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Enhancing First-Grade Math Fluency: A Multi-Tiered Intervention Approach

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Review of Literature

Response to Intervention (RTI) employs a three-tiered approach (Preston et al., 2016). It stresses continuous academic progress monitoring by teachers and is **consistently effective**, reducing the need for special education services by emphasizing early intervention.

Math fluency, the ability to swiftly and accurately solve math facts, strongly influences academic math success (Gliksman et al., 2016). Accuracy serves as the crucial foundation for fluency to be applied.

Explicit Timing (ET) is an educational strategy that enhances math fluency, emphasizing rapid and accurate math fact-solving through timed distributed practice. Student proficiency and accuracy are essential prerequisites for the effectiveness of ET (Rhymer et al., 2002).

Cover Copy and Compare (CCC) stands out as an effective intervention, well-supported by research for improving math accuracy and fluency. CCC merges two essential learning components—accuracy and fluency—by offering immediate feedback to maintain response precision and deter the reinforcement of errors (Stocker & Kubina, 2017).

Fact Families is a relatively new intervention aimed at teaching computational accuracy. Several studies have found that it can enhance both addition and subtraction skills, even when direct instruction is focused on a single operation (Musti-Rao & Telesman, 2022; Stocker Jr. et al., 2022).

Tier 1: Explicit Timing (ET)

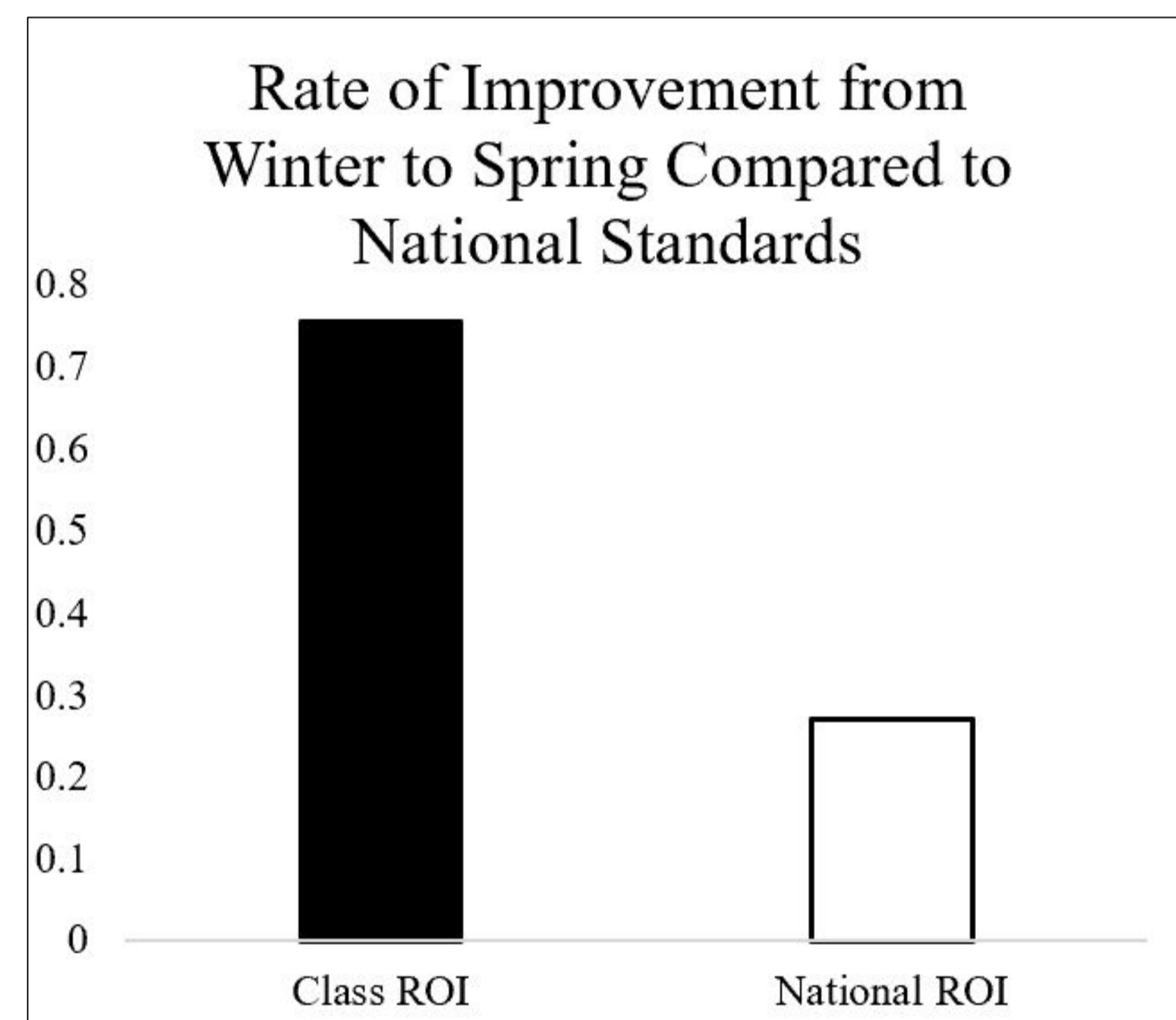


Figure 1. Notes. This figure shows that after the intervention, the class as a whole increased their aimsweb ROI compared to the national ROI standards.

