

The Use of Phoneme Grapheme Mapping to Improve Decoding in the Primary Classroom

Payton Steensma, Jessica Jones, Chris Wilcoxon, and Jennifer Lemke
University of Nebraska at Omaha

Abstract

Phonemic awareness is a building block for decoding words. It is the ability to recognize and manipulate the smallest unit of sounds, phonemes (Ryder et al., 2007). Without the ability to discriminate phonemes, mapping phonemes and graphemes to decode words is extremely challenging, even impossible (Lindsey, 2022). The aim of this study was to determine if implementing phoneme grapheme mapping strategies into a small group setting coupled with explicit feedback would improve students' decoding abilities.

Following the pandemic's impact in 2020, schools faced many challenges. Some students had missed a year or more of school due to health concerns. Teachers had to manage in-person and online learning formats. With social distancing guidelines in place, students did not have the same engagement opportunities in the classroom as they did before. These changes to both teaching and learning resulted in teachers noticing gaps in learning that varied on scales larger than before.

The lack of interaction and engagement with school norms and atmosphere impacted student achievement. As two first grade teachers, whose classrooms span two states, we observed essential foundational skills were missing for our students. Baseline data from our classrooms showed a decrease in overall decoding scores with 44% of students performing below grade level. Specifically, 100% of our students needed support with decoding nonsense words and word segmenting. Overall, the data showed a collective need for reading instruction pertaining to decoding, specifically phoneme-grapheme mapping.

Phonemic awareness is a building block for decoding words. It is the ability to recognize and manipulate the smallest unit of sounds, phonemes. Letters are designed to represent spoken phonemes so phonemic awareness, or the awareness of individual sounds in spoken words, is an essential skill to reading (Kilpatrick, 2020; Ryder et al., 2007). Word decoding requires the ability to apply phonemic awareness. It is “[this] knowledge of the alphabetic code, which involves understanding the relationships between letters and sounds” (Ross & Joseph, 2019, p. 1) that allows students to correctly pronounce written words and begin to recognize them when reading. Without this connection between letters and sounds, one that is essential for mapping words, students often struggle to read because they cannot orally blend or manipulate the sounds in words (Dragić & Vučković, 2020).

The term decoding refers to different strategies used to read words. This involves translating graphemes into phonemes and blending the sounds to form words. Ehri (2005) portrays the development of the ability to read words through overlapping phases. Represented in these phases is the connection students are making between written words and their spoken pronunciation. As students' understanding of the phoneme-grapheme connection enhances, so does their ability to decode and read words. Since our alphabetic system represents speech at the phoneme level, students should be taught to identify the connection between the phonemes they hear and the string of graphemes that represent the sounds (Sargiani et al., 2022). This connection bonds the spellings of those words to their pronunciations and meanings and secures these words in students' memory.

When students are given explicit intentional instruction with word decoding, they are more successful at reading a given text. Garcia and Cain (2014) found that when students have more accurate and automatic decoding skills, they are able to read at a more accurate rate. Explicit training in phonemic awareness and decoding skills helps students who are at risk for falling behind (Nilvius et al., 2021). According to Felton (1993), “Reading will not become pleasurable until a certain level of automaticity of word decoding is achieved” (p. 588). Giving students a deep understanding of how to decode words provides more positive feelings towards reading.

