Using Ability Grouping to Examine the Effects of Differentiated Instruction in an Undergraduate Course in Communication Sciences & Disorders

Katherine B. Green
University of West Georgia, kbgreen@westga.edu

Jacqueline Towson
University of Central Florida, jacqueline.towson@ucf.edu

DOI: https://doi.org/10.30707/TLCSD6.1.1649037808.600819

Recommended Citation

The population of students accessing higher education is becoming increasingly diverse. From first-generation students to nontraditional students in undergraduate programs, it is important to consider the characteristics of the individual students. These characteristics include the various levels of prior knowledge students have regarding a particular subject (Fink, 2010), student interest, and student competency and readiness for learning (Fry et al., 2008; Pham, 2012; Tomlinson & Imbeau, 2013). Differentiated instruction is a student-centered approach that takes into account the different characteristics and aspects of the learner (Tomlinson, 2004). Differentiated instruction provides a variety of avenues for instructors to modify their pedagogy to meet the needs of individual students in order to facilitate student success (Santangelo & Tomlinson, 2009; Tomlinson & Imbeau, 2013; Tomlinson et al., 2003). When differentiating instruction, educators may consider a student's readiness, interest, and learning profile (Tomlinson, 2004). Instructors may differentiate instruction by modifying the course content, the process of teaching and learning, the product or assessment of the course content, and/or the learning environment.

Principles for Differentiated Instruction

Differentiated instruction includes a set of strategies used by an instructor to meet each student at their current knowledge and skill level (Ernst & Ernst, 2005). Through the use of these strategies, the instructor may pre-assess the students to gauge their current knowledge, learning profile, interests, strengths, and/or challenges, and then move them forward as far as possible in the content (Levy, 2008). One key aspect of differentiated instruction involves understanding students' present levels of content knowledge. One way to know their present level is a pre-assessment to determine students' current understanding of various given topics, as well as the use of formative and summative assessment across instruction. The results of the pre-assessment can drive variable grouping based on students' current needs related to specific content. However, groups do not need to remain static. Another important component of differentiated instruction is flexible grouping, which allows students to move fluidly between groups based on pre-assessment data of specific content. Instructors can group students in various ways, such as student interests or ability level, forming either heterogeneous or homogeneous groups (Levy, 2008). Challenging tasks, flexible groupings, and ongoing assessments help educators adjust and tailor instruction to the variety of learners in the classroom (Ernst & Ernst, 2005).

Regarding differentiating instruction in the higher education classroom, Chamberlin and Powers (2010) reported seven key guiding principles.
1. Teacher-student communication regarding the essential learning objectives of a lesson and assessment. The assessment is ongoing and drives the instruction.
2. Teachers respond to the various student differences: accepting students' current levels and having high expectations for what they can learn.
3. Instructors challenge students and have high student expectations.
4. The learning process is collaborative between student and teacher.
5. Teachers use flexible grouping in the college classroom: instructors may group students by levels of understanding of content, interests, or learning profiles.
6. Proactive planning, rather than reactive instruction.
7. All materials, space, and time are designed to meet the needs of all learners in the classroom.

Differentiated instruction intersects with a similar and complementary instructional approach to provide access to the curriculum for all learners: Universal Design for Learning (UDL). UDL has three principles for instructors to provide universal access to the curriculum: (a) provide multiple methods of presentation, (b) provide multiple means of student expression, and (c) offer various options for student engagement (Hall et al., 2003). Instructors may employ the UDL when designing their classroom curriculum to increase engagement and access for all learners. Yet, while instructors may design their classroom to be accessible for all learners using UDL, employing differentiated instruction strategies requires understanding the interests, needs, strengths, and challenges of the individual learners in the classroom. Instructors can gain this information in the form of pre-assessments, surveys, and student interviews.

Differentiated Instruction in Higher Education

The use of differentiated instruction to address the needs of all learners is well established in K-12 education (Levy, 2008). However, there is limited empirical evidence for using these methods of instruction in higher education. Differentiating in higher education classrooms can vary from differentiating in the K-12 classroom, particularly due to more robust class sizes and higher student-to-teacher ratios. Differentiated instruction challenges the notion that in the college classroom setting, "one size fits all." Dosch and Zidon (2014) demonstrated the idea of differentiating the college classroom to meet the current abilities and needs of the students in the classroom. The authors aimed to determine if the students would view the differentiated classroom as beneficial to their learning. The authors compared two college classrooms: one classroom with differentiated instruction and one taught without differentiated instruction. The students in the classroom with differentiated instruction experienced higher achievement on some exams and assignments. The students also perceived the differentiated methods of instruction as beneficial, engaging, and the instructor created the course to fit the students, rather than the students fitting into the course (Dosch & Zidon, 2014).

Benefits and Challenges of Differentiated Instruction in Higher Education. While there is less research literature on the use of differentiated instruction in college settings (Turner et al., 2017), there are several benefits documented in the research for implementing this student-centered practice in the higher education classroom. For example, differentiated instruction has been found to promote greater content understanding and academic gains of students (Chamberlin & Powers, 2010; Dosch & Zidon, 2014) in a variety of disciplines, such as mathematics education (Chamberlin & Powers, 2010), educational psychology (Dosch & Zidon, 2014), public policy (Ernst & Ernst, 2005), and in education courses (Santangelo & Tomlinson, 2009). Chamberlin and Powers (2010) examined differentiated instruction in a mathematics education undergraduate course for preservice teachers to determine the impact of differentiated instruction on students' mathematical understanding. The students experienced greater gains in mathematical concepts when receiving differentiated instruction. Yet, differentiated instruction is not only beneficial for academic achievement. Dosch and Zidon (2014) reported that via a self-perception survey, college students found the differentiated instruction beneficial to creating a more engaging and interesting classroom setting.