Table 1

Independent t-test of aimsweb Class Growth v. National Norms

df	t-score	One-tailed Sig.
7.68	-2.163	$p < 0.05$

Table 1. Notes. This table provides the results from a one-sided independent t-test between the aimsweb national growth norms and the class's growth, which revealed that the class's growth was significantly higher than the national growth norms.

Methodology

Referral: A first-grade teacher referred 21 students for a math fact fluency intervention to enhance their addition proficiency by improving speed and accuracy. The students exhibited varying fluency levels, with some progressing to double-digit subtraction and mixed problems. In contrast, others required further intervention based on specific accuracy and Digits Correct Per Minute (DCPM) criteria.

Interventions:

- Tier 1:** Class-wide implementation of Explicit Timing (ET) featuring goal setting, percentile shaping, examiner and self-graphing, and positive reinforcement.
- Tier 2:** Select students with accuracy concerns transitioned to the Cover Copy and Compare (CCC) Model after the data indicated that these students needed to work on their accuracy. These students returned to ET after achieving two weeks of 90-100% accuracy and an average of at least 13 DCPM.
- Tier 3:** Tier 2 adaptations proved insufficient for a specific struggling student. Tier 3 interventions began with Fact Families (FF), providing direct addition instruction and indirect subtraction instruction. The student later transitioned to Explicit Timing, resembling Tier 1 but allowing for additional corrective feedback.