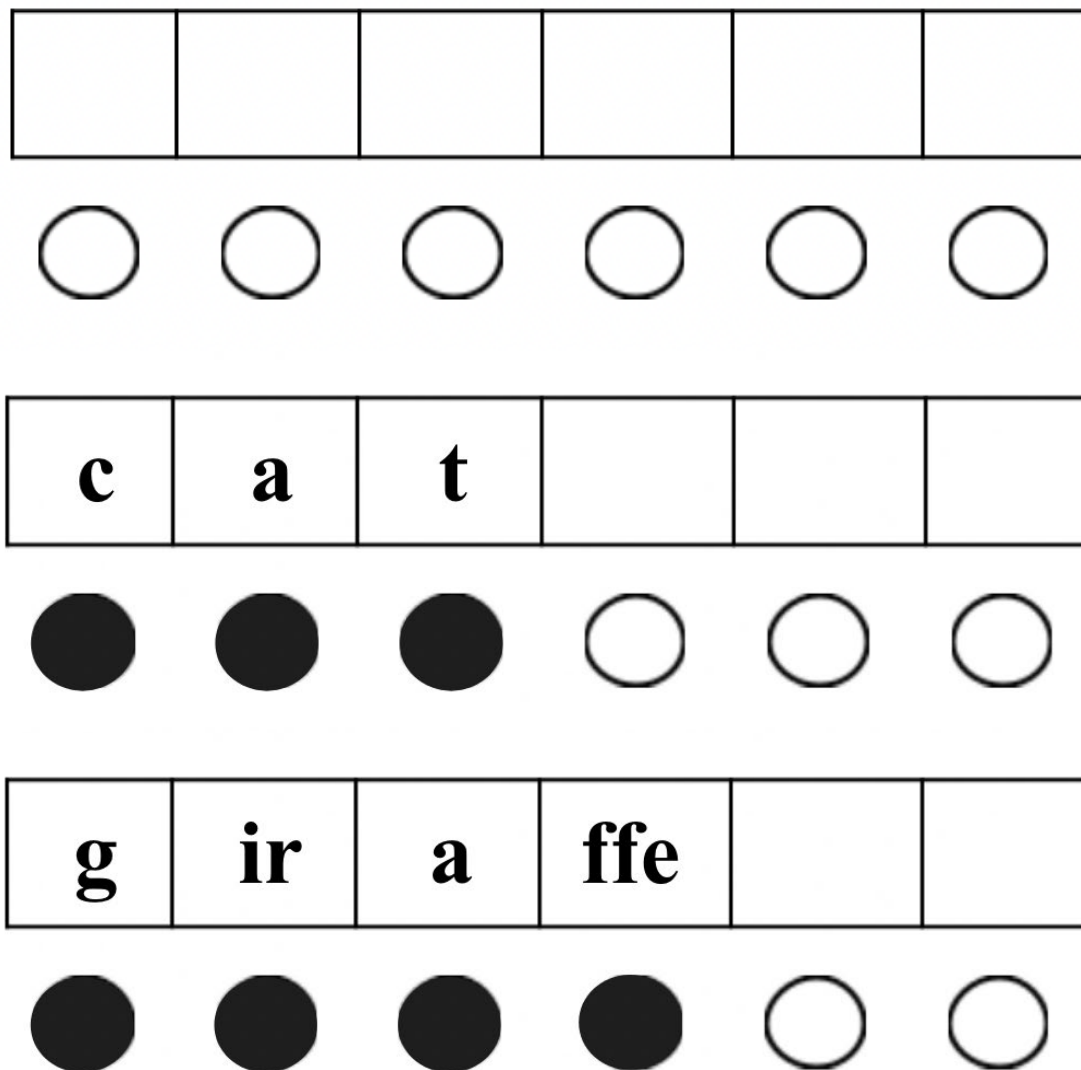
Phoneme Grapheme Mapping

The road to automatic word reading is long and complex and requires mastery of letters, phonemic awareness, knowledge of the writing system and how to spell the sounds in words. Research shows that written words are stored in memory when graphemes are connected to phonemes in pronunciations of words (Ehri, 2022; Kilpatrick, 2020). A reader encounters an unfamiliar written word and decodes it by converting graphemes into a blend of phonemes. Repeating this process a few times securely bonds its pronunciation in memory. To deepen students’ understanding of the alphabetic principle and the connection between phonemes and graphemes when decoding and encoding words, teachers must utilize strategies and tasks that place emphasis on this connection. Elkonin boxes can be a beneficial tool in supporting this connection.