However, as with many instructional strategies and interventions, differentiated instruction is not without its challenges. The success of these strategies in the college classroom is based on the instructors' self-efficacy and teaching beliefs (Suprayogi et al., 2017). In a study of differentiated instruction in large higher education classrooms, Turner and colleagues (2017) surveyed 20 instructors teaching large college classes (i.e., 50 to 550 students). Survey results indicated that there is a lack of resources for using differentiated instruction in higher education. Additionally, instructors felt pressure to meet other educational and performance goals rather than focus on differentiating their instruction. Though many instructors saw benefits to using these strategies, some college professors believed that implementing differentiated instruction in a college classroom is impractical and unreasonable, particularly given the effort on the part of the instructor (Turner et al., 2017). Thus, implementing differentiated instruction in the college setting may require professional development (Turner et al., 2017) or professional support (Boelens et al., 2018) for effective implementation, particularly for large class sizes.

How to Differentiate Instruction

Differentiation in Higher Educational Settings. Differentiating instruction within all aspects of the college classroom can seem overwhelming. Therefore, Tomlinson (2004) noted four areas that instructors can address to differentiate in the classroom: (a) the course content, (b) the process of teaching and learning, (c) the product or assessment of the course content, and/or (d) the learning environment. Importantly, instructors are not required to differentiate every element of a class in order to implement differentiated instruction. Additionally, the four aspects of differentiated instruction described below may intertwine with one another. Within Tomlinson's framework, different strategies can be applied. See Table 1 for definitions and examples of differentiated instruction in higher education. One commonly used way to differentiate instruction is the use of Bloom's Taxonomy.

Based on the work by Benjamin Bloom and colleagues (Bloom et al., 1959), instructors can approach differentiating the process, content, and product of student learning. Bloom's Taxonomy, first designed in 1956, is a hierarchical ordering of cognitive skills that assists educators in teaching and assessing students from a basic level of understanding to higher-order critical analysis. Slightly modified from the original taxonomy, Bloom's Taxonomy is most recently titled: *A Taxonomy for Teaching, Learning, and Assessment* (Anderson et al., 2001). This revised taxonomy placed the following categories in a pyramid with the first category on the bottom, and the sixth category on top, representing an increase in cognitive processes. The categories include: (a) remember, (b) understand, (c) apply, (d) analyze, (e) evaluate, and (f) create. Instructors can use this framework as one way to provide tiered activities of complexity at the students' level of knowledge or readiness (see Figure 1).

Table 1

Examples of Differentiated Instruction in Higher Education

Differentiation Type	Definition	Examples in Higher Education
Course Content	What is taught in the course, and how the students access the materials.	The instructor may choose a text that has complementary audio instruction. The instructor may "chunk" material for students who have prior experience or knowledge with the content.
Process of Learning	How the teacher plans the instruction	The instructor may plan for whole group instruction for part of the course content, have the students work in small groups or pairs for greater application of the content. The instructor may change the pace of instruction for particular students.
Product of Learning	The assessment of how a student demonstrates an understanding of the course material	The assessment of learned material may be in different forms, or the instructor allows a choice of ways to express learning: a multiple-choice test, an essay test, student presentation, project, reenactment, video, role play.
Learning Environment	The changing of the physical space of a classroom.	The instructor may change the location of desks into a circular pattern, or place the desks or tables where students can interact with one another. Another option may be to change the tables or desks so that all students can see the presentation of materials.

Figure 1

Revised Bloom's Taxonomy with Elaboration
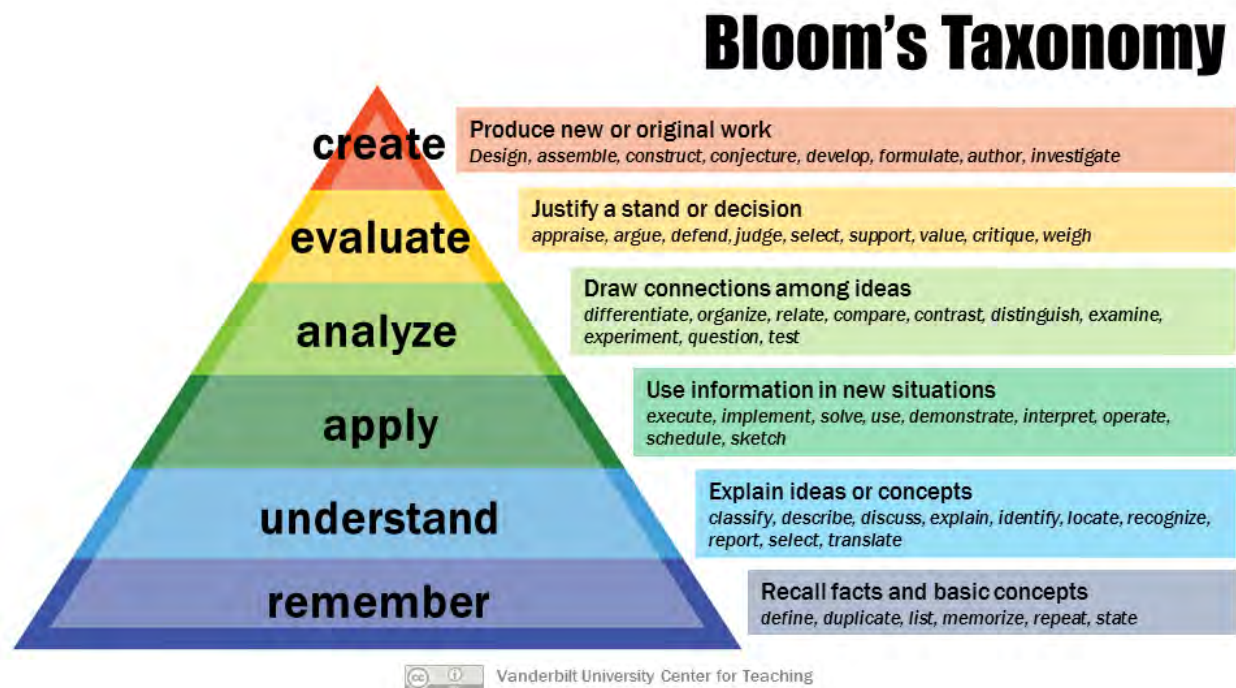
Note. Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Center for Teaching. https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/.