Tier 3: Fact Families and ET

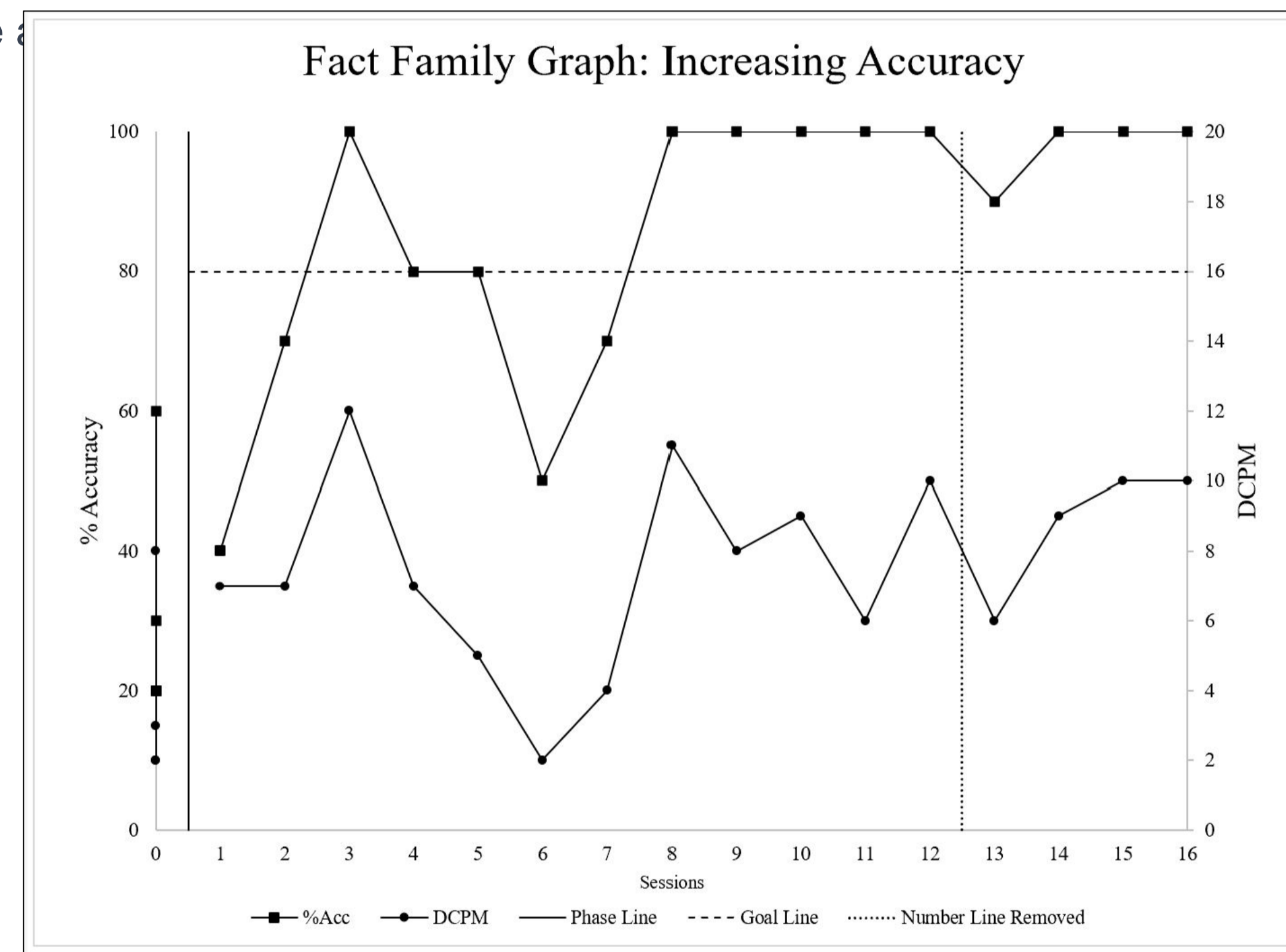


Figure 2. Notes. The figure that is positioned directly above portrays the data collected from Tier 3 student that was put in Fact Families Intervention.

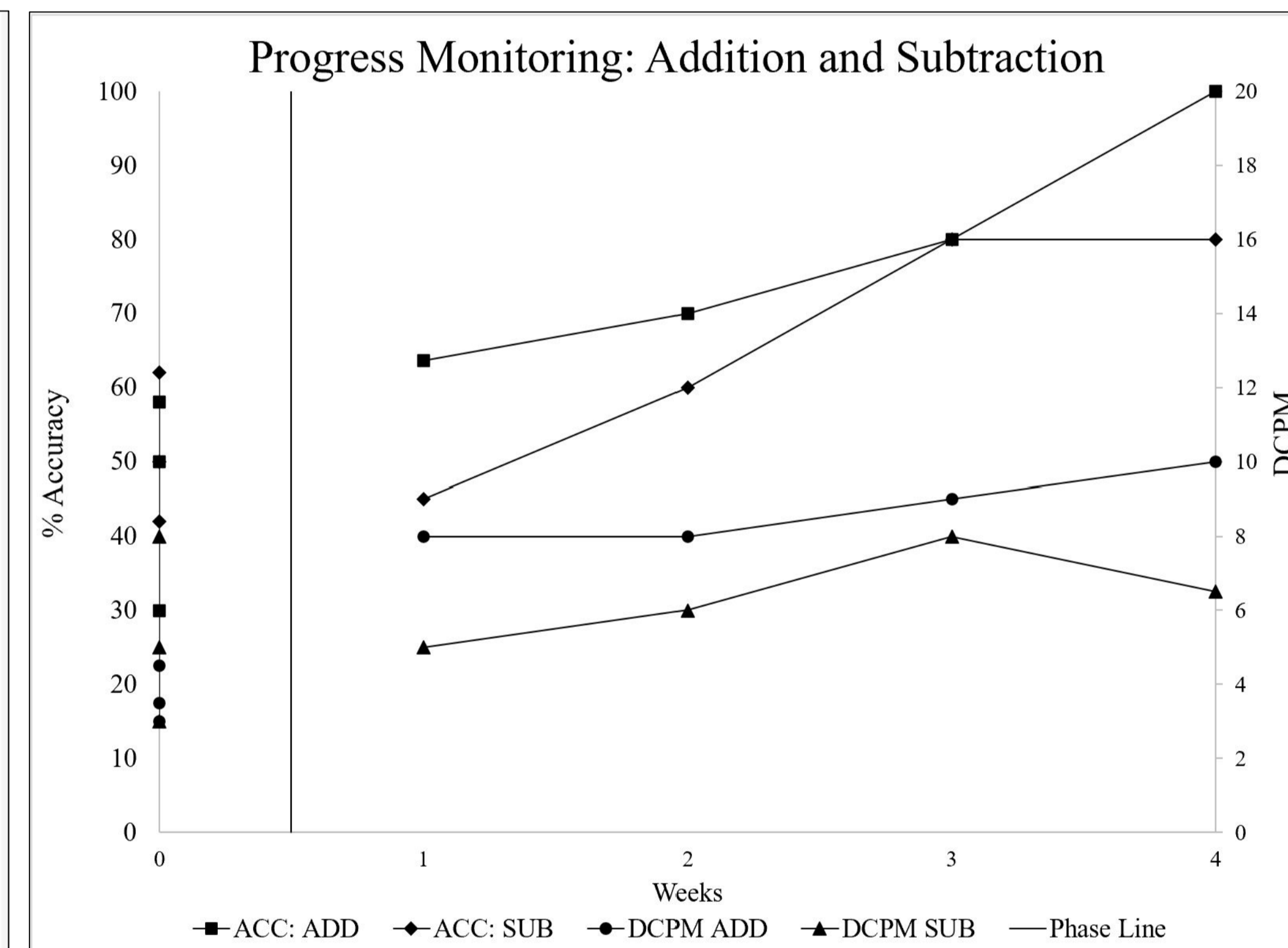


Figure 3. Notes. This figure portrays the weekly progress monitoring (PM) data collected during the FF intervention. The PM was formatted the same as the ET group's initial probe but included a subtraction.