Elkonin Boxes

Elkonin Boxes are both a visual and kinesthetic way to demonstrate the explicit connection between letter and sound. Knowing how words are best stored in memory, this approach supports students in identifying the phonemes in a word and then identifying graphemes that represent those phonemes. Students start by counting the phonemes in a word using counters. Then, each grapheme is written in an Elkonin box (Miles et al., 2017). For example, if a student is breaking up the word “cat,” the student would count each phoneme in the word, starting with /c/. Then, the student would write a letter c in the first box because it is the letter matching the first phoneme. The next step would be to add a letter a in the second box which matches the next phoneme /ă/. In the third box, we would add the letter t to represent the phoneme /t/. This strategy is particularly useful when students practice irregular word patterns, such as the word “giraffe.” Students must be taught segmentation, which is the ability to break, or segment, a word into each of its sounds. The strategy works best with words at a student’s instructional level. In a recent study, phoneme grapheme interventions demonstrated “high levels of phoneme-grapheme mapping segmentation, letter-sound correspondence, and spelling performance” after the intervention was no longer in place (Ross & Joseph, 2019, p.48). In a similar study researching the use of Elkonin boxes with sight words, results showed improvement of sight word recognition in struggling readers (Miles et al., 2017). This segmentation strategy assists students in relating sounds to letters and letter patterns during reading, which also allows them to practice decoding. Stretching phonemes is where students hold each sound for a few seconds before saying the next phoneme (Ryder et al., 2007). This helps students recognize each sound and the formation their mouth makes when they produce the sound. Figure 1 shows the Elkonin Boxes students used in small groups and independently and the phoneme grapheme maps for the words, “cat” and “giraffe.”

Figure 1
Elkonin Boxes



Explicit Feedback & Progress Monitoring

By giving students explicit feedback, they know the area of reading and skill they are working to improve. No matter the strategy that is used, all the strategies must be explicitly taught with explicit feedback attached to the practice (Hudson et al., 2011; Felton, 1993). In a study conducted by Hudson and colleagues (2011), results of this study showed student improvement of decoding automaticity and reading fluency when instruction was paired with explicit feedback.

Monitoring progress and providing feedback is an important aspect of reading intervention because it supports student self-regulation and motivation. Benefits include organization, confidence, participation in class, and better time management (Lee et al., 2009).

When students set personal goals, self-monitor and visualize their progress towards the goal, they take ownership of their own learning. Self-monitoring increases student engagement as students work to self-observe and record to reach their goal (Lee et al., 2009). Progress monitoring and feedback is an important aspect of reading intervention because it supports student self-

regulation and motivation. This strategy is beneficial when students are reading which is paired with reinforcement (Hudson et al., 2011). Motivation and progress monitoring connect a student to working towards improvement and growth.

Therefore, educators must accurately identify lacking skills to implement supplemental instruction that meets students’ needs (Ross & Joseph, 2019). Our action research explored the impact phoneme grapheme mapping strategies would have on students’ decoding abilities. Specific strategies included Elkonin boxes, explicit feedback, and progress monitoring.

Methodology

Research Context

The aim of this study was to implement phoneme grapheme mapping strategies to improve students’ decoding abilities. Action research took place in two, first grade classrooms in two separate schools, in two different states. Action research identifies a problem with the intent to seek the solution (Alfaro-Tanco & Erro-Garcés, 2020). Throughout the study, classroom teachers were flexible with the implementation of strategies in our classroom which follows the procedures of action research (Alfaro-Tanco & Erro-Garcés, 2020).