Differentiate the course content. The content of the course refers to what is taught and how students access the materials. While college courses often have set objectives and required content to teach, the course instructor may have the ability to modify or adapt how students access that content. Examples of differentiating the course content include varying the course materials (e.g., textbook, book on audio, multimedia, lecture, hands-on activities), teaching content with flexible grouping (e.g., supplemental instruction in small groups), providing supports such as guided notes or highlighting key information, or through "chunking" material for certain students based on pretest results. Additional examples of differentiating course content include using multimedia and interactive applications, various types of online lectures and activities, animation, interactive presentations, and course notes tools (Ryan et al., 2015).

Differentiate the process. Process differentiation may overlap or appear similar to content differentiation. Differentiating the process allows students to "own" the content by allowing them to make sense of the content, understand the content, and see the use outside the classroom (Tomlinson & Imbeau, 2013). Process differentiation is based on how the instructor plans the content of the course and how they adapt a task or a series of tasks that allow students to begin thinking about, practicing, or working with the materials. Additionally, the instructor provides time and instructional materials for students to ask questions, make mistakes, and/or try out new ideas or practice with new materials. Differentiating the process involves applying teaching strategies and techniques to organize the instruction so that learning is both meaningful and applicable to students. Examples include varying levels of support and accommodation, tiered activities of

complexity at the students' level of knowledge or readiness, changing the pace of work, and providing a choice of activity topics. For example, Opdecam and Everaert (2019) differentiated the process of instruction in a higher education setting for eight consecutive years. They provided college students in a large class a choice of how they would like to be taught: team learning or traditional lecture-based learning. Opdecam and Everaert found that though most college students selected lecture-based learning, team learning had positive effects on learning outcomes.

Differentiate the product. The product is typically an assessment or assignment of how students can demonstrate their understanding of the course objectives and content. Differentiating the product means that an instructor has various ways a student can demonstrate mastery: written or oral assignment, presentation, student-created video or website, multiple-choice assessment, essay assessment, real-world application. Allowing for the differentiation of the product (e.g., student self-selection of the type of assessment product) may allow students to have autonomy within their own learning.

Differentiate the learning environment. An instructor may choose to differentiate the learning environment by adapting the setting of the classroom. Examples of differentiating the environment include rearranging the furniture in the classroom or varying the location of the classroom (e.g., outside, classroom, lab). Other options include flexible seating and areas that allow for collaboration and individual work. Instructors may also choose to provide a variety of materials for students, particularly which reflect cultural differences.

The Purpose of the Current Study

In higher education, instructors consistently seek ways to improve student engagement and outcomes (Fink, 2010). Differentiated instruction using variable grouping and pre-assessments may be one such way to increase student performance. While it is known that differentiated instruction can benefit student achievement and engagement in higher education (Chamberlin & Powers, 2010; Dosch & Zidon, 2014; Ernst & Ernst, 2005; Santangelo & Tomlinson, 2009), there is a paucity of literature on differentiating instruction in the college classroom for Communication and Sciences Disorders (CSD) majors.

Thus, the current investigation will add to the scant body of literature evaluating the use of differentiated instruction in higher education by focusing on a differentiated instruction intervention with undergraduate CSD majors. Specifically, the current study will examine the effects of using differentiated instruction, including pre-assessment and variable grouping, on the learning of undergraduate students and their perception of instruction within a *Language Science* course. As CSD students are expected to engage in critical thinking and application of knowledge for clinical skills at the graduate level, we were particularly interested in the impact of differentiated instruction for CSD students in an undergraduate program. The research questions include:
1. Does the use of differentiated instruction impact the learning of undergraduate students in a *Language Science* course?
2. What is the perception of students who participated in variable grouping compared to students who participated in static grouping?

Method

Participants. Convenience sampling was used to recruit participants for this study due to accessibility, availability, and willingness to participate. This sampling technique is considered comparable to other nonprobability sampling techniques such as purposive sampling and appropriate for the purpose of this particular study (Etikan et al., 2016). Participants included undergraduate CSD students enrolled in two distinct sections of an undergraduate course called *Language Science* ($N = 89$). The participants were divided into two sections based on enrollment choice and availability (i.e., Section 001, Section 002). Each section was randomly assigned to a study condition, and all students naturally nested within that section were assigned to the appropriate group (i.e., intervention and comparison). The intervention group consisted of 58 participants, the large majority female (93%). The comparison group consisted of 31 participants, with the large majority female (87%). Students in both groups were mixed between sophomores, juniors, and seniors (see Table 2 for demographics).

