impairment (SLI) is the most beneficial because it has t**he deepest roots in literature and a lot more to read about**;" and "I would suggest using developmental language disorder since, even though it is a relatively new label, **more research is being published** about the signs, symptoms, strengths, and weaknesses that accompany the diagnosis."

Professional Practice. The theme of *Professional Practice* was created to encompass responses that had initially been coded as *clinical* or *professional*. Responses related to this theme included words and phrases such as *diagnosis, symptoms, intervention, therapy, clinicians, and speech-language pathologist*. Pre-PBL, 24 of 96 terms (25%) were coded as *Professional Practice.* For example, one student responded, "DLD because the **diagnostic criteria fits more individuals in the diagnostic label** therefore it won't exclude **students who need services** but could not receive them under an SLI or DLD diagnosis." Post-PBL, professional practice terms were again used 24 times, but proportionally, the percentage decreased to 15% of all terms. For example, students stated reasons that included, "It's most appropriate to use **this diagnostic label in schools**," and "Consistent terminology is also important to **bridge the gap between research and clinical practice.**"

Currency. *Currency* is the theme that emerged to include responses that related to *time* and *quantity*. Responses related to the theme of *Currency* included words and phrases such as *longer, newer, more recent,* and phrases that had to do with how frequently a term was used. Pre-PBL, 19 of 96 terms (19.8%) were coded as *Currency*; versus 35 of 159 (22%) post-PBL. Prior to the exercise, students cited reasons for choosing a particular label including: "I would choose SLI since **it has been used longer**"; "DLD because it is a **more recent classification"**; and "As DLD is **more widely used** I would switch to using that label." Post-PBL, currency codes included responses such as, "This is a term that has been **used consistently in the past"** and "DLD due to it being the **most up to date and recent term."**

Appropriateness. The theme of *Appropriateness* combined categories initially coded as *specificity, acceptance, appropriateness, relevance, and beneficial.* Responses related to the theme of *Appropriateness* included words and phrases such as *relevant, beneficial*, *widely known* and *appropriate*. Pre-PBL, 23 of 96 responses (24%) contained terms related to *appropriateness*, for example, "**it's very broad**," and "it would be **more appropriate.**" Post-PBL, 27 of 159 (17%) of responses were coded for this theme. Students explained their choices using phrases such as "it is **beneficial** for parents," "DLD is a **more beneficial term** as it was designed to be **more inclusive**,"

"using SLI provided the **most relevant** information," and "I think that DLD is the **most beneficial** due to the fact that the **support for this term is growing and it fits more students**."

Personal Experience. Finally, the theme of *personal experience* was assigned to words or phrases that reflected the students' own knowledge or experiences, for example, phrases such as *I learned, my class(es), my supervisor(s),* etc. Relatively few pre-or post-PBL responses were coded as *personal experience* (4/96 or 4.2% pre-PBL; 9/159 or 5.66% post-PBL). Pre-PBL responses typically referred to past knowledge or experience, e.g., "I would use this because **last semester ...we learned this term**," "**previous courses have indicated**…," and "it is the term **I see and hear** being used most often". Post PBL, students used phrases such as "**I have learned**," "**I have noticed**," and "**I found**" more frequently to describe their independent learning.

Discussion

The purpose of this study was to examine the impact of the use of PBL on graduate students' confidence in their understanding of the terminology issues associated with unexplained language disorders in children. Further, it sought to examine the impact of the use of PBL on students' confidence in their ability to employ EBP for this population. In terms of the quantitative data, findings were positive across all measured areas on the student questionnaire, as confidence ratings increased post-PBL for every item examined. The first three items on the student questionnaire were related to students' understanding of and familiarity with the nature of unexplained language disorders in children. Items four through six were related to potential consequences of the terminology issue, and the final three items were related to students' confidence in applying principles of EBP for children with unexplained language disorders. When viewed item-by-item, there were five items with changes that were larger than the others, with post-PBL rating increases equal to or greater than one point on the scale. The five items were: "I have a good understanding of the nature of unexplained language disorders in children" (question 1), "I am familiar with the various terms used in the literature to describe children with unexplained language disorders" (question 2), "I have an understanding of the current trends in terminology to describe children with unexplained language disorders" (question 3), "I am able to conduct a literature search to find evidence to answer clinical questions related to children with unexplained language disorders" (question 8) and "I understand the most useful search terms to use when seeking evidence relating to children with unexplained language disorders" (question 9). So, although survey responses on all items increased post-PBL, students had larger changes in confidence on statements corresponding to the nature of unexplained language disorders (questions 1 - 3) and their ability to seek external evidence to support EBP (questions 8 and 9) than on the survey items that related to the results of the problem of inconsistent terminology use (questions 4 - 6). It is worth noting that students' confidence ratings for questions 4 and 5 were high to begin with, indicating that students already felt confident about their understanding of the benefits and challenges of using various labels, perhaps from experiences in previous coursework or clinical practica. However, their responses on item 6 (related to their confidence in actually applying the labels in a diagnostic/clinical setting) were low pre-PBL and increased relatively little to just above average (3.0).