Participants

Participants of this study were in two first grade classrooms in two separate states. Although one school was in a suburban location and the other was rural, both schools had nearly 600 students with School A reporting 15% of students on free and reduced lunch and School B 43%. Classrooms A and B had 22 and 21 students respectively. In Classroom A, 36% of the students needed additional support and were included in the action research; 52% were included in Classroom B. Within Classroom A, 25% of the participants were girls and 75% of the participants were boys. In Classroom B, 36% of the participants were girls and 64% of the participants were boys. Out of the 19 participants, 32% did not attend kindergarten and 5% attended remotely. Information in Table 1 details the school and classroom community.

Table 1
Participant Demographics

Demographics	Classroom A	Classroom B
School Location	Suburban Community	Rural Community
Participants	8 students (2 girls, 6 boys)	11 Students (4 girls, 7 boys)
Classroom Population	22 students	21 students
School Free and Reduced Lunch Percentage	15%	43%
White Student Population of School	87%	93%

Action Research Design & Implementation

The 19 students receiving intervention met in small groups four-five days each week for a combined total time of 60 minutes of additional practice and instruction. The small group format

included a phonemic awareness warm-up, followed by a new or reviewed phonics pattern, reading a differentiated book that connected to the phonics pattern as a group, followed by an Elkonin Boxes activity. Students were given opportunities to practice the phonics pattern through both the connected passage and the Elkonin Boxes activity. When using Elkonin Boxes, it is essential that the same routine is used repeatedly throughout the process of teaching (Keeseey & Joseph, 2015). When using Elkonin Boxes, the teacher first says the word and then asks students to repeat it. Students are then asked to identify the sounds and represent each sound in the word with counters. Students would then write the corresponding letters to represent each sound before blending the sounds to read the word. This building, writing, and reading of words provides more guidance and opportunities for explicit feedback. The mastery of the decoding skill was assessed every two weeks using the nonsense word screener. This influenced instruction for the following two-week period.

Data Collection & Analysis

During the six-week intervention, both qualitative and quantitative data was collected to inform next steps and adjust instruction as needed. Data collection methods included anecdotal notes and nonsense word screeners.

Anecdotal Notes. Throughout the research progress monitoring was used for each student. Figure 2 shows an example of the anecdotal note organization that was used in data collection.

Figure 2

Example Anecdotal Note Structure

Student (A)	Observations (B)	Next Steps & Feedback Provided (C)

In Box A, we listed the student’s name. Box B included observations such as body language, quotes from the students, and behaviors noted. Box C highlighted the feedback we provided and the next steps for the student.

Data Analysis of Anecdotal Notes. Anecdotal notes were analyzed for the themes. Thematic analysis allows researchers to gather an understanding of experiences and patterns (Braun & Clarke, 2006). Thematic analysis, although a common qualitative research method, is often not described with enough detail to be viewed as a sophisticated method of research (Braun & Clarke, 2014; Kiger & Varpio, 2020). As a result, Braun and Clarke (2006) developed a six-step process to support the methodology. Although originally developed in psychology, it transfers to education as well. First, we, as Authors 1 and 2, reviewed the data collected from the anecdotal notes independently. After analyzing, we found our observations of students were similar. Together we identified the initial coding and used this to search for themes found in the data. Afterwards, we reviewed, defined, and named themes, before reporting the information (Kiger & Varpio, 2020).

Nonsense Word Screener. A Nonsense Word Screener following the phonics scope and sequence, shown in Table 2, was administered individually to students every two weeks in small groups. The screener consisted of ten nonsense words connected to each phonics skill identified in the scope

and sequence. Teacher A and Teacher B used district curriculum nonsense word screeners. An example of the screeners is shown in Figure 3. Students were asked to decode each word listed on the screener. Students demonstrated mastery if they were able to accurately decode 5 out of 10 nonsense words connected to a specific phonics skill. Students received reteaching on the decoding skill if mastery was not met. If students showed mastery, they received instruction on the next phonics skill in the scope and sequence.