Table 2

Demographics of Participants by Group

Participant Characteristic	Intervention Group ($n = 58$)	Comparison Group ($n = 31$)	Total ($n = 89$)
Gender			
Male	4	4	8
Female	54	27	81
Year in College			
Sophomore	15	9	24
Junior	32	13	45
Senior	10	4	14
Post-Bac	1	5	6

Setting. The current study was conducted at a large research university in the southeastern United States. Data were collected in an undergraduate course for CSD majors entitled *Language Science,* a foundational course covering language components, models of language production and comprehension, and theories of language development. Each section of the course was taught face-to-face during a regular academic term for 16 weeks. The same instructor taught both sections of the course at the same university during the same semester. Section 001 was taught on a weekday in the afternoon for one three-hour block. Section 002 was taught on a weekday in the evening for one three-hour block. Both sections were taught on the main campus in the university. The course assignments, quizzes, and activities related to the study took place during regularly scheduled class

sessions. Students' perception surveys of the group activities and experiences were collected via an online survey.

Measures. The independent variable was the differentiated instruction, specifically differentiation of course content through variable grouping based on pretest scores for five of twelve given units, was the independent variable.

There were four dependent variables: (a) scores on five instructor-developed unit posttests, (b) scores on instructor-developed final posttest on the course content of *Language Science*, (c) scores on the Likert-type student perception survey of instruction which measured differences between groups for student experience, and (d) final course grade. See the Appendix for the student perception survey.

Pretest and Posttest. The assessment used for pre and posttest was developed by the instructor on the content of the *Language Science* course. The pretest had 40 objective questions: 37 multiple choice and three true/false. Content included the five domains of language (i.e., phonology, morphology, syntax, semantics, and pragmatics), defining and identifying basic parts of speech within sentences, basic terminology in CSD, and language development theories. All questions were original to this iteration of the course and had not been used in prior course offerings.

Unit Pretests and Posttests. The five unit pre and posttests included in this study were developed by the instructor. Each assessment focused on one aspect of language targeted in that particular unit (i.e., phonology, morphology, syntax, semantics, and pragmatics). The assessments consisted of ten open-ended question quizzes requiring a single word response, which the students took with paper and pencil. The five pretest quizzes were used in the intervention group to determine variable grouping for that unit's in-class group work. Specifically, students scoring in the top one-third were in the highest group, students in the middle one-third in the mid-range group, and students in the lowest one-third in the lower group.

Student Perception Survey. The 20-question Likert-type student perception survey was given at the end of the semester. Adapted from Klegeris and Hurren (2011), the survey was designed to measure student experience of the course related specifically to small-group work. The scale ranged from 1, Strongly Disagree, to 5, Strongly Agree. Questions related to students' motivation, understanding and retention of material, communication skills with peers, and preference of group work to lecture. Students also rated their perception of small-group work difficulty.

Course Final Grade. All students were graded on a 100-point scale. The final numeric grade for the course was the fourth dependent variable. The final course grade was based on the following: active participation [attendance count taken by a Graduate Assistant (GA) blind to condition;12.5%], weekly journal entries based on course readings (based on a rubric, graded by GA blind to condition; 27.5%; rubric), small-group application assignments (graded by GA blind to condition; 15%), final group presentation (graded by instructor; 20%), mid-term and final exams (objective assessment graded by a computer system; collectively 25%).

Procedures. Following University Institutional Review Board (IRB) approval, participants for this study were recruited from two sections of an undergraduate *Language Science* course during one

academic semester. A research assistant, not affiliated with the research project, spoke with each section of the course to explain participation in the study and distribute the IRB "Explanation of Research" forms, which detailed study guidelines for students. Participation in the study was voluntary, and students were informed they may opt-out of the research portion of the course (i.e., having their data included in the study) at any time. The students were not compensated for their participation. Inclusion criteria included: (a) enrollment in one of two sections of *Language Science* for one semester, (b) age 18 years or older, and (c) enrolled in the course for the entire semester and (d) miss no more than two classes. All students enrolled in each of the two sections met the inclusion criteria.

Due to the two distinct sections of the *Language Science* course offered, one section was assigned to the intervention group, and one section was assigned to the comparison group. Each section of the course had the same syllabus, course objectives, assignments, and assessments. All participants in both sections of the *Language Science* course were administered a course pretest the first week of classes at the beginning of the semester as part of standard course requirements. The 40-item pretest examined the participants' baseline knowledge of the basic content in *Language Science*. Additionally, 10-question pretest quizzes were administered prior to each of the five units targeted for differentiated instruction in the course. These five unit pretest quizzes were used in the intervention group to determine grouping for that unit's in-class group work which took place during the last part of each class session. Students were then placed into groups of four to five students by the instructor and given in-class group assignments (note: the comparison group stayed in the same groups for the entire semester). At the end of each of the five units, all participants were administered a 10-question posttest quiz to determine growth in learning in a specific domain area of *Language Science*. All participants were also administered a final posttest, embedded within the final exam, as a part of standard course requirements. Student perception surveys were collected via the course management system during the final exam week, but prior to the final exam. Data were de-identified and analyzed the following term.