Turning to the qualitative data, when asked to provide all the diagnostic terms they were aware of, the number of labels students provided post-PBL more than doubled from their pre-PBL responses

(10 pre-PBL, 21 post-PBL). This could indicate that the assignment made students more aware of the plethora of terms utilized in the literature to describe children with unexplained language disorders. This knowledge would also likely have a positive impact on their ability to employ EBP, as they would understand that using a single term when searching for evidence to support treatment decisions for children with unexplained language disorders would likely not capture the full scope of information in the literature. Moreover, when students were asked to select the one label that they felt was most appropriate, the number of terms provided narrowed from five terms (pre-PBL) to four terms (post-PBL), with SLI becoming the dominant choice (66% post-PBL). This suggests that students were refining their choice of terms and zeroing in on what would give them the most comprehensive results. Studies have shown that SLI is the most common term used in the scientific literature to refer to unexplained language disorders in children and, if used in a search, would therefore produce the largest number of studies (Bishop, 2014). This information seemed to become apparent to students as well. So, although post-PBL students were aware of a wider range of terms, they appeared to focus on the term that was most widely used in the literature when asked what they thought was the most appropriate term to use. One implication of this finding for CSD educators is that although DLD is becoming more commonly used in research, instructors should continue to make students aware of the term SLI, as it is clearly the historically favored term in the literature. In addition, a PBL approach that encourages students to independently explore and learn from the literature may improve their understanding of the complexity of the issue, so that students searching for external evidence related to children with unexplained language disorders don't end up with limited results.

When examining student responses to the open-ended questions asking students to explain why they felt the label they selected was most appropriate, there was an overall increase in the number of coded responses post-PBL (96 to 159). One potential explanation for this is that the PBL activities increased students' confidence in understanding the terminology issue and encouraged more lengthy responses. Interestingly, the proportion of student responses that related to *Professional Practice, Currency*, and *Appropriateness* decreased in the post-PBL responses, while responses related to *Evidence* increased. Pre-PBL, 27% of the total number of coded student responses related to *Evidence*. This increased to 40% post-PBL. This suggests that students' responses became more oriented to content that would help them to make evidence-based decisions, specifically related to finding information in the literature.

Taken together, the quantitative and qualitative results of this study provide support for the use of problem-based learning (PBL) to address complex topics in CSD coursework. The current study suggests that PBL helped students learn both cooperatively and independently to examine the problem of varied use of terminology to refer to children with unexplained language disorders, and its obstacles to EBP. This was highlighted in several students' reflections such as "The PBL exercise was a more interactive process of learning that helped to truly engage the classroom. This exercise incorporated all different types of learning, independent and group. Incorporating independent and group learning was a very effective learning process. Traditional learning modes are not as interactive as the PBL exercise; there isn't as much collaboration." and "I also gained a better understanding of the differences of the terms used to describe children with unexplained language problems. Before this project, I had enough understanding to explain the important differences between them, but not enough to properly diagnose or set up a worthwhile intervention plan. Now I feel confident enough to be able to do both these things." Post-PBL, students gained

confidence and appeared to narrow their focus towards locating evidence, and on identifying the most useful term to collect evidence for clinical decision making. This provides support for PBL's potential as a tool for teaching and learning in the field of CSD, where educators are responsible for helping to develop problem-solving and critical thinking skills in our students. These skills are crucial when working with complex clients with varied diagnoses. PBL provides a potential framework for encouraging students to make reasoned decisions about real-world problems.

There were some limitations to this investigation. First, the procedures were carried out across two sections of a course with two different instructors. Although specific scripts and guidelines were prepared, the PBL exercises may have been executed with slight variation. The second limitation is that there was no control group that employed more traditional pedagogy for comparison. With the limited number of students enrolled in both sections of the course (n = 24) and not knowing how many students would consent to participate, the decision was made to have a larger number of participants overall rather than split into two groups. Despite these limitations, these results are promising, and suggest that educators in CSD programs should utilize PBL as a tool to develop critical-thinking and problem-solving skills in our students as well as to emphasize the importance of EBP. Continued investigation of PBL as a tool for educators will help to illuminate its potential in the field of CSD.

Disclosures

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