Table 2
Nonsense Word Screener Scope and Sequence

Level	Proficiencies
1	Letter Sounds
2	CVC
3	Consonant Digraphs
4	CCVC/CVCC
5	Silent e
6	R Controlled Vowels

Figure 3
Example Nonsense Word Screener

CVC	jat tep lom fap vad weg pim zaf lud sib	/10
Consonant Digraphs	nosh ling whap thig fosh chab thid tish mack fich	/10
CCVC/CVCC	stam plub gleb praf jest slud bant tosp lund clud	/10
Silent e	dole paze jate pote gile tade lune hite labe mune	/10
R Controlled Vowels	lort purt girk dirn lerm farp darm lurf horb surp	/10

Data Analysis of Nonsense Word Screener. Mastery of the decoding skill was assessed every two weeks using the nonsense word screener. Students mastered the skill when they decoded 50 percent of the words accurately. Students are able to segment and blend the sounds to produce the nonsense word. To calculate the number of phonics skills each student grew by a numerical value was given to the phonics skills in the scope and sequence. At the beginning of this study, students ranged from CVC (2) to CCVC (4). Additionally, a Paired-Samples T-Test was conducted prior to implementation of the intervention and six weeks after.


Results

The goal of the intervention was to improve students’ decoding skills. Data collected showed that Elkonin Boxes and corrected feedback positively impacted student learning outcomes. In the following sections, we report the results and our interpretation of the data.

Anecdotal Notes

After analyzing anecdotal data from observations (Box B), it was clear there was a change in student perceptions. In weeks 1-3 students showed more frustration and at times aggressive behavior. They often appeared nervous. Frustration levels included physical and verbal aggression and negative self-talk. Nervousness included reading quietly or seeking reassurance. In weeks 4-6 another theme emerged. Students demonstrated more self-confidence while decoding. We also saw a decrease in frustration levels and nervousness. Student confidence was demonstrated when students read words as a statement, rather than as a question. Quotations and observations are included for each theme found throughout the research in Table 3. Overall, we noted that students saw themselves as readers and knew they had the ability to decode accurately.

Table 3
Observations and Example Quotations from Students

Weeks	Themes	Observations	Student Quotations
Weeks 1-3	Frustration Level	Kicking and throwing objects Fixed Mindset Avoidance	“This is stupid.” “I can’t read.” “I don’t want to.”
	Nervousness	Quiet Reading Seeking Reassurance Tone of Voice	“Is that right?” “Reading makes me nervous.” “I don’t want anyone to hear me.”
	Weeks 4-6	Confidence	Fluent Reading Engagement Participation

When analyzing feedback provided and next steps (Box C) from the anecdotal notes, data analysis indicated that our explicit feedback fell into two themes: positive feedback and corrective feedback. Corrective feedback was used only when a mistake is made to ensure students do not reinforce incorrect practices. If attention is not drawn to a mistake, students continue to make the same mistake. After corrective feedback is given, it is important to follow with positive feedback to avoid students feeling defeated and frustrated (Lee et al., 2009). When analyzing observations (Box B), we noted positive affirmations increased as the weeks progressed as did their confidence. At first, we modeled the phrases and repeated them to students when providing explicit feedback. As their confidence increased, it became routine for students to positively affirm themselves, before reading, during reading, or after reading. By the end of the study students were verbally expressing that they enjoyed reading more and self-correcting. Students were more motivated to self-correct their decoding during independent reading tasks as well.

Nonsense Word Screener

Based on the results of the study, 100% of students made growth in their decoding abilities. At the end of the study, students' growth ranged from Consonant Digraphs (3) to R-Controlled Vowels (6). On average, students receiving classroom support grew by nearly 2 phonics levels, specifically the average student grew 1.7 levels over the course of the 6 weeks.

A Paired-Samples T-Test was conducted to determine the effect of the use of phoneme grapheme mapping strategies on students' decoding. There was a significant difference in the scores prior to implementing phoneme grapheme mapping strategies (M=3.21, SD=0.69) and after implementing (M=5.05, SD=0.76); $t(19) = 13.335, p < .001$. The observed effect size d is large, 3.06. This indicates that the magnitude of the difference between the average of the differences and the expected average of the differences is large. These results suggest that the use of phoneme grapheme mapping strategies had a positive effect on students' decoding.