Intervention Group. Differentiated instruction with variable grouping based on pretest scores for the five units were the independent variables for the intervention group. Participants took a pretest for each of the five specific units. Students were then placed into groups of four to five students each week by pretest score (mid, low, high as noted above) for the given unit. The students were ability-grouped, meaning that all the students who had the highest scores were in one group, the students who scored in the middle third of the class were in a second group, and the students who scored the lowest third were in the third group. As students were in small groups, there were multiple "low, middle, high" groups each week. The participants in each of the groups varied from week to week across the five units, depending on the pretest score for each given unit, and the participants were unaware of the level of their group (i.e., students might move from "high" to "low" to "mid" across three given weeks). Across the five-unit intervention period, approximately 90% of students moved at least once between the three groupings, just less than half moved more than once between groupings, and approximately 15% moved between all three levels. Four students remained in the "low" group across all units, one student was in the "mid" group during the entire intervention, and no students were in the "high" group across the five units. Differentiated instruction was implemented during in-class group work and activities for the intervention group based on Bloom's Taxonomy. Specifically, the students were assigned activities that were created using action words taken directly from the multiple tiers of Bloom's Taxonomy

(e.g., define/describe, analyze/compare/contrast, defend/evaluate/explain). Work was differentiated to include remediation and enrichment of skills where necessary. While the tasks in each group differed, students were not informed which group was "high," "middle," or "low" in any given week. However, they were aware that different groups had different assignments, as all were shared via PowerPoint with the class. During the remainder of the semester, students in the intervention section were grouped randomly, with groups being static.

During the five week intervention period, weekly in-class assignments for the intervention group were based on Bloom's Taxonomy such that students in the "low-level" group completed tasks associated with the two lowest levels of the taxonomy (i.e., remember, understand). Students in the "mid-level" groups completed tasks associated with the two middle levels of the taxonomy (i.e., apply, analyze), and students in the "high-level" groups were assigned activities related to the two highest levels (i.e., evaluate, create). Each group completed their assigned tasks within their small group and then shared their responses with the entire class. Therefore, all students in the course were exposed to the content but only worked directly on their assignment. See Table 3 for example activities.

Table 3

Examples of Differentiated Group Assignment using Bloom's Taxonomy

Group Level	Activities	Examples of Bloom's Vocabulary
Low	Describe three ways in which semantic development could be affected by gender (negatively or positively).	Describe, List
	List three ways adolescents expand their sentences (either intra or intersential).	
Middle	Compare and contrast (using visuals & words) how language exposure and language impairment could affect semantic development (negatively or positively).	Compare, Contrast, Modify
	Modify three sentences to show how adolescents can increase language complexity within sentences.	
High	Make an argument (with visual support) of how gender, poverty, language exposure or language impairment could most positively or negatively impact semantic development.	Argue, Formulate
	Formulate instructions on how an adolescent can expand their language complexity within these three sample sentences.	

***Comparison Group*.** The comparison group had the same syllabus, course objectives, and assignments as the intervention group. The participants took the same pretests and posttests and had weekly group in-class activities, as well. However, the groups were static across all twelve units, including the five units targeted in this study, and were grouped alphabetically by last name throughout the semester. Weekly in-class assignments were identical to the "low-level" group assignment from the intervention group as had been previously implemented by the instructor in the prior semester to create a business as usual comparison group. The selection of activities to be "low-level" was to mimic instruction in previous iterations of this course at this university.

Research Design and Data Analysis. A quasi-experimental pretest-posttest group design was employed. All pre and posttests were scored by a GA who was not aware of group assignments. Data were analyzed using SPSS software (SPSS; IBM Corp, 2016), with the alpha level set at .05 for all statistical tests. For research question 1, data were analyzed using an independent samples t-test to examine final course grades and individual unit posttest scores (i.e., syntax, semantics, pragmatics, morphology, phonology), and an ANCOVA (Analysis of Covariance) for final posttest scores with pretest scores used as the covariate. For research question 2, student perceptions were reported at the end of the semester on a Likert-type scale. Scores were reported both anecdotally and through independent samples t-test comparison between groups. Before data analysis was completed, data screening was completed to assure that all assumptions for statistical tests were met.

Results

The purpose of the current study was to examine the effects of differentiated instruction on content with variable grouping on student learning and perception of instruction in an undergraduate course in a CSD program. The intervention group scored significantly higher on the final course grade than the comparison group. Yet, there were no significant differences between the intervention and comparison group on the final posttest scores, on the student perception survey, nor the five weekly unit posttest quiz scores (see Table 4).

Table 4

Pre and Posttest Scores by Group

	Intervention Group		Comparison Group	
	Pretest Mean (SD)	Posttest Mean (SD)	Pretest Mean (SD)	Posttest Mean (SD)
Comprehensive Test	27.32 (5.03)	31.33 (4.53)	25.13 (4.73)	29.85 (4.11)
Phonology Unit	3.45 (2.22)	6.42 (1.94)	2.48 (1.80)	5.83 (2.07)
Morphology Unit	1.86 (1.66)	6.41 (1.74)	1.39 (1.44)	5.75 (1.97)
Syntax Unit	2.20 (1.29)	6.05 (2.07)	2.04 (1.13)	5.21 (1.91)
Semantics Unit	2.66 (1.19)	5.06 (1.87)	2.17 (1.16)	5.07 (1.89)
Pragmatics Unit	2.65 (.79)	6.02 (1.35)	2.28 (.75)	5.40 (1.58)
Final Course Grade	---	91.68 (6.26)	---	88.62 (7.83)
Perception	---	76.54 (9.78)	---	75.96 (11.54)

Note. Comprehensive Test: Out of 40; Unit Test: Out of 10; Final Course Grade: Percent out of 100; Perception: Out of 100

Research Question 1. To examine if the use of differentiated instruction, specifically the differentiation of content through variable grouping, positively impacted the learning of undergraduate students in a *Language Science* course, three variables were compared between

groups: final course grades, individual unit posttest scores, and overall posttest scores. There was a significant difference between groups on the final course grade, $t = 2.007$, $p = .048$. No other significant differences were noted between the two groups on any unit posttests (i.e., morphology, syntax, semantics, pragmatics, phonology). There were also no significant differences between the intervention and comparison group on the final posttest scores when pretest scores were held constant. See Table 4 for means and standard deviations for each measure by group.