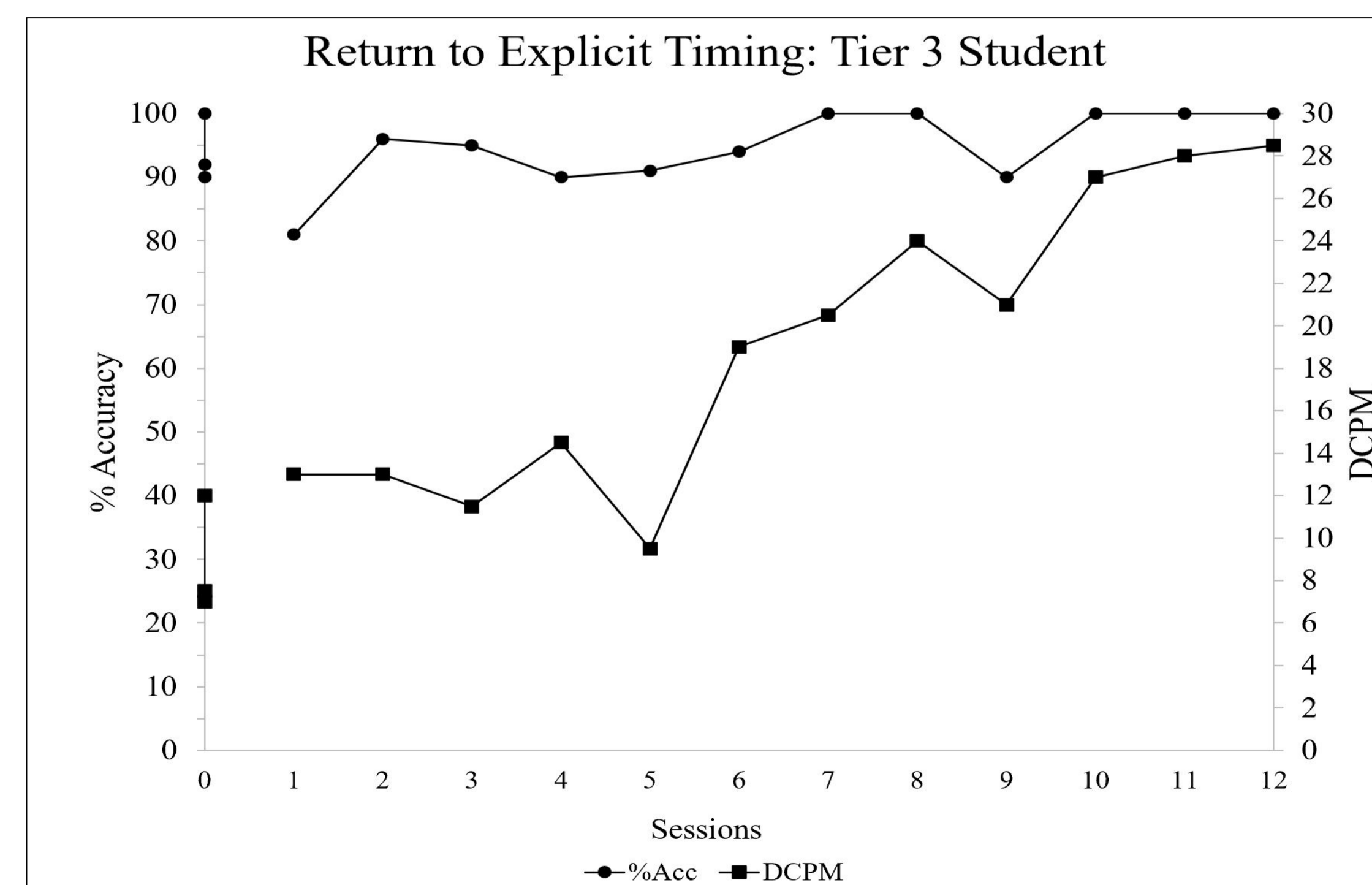


Figure 4. Notes. The figure to the left demonstrates the data collected after the discontinuation of FF after the student met the criteria. The ET intervention was resumed for 3 weeks.