Implications & Discussion

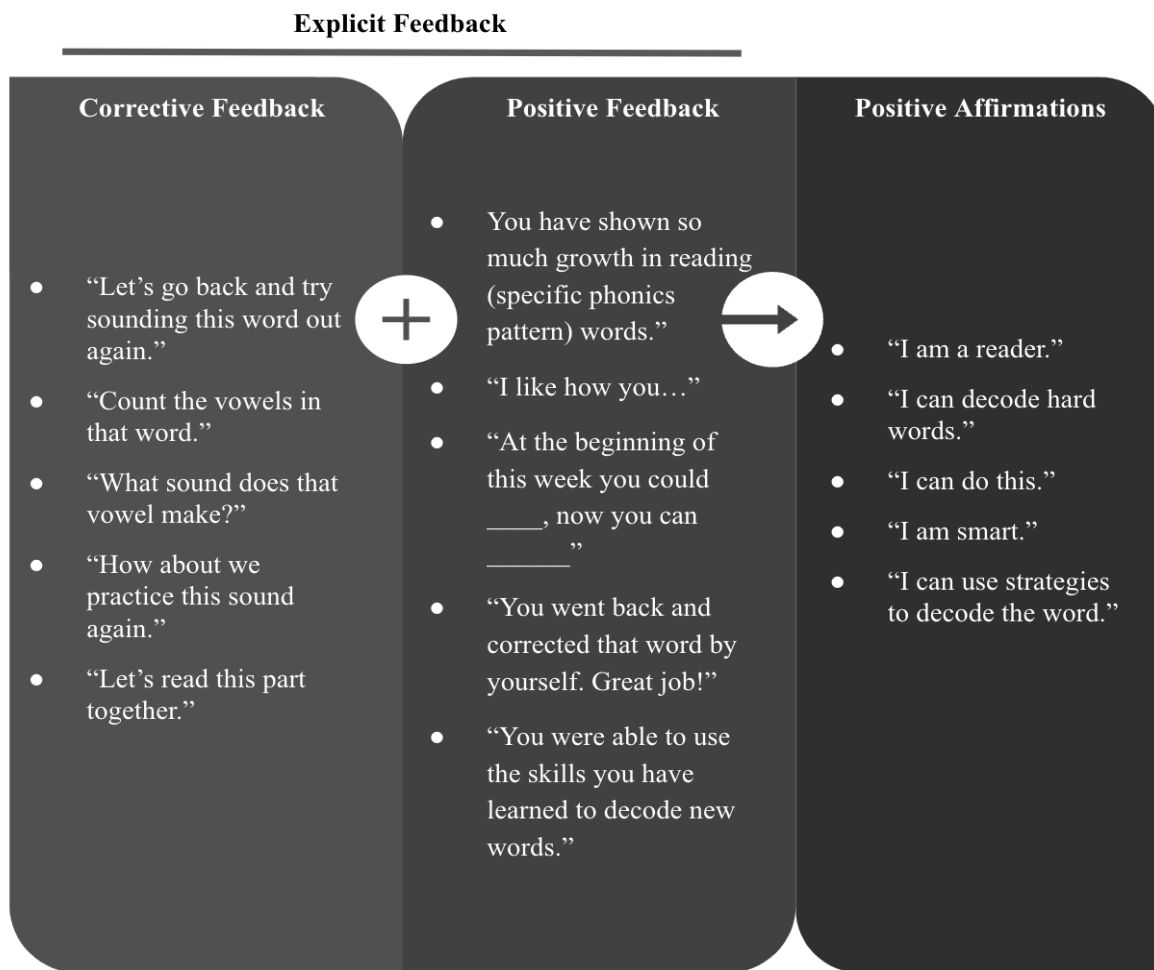
What was validated from the results is that the use of Elkonin Boxes and explicit feedback can have a positive impact on students' decoding abilities. Given the results of the study we suggest using Elkonin Boxes to support students' abilities to build, write, and read words (Miles et al., 2017) in conjunction with explicit feedback (Hudson et al., 2011). Creating consistent opportunities to build, write, and read words provides practical, tactical application. We suggest teachers utilize counters, as described in Build It, because it reinforces students' awareness of phonemes in spoken words (Kilpatrick, 2020). Write It supports memory connections between graphemes and phonemes, while Read It supports the connection to the pronunciation of the words (Ehri, 2022; Kilpatrick, 2020). See Table 4 for step-by-step ways to integrate, build it, write it, and read it into small group work.