Research Question 2. To answer research question 2 regarding the perception of students who participated in the variable grouping as compared to students who participated in the static grouping, students were provided with a Likert-type scale survey to determine student perception of their experience related only to the small group learning tasks. There was no significant difference in the total scores of the survey between the two groups, $t = .242$, $p = .810$. However, students in the intervention group rated the experience slightly more favorable with less variability in the data (see Table 5 means and standard deviations for each item by group). Specifically, students in the intervention group rated their experiences slightly higher than those in the comparison group on items related to motivation to attend, participate and perform well in the course, comfort level and ability to interact well with peers, understanding of course content, organization and positive experience related to group assignments, and ability to demonstrate problem-solving skills. Areas in which the intervention group rated experiences slightly lower than the comparison group were related to retention of course content, the level of challenge in assignments, preference of group work over lecture, and materials geared toward their level of understanding. Data analysis in the intervention group did not account for students' ratings based on their specific group experiences of "high, mid, low" as 90% of students fluctuated between groups across the five-week intervention.

Discussion

Differentiated instruction is a student-centered approach to instruction that considers the differing characteristics and aspects of the learner (Tomlinson, 2004). With diversity increasing in higher education, differentiated instruction is one strategy that instructors may use to meet the needs of a variety of learners. Differentiated instruction provides a set of strategies for instructors to meet the needs of students to facilitate student success (Santangelo & Tomlinson, 2009; Tomlinson & Imbeau, 2013; Tomlinson et al., 2003).

In the present study, students in the intervention group, who had access to differentiated instruction as part of their course instruction, specifically the differentiation of content through variable grouping, only experienced statistically significantly higher course grades at the end of the semester, with no differences noted on unit posttests. Given the many variables that were not controlled for, these results do not make a strong statement for the inclusion of differentiated instruction in the college classroom for CSD undergraduate majors. However, these results are similar to Dosch and Zidon (2014), in which the students in the intervention group did not always score higher on individual exams and assignments, but rather in the aggregates of the assignments and exams. While the difference in means between the two groups indicated statistical differences, it is difficult to determine meaningful differences. The results suggest that differentiated instruction in the college classroom may assist in overall student achievement. However, due to the nature of the data collected in this study, it is difficult to ascertain the reason for this small

difference in the final grades. It should be noted that many assignments factored into the students' final grades and it is impossible to determine the amount of variance the differentiated instruction had without controlling all variables within the course. However, despite small changes in the outcome variables, differentiated instruction has a place in higher education. Specifically, differentiated instruction may increase student motivation by catering assignments to individuals' needs, which in turn may impact knowledge gained. It is also possible that providing differentiated instruction directly impacts students' access to knowledge by providing instruction at their level of need and exposing all students to a wider scope of content, regardless of their motivation. However, the mediating factors related to differentiated instruction should be explored in future studies.

Although the results of the comprehensive posttest administered at the end of the course showed that participants in both groups (i.e., variable and static grouping) performed equally well, there were lessons learned through this study. It may not have been necessary for the instructor to continually change or regroup students for them to successfully gain the content knowledge in the course. Instead, it might have been as effective to provide each group with all levels of instruction or provide differentiated instruction through differentiation of assessments or products related to the assignments. It may also be important to maintain differentiation of instruction across all content in order for students to make meaningful changes in learning and their sense of having their individual learning needs met by an instructor. This is particularly interesting as students in this study who participated in the variable grouping and differentiation of content did not rate their experiences significantly better than those who remained in static groups without differentiation of content. This may be attributed to students in the comparison group feeling generally satisfied with the group experiences as it was similar to the instruction to which they were accustomed.

It is also important to note that the feasibility of differentiated instruction in the college classroom can be a challenge. Several key issues should be noted for implementing differentiated instruction in higher education. First, there is a lack of resources for higher education instructors on differentiated instruction. Higher education instructors may need to seek out information from research and resources in the elementary-high school literature. Additionally, college instructors may require professional development on differentiated instruction. Next, differentiated instruction may require more pre-planning than the traditional college teaching practice of all students accessing the content in the same way. Also, within differentiated instruction, the instructor has several decisions to make. Does the instructor want to differentiate the content, the process, the product, or the learning environment? It is important to note that instructors do not have to differentiate all aspects of the classroom. Rather, instructors can choose to differentiate only one element, such as the assessment or the content. Differentiating only one aspect, such as in the current study, makes the process more feasible for college professors, particularly those new to implementing differentiated instruction.

As it relates specifically to implementing differentiated instruction for the process of instruction using Bloom's Taxonomy, instructors would want to be aware of monitoring students' placements across a course to ensure that students are exposed to a variety of learning opportunities. While the use of Bloom's taxonomy to meet a student's ability might be helpful for a specific area of content, all students should have access and exposure to learning across the cognitive continuum.

Implications. The current study has several implications for CSD instructors and faculty in higher education settings. Critical thinking, analysis, and application of knowledge are key aspects of Speech-Language Pathology (SLP) preparation in higher education. SLP's will be faced with many opportunities to apply critical thinking in graduate school and their future profession (Ellis, 2017). Thus, providing opportunities to practice and apply critical thinking and analysis in the differentiated undergraduate classroom might assist future SLPs with real-world experiences. Additionally, if instructors feel they are not meeting the needs of all learners in the classroom, differentiated instruction is an approach that may be impactful on increasing student engagement and success. The results of the current study provide only preliminary evidence that instructors may only need to differentiate one or two classroom aspects to positively affect student achievement. Researchers in future studies should both replicate and expand this line of research, examining which factors of differentiated instruction result in the most positive outcomes for students. Furthermore, it is clear in the literature there is not enough support for the implementation of differentiated instruction in college settings. This is an area in which universities can increase support by providing instructors additional resources (e.g., workshops, individual consultations) to meet the ever-increasing diverse student population.

Limitations and Future Research Directions. There are limitations in regard to the current research study. First, the present study was conducted at one large university in the southeast; therefore, these limited findings may not be generalizable to other areas or universities. The authors only investigated the differentiation of the content during five units of small group activities, specifically using variable grouping. Different aspects of combinations of differentiated instruction or infusing differentiated instruction across all aspects of course instruction may have different results. It may also be that more time in these variable groups with differentiated content would be helpful for students. While all other instruction provided to the students was the same (provided by the same instructor), it is difficult to know what contributed to their learning across the entire semester and specifically to the minimal difference in final grades. Additionally, the groups differed in size due to group assignment at the class level. In this study, the authors did not control for the variable versus static grouping and therefore, cannot conclude if the variable group, in the absence of differentiated instruction, was a contributing factor to the small change in final grade. Next, data analysis in the intervention group did not account for students' ratings of the intervention based on their specific group experiences of "high, mid, low," as 90% of students fluctuated between groups across the five-week intervention. Thus, the authors were unable to make conclusions about the acceptability of the intervention related to specific experiences. Finally, providing the comparison group with "low-level" activities may not represent business as usual across all undergraduate courses in a CSD curriculum. Researchers may want to consider different levels of activities in future studies to better mimic business as usual in an undergraduate curriculum.

Regardless of the small changes noted in the final course grade, using differentiated instruction in a college classroom is an under-explored topic and may allow for improved performance and learning of course content; however, additional research is needed. Future researchers might consider a mixed-methods approach where qualitative data can provide additional context for the quantitative data collected. For example, it would be interesting to examine how students and the college instructors were impacted by the intervention through methods of focus groups or interviews. Researchers should account for a more sensitive measure of both background

knowledge and learning performance. The participants in the current study were provided a pretest on background knowledge; however, additional factors could be taken into consideration, such as the student's prior experience in the content area. Additionally, a future research study may look at variable grouping, such as grouping based on learning interests or learning profiles, as well as content knowledge. Future research studies may also consider differentiating the process, product, learning environment, and/or a combination of approaches. Finally, given the increased use of remote learning in the college classroom setting, future research may investigate differentiating instruction in an online college classroom.

Conclusion. In conclusion, differentiated instruction is an evidence-based practice in K-12 schools; however, there is a scarcity of research on differentiated instruction in the college classroom (Turner et al., 2017). Though there are challenges in the implementation of differentiated instruction in the college classroom (Suprayogi et al., 2017; Turner et al., 2017), differentiated instruction shows promise to positively impact student achievement in the university setting (Chamberlin & Powers, 2010; Dosch & Zidon, 2014; Lightweis, 2013). This study demonstrates that differentiated instruction was feasible in a large classroom with CSD undergraduate majors. Differentiated instruction takes planning, knowledge of the student's readiness levels, and adjusting or adapting the curriculum throughout the semester. This is an approach that can provide students with the tools to be self-directed and collaborative learners (Pham, 2012). When planning for increasing student success, instructors may consider taking the time to implement differentiated instruction to improve student success and autonomy in the college classroom.

Author disclosure statement
The authors have no relationships – financial or nonfinancial – that present a potential conflict of interest with the manuscript content.

References

Anderson, L. W., Krathwohl, D. R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives.* (Abridged edition). Addison Wesley Longman.

Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Center for Teaching. https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1959). Taxonomy of educational outcomes: The classification of educational goals. Handbook 1: Cognitive Domain. David McKay Company.

Boelens, R., Voet, M., & De Wever, B. (2018). The design of blended learning in response to student diversity in higher education: Instructors' views and use of differentiated instruction in blended learning. *Computers & Education, 120,* 197–212. https://doi.org/10.1016/j.compedu.2018.02.009

Chamberlin, M., & Powers, R. (2010). The promise of differentiated instruction for enhancing the mathematical understandings of college students. *Teaching Mathematics and Its Applications: An International Journal of the IMA*, *29*(3), 113-139. https://doi.org/10.1093/teamat/hrq006

Dosch, M., & Zidon, M. (2014). "The course fit us": Differentiated instruction in the college classroom. *International Journal of Teaching and Learning in Higher Education*, *26*(3), 343-357. https://files.eric.ed.gov/fulltext/EJ1060829.pdf

Ellis, C. M. (2017). Using simulation and critical thinking in speech-language pathology: A university case study. *Journal of Human Services: Training, Research, and Practice*, *2*(2), Article 6. https://scholarworks.sfasu.edu/jhstrp/vol2/iss2/6/

Ernst, H. R., & Ernst, T. L. (2005). The promise and pitfalls of differentiated instruction for undergraduate political science courses: Student and instructor impressions of an unconventional teaching strategy. *Journal of Political Science Education*, *1*(1), 39-59. https://doi.org/10.1080/15512160590907513

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 1-4. https://doi.org/10.11648/j.ajtas.20160501.11

Fink, L. D. (2010). Designing our courses for greater student engagement and better student learning. *Perspectives on Issues in Higher Education, 13*(1), 3-12. https://doi.org/10.1044/ihe13.1.3

Fry, H., Ketteridge, S., & Marshall, S. (2008). Understanding student learning. In H. Fry, S. Ketteridge, & S. Marshall (Eds.), *A handbook for teaching and learning in higher education: Enhancing academic practice* (2nd ed., pp. 9-25). Routledge.