Table 4
Elkonin Boxes Format

Build It	Write It	Read It
<ol style="list-style-type: none"> Use counters to find the number of sounds in each word. Once students have found the number of sounds then they are to build the words with magnetic letters or tiles. Place each phoneme in each Elkonin Box. Have students say each sound as they place it in the box. 	<ol style="list-style-type: none"> Students start by counting the sounds on their fingers of the word they are writing. Each finger represents a sound. The student goes back through each sound and writes the letter that matches that sound on their paper. Students write the whole word. 	<ol style="list-style-type: none"> As students are reading after practicing letter-sound correspondence with Elkonin boxes, they continue to use the skill while decoding. Students decode a word by touching underneath the letters with their fingers. While touching underneath each letter, the student says the sounds aloud. After decoding the whole word, the student blends the sounds together to read the whole word.

Results also showed an increase in student confidence and accuracy in decoding skills. In support of Felton (1993), this structure supported increased decoding confidence and increased positive affirmations supporting that reading is more pleasurable when automaticity is reached. We surmise this is a direct result of the positive outlook students had on themselves and their abilities because of explicit feedback. As we provided positive explicit feedback, we modeled positive affirmations to build reading confidence as opposed to when only providing corrective feedback. If students are decoding incorrectly without explicit feedback, students will continue to decode incorrectly, yet teachers need to consider how to blend this with positive feedback to support growth. Ending small groups on a positive, allowed for students to leave feeling proud of their growth and promoted a positive reading outlook. See Figure 4 for examples of explicit feedback leading to positive affirmations.

Figure 4
Explicit Feedback Leading to Positive Affirmations



Conclusion

Every student is different and not every strategy is going to work for every student. Intentional, individualized, and meaningful learning experiences are essential for student growth, not only in reading, but in their view of themselves. As educators, it is important to research, collaborate, and use data to guide instruction. This study taught us how our actions impact students.

The way we, as teachers, plan and solution-seek requires us to look beyond just the academic data. Student needs are the largest priority in our classrooms, and it is our job to meet those needs.

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Author Information

Author 1: Payton Steensma is a first-grade teacher who is working to improve instructional strategies and positively impact learners. She is currently a doctoral student at the University of Nebraska Omaha.

E-mail: psteensma0714@gmail.com

Author 2: Jessica Jones is a first-grade teacher who has a passion for early literacy skills in the classroom. She recently completed her master’s degree through the University of Nebraska Omaha.

E-mail: jessicajones33199@gmail.com

Author 3: Chris Wilcoxon, Ed.D., is the Teacher Education Graduate Chair and Director of the CADRE Project at the University of Nebraska at Omaha. Her research focuses on teacher development, induction, mentoring, coaching, instructional leadership, clinical practice, and field-based preparation.

E-mail: cwilcoxon@unomaha.edu

Author 4: Jennifer Lemke, Ed.D. is an assistant professor of literacy at the University of Nebraska at Omaha. Her literacy interests focus on student engagement, multicultural literature and literacy integration.

E-mail: jenniferlemke@unomaha.edu