Hall, T., Strangman, N., & Meyer, A. (2003). *Differentiated instruction and implications for UDL implementation*. National Center on Accessing the General Curriculum. https://sde.ok.gov/sites/ok.gov.sde/files/DI_UDL.pdf

IBM Corp. (2016). IBM SPSS Statistics for Windows, Version 24.0. IBM Corp.

Klegeris, A., & Hurren, H. (2011). Impact of problem-based learning in a large classroom setting: *Student* perception and problem-solving skills. *Advances in Physiology Education*, *35*(4), 408-415. https://doi.org/10.1152/advan.00046.2011

Levy, H. M. (2008). Meeting the needs of all students through differentiated instruction: Helping every child reach and exceed standards. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 81*(4), 161-164. https://doi.org/10.3200/TCHS.81.4.161-164

Lightweis, S. K. (2013). College success: A fresh look at differentiated instruction and other student-centered strategies. *College Quarterly*, *16*(3). https://files.eric.ed.gov/fulltext/EJ1018053.pdf

Opdecam, E., & Everaert, P. (2019). Choice-based learning: Lecture-based or team learning? *Accounting Education, 28*(3), 239-273. https://doi.org/10.1080/09639284.2019.1570857

Pham, H. L. (2012). Differentiated instruction and the need to integrate teaching and practice. *Journal of College Teaching & Learning (TLC), 9*(1), 13-20. https://doi.org/10.19030/tlc.v9i1.6710

Ryan, M., Jonick, C., & Langub, L. W. (2015). Expert reflections on effective online instruction: Importance of course content. *Online Journal of Distance Learning Administration*, *18*(4). https://www.learntechlib.org/p/175309/

Santangelo, T., & Tomlinson, C. A. (2009). The application of differentiated instruction in postsecondary environments: Benefits, challenges, and future directions. *International Journal of Teaching and Learning in Higher Education*, *20*(3), 307-323. https://www.isetl.org/ijtlhe/pdf/IJTLHE366.pdf

Suprayogi, M. N., Valcke, M., & Godwin, R. (2017). Teachers and their implementation of differentiated instruction in the classroom. *Teaching and Teacher Education*, *67*, 291-301. https://doi.org/10.1016/j.tate.2017.06.020

Tomlinson, C. A. (2004). *How to Differentiate Instruction in Mixed-Ability Classrooms (2nd ed.)*. Association for Supervision and Curriculum Development (ASCD).

Tomlinson, C. A., Brighton, C., Hertberg, H., Callahan, C. M., Moon, T. R., Brimijoin, K., Conover, L.A., & Reynolds, T. (2003). Differentiating instruction in response to student readiness, interest, and learning profile in academically diverse classrooms: A review of literature. *Journal for the Education of the Gifted, 27*(2), 119–145. http://doi.org/10.1177/016235320302700203

Tomlinson, C. A., & Imbeau, M. B. (2013). Differentiated instruction. In B. J. Irby, G. Brown, R. Lara-Alecia, & S. Jackson (Eds.), *The handbook of educational theories* (pp. 1097–1117). Information Age Publishing, Inc.

Turner, W. D., Solis, O. J., & Kincade, D. H. (2017). Differentiating instruction for large classes in higher education. *International Journal of Teaching and Learning in Higher Education*, *29*(3), 490-500. https://files.eric.ed.gov/fulltext/EJ1151047.pdf

Appendix

Survey of Student Perception of Work Groups

LIN3713 Language Science

Please rate your experiences in LIN3713, as related __ONLY__ to small group work completed in class across the semester, using the following scale where 5 *is the highest rating and* 1 *is the lowest rating.*

1: Strongly Disagree	2: Somewhat Disagree	3: Neutral	4: Somewhat Agree	5: Strongly Agree

1.	Increased my motivation to *participate* in class.	1	2	3	4	5
2.	Increased my motivation to *attend* class.	1	2	3	4	5
3.	Enhanced my communication skills with peers.	1	2	3	4	5
4.	Increased my motivation to do well in the course.	1	2	3	4	5
5.	Enhanced my retention of course content.	1	2	3	4	5
6.	Increased my understanding of course content.	1	2	3	4	5
7.	Increased my comfort level in working in groups.	1	2	3	4	5
8.	Increased my ability to interact with peers.	1	2	3	4	5
9.	Materials were geared toward my level of understanding.	1	2	3	4	5
10.	Assignments were adequately challenging.	1	2	3	4	5
11.	Peers in my group worked at about the same level.	1	2	3	4	5
12.	Peers in my group shared my background knowledge.	1	2	3	4	5
13.	My group work experiences were mainly positive.	1	2	3	4	5
14.	Group work assignments were well organized.	1	2	3	4	5
15.	Increased my problem-solving skills.	1	2	3	4	5
16.	Group work assignments were applicable to the course.	1	2	3	4	5
17.	I prefer group work over a class of straight lecture.	1	2	3	4	5
18.	Improved my presentation skills.	1	2	3	4	5
19.	Group work assignments were too simplistic.	1	2	3	4	5
20.	Group work assignments helped me apply topics from lecture.	1	2	3	4	5

Adapted in part from Klegeris & Hurren, 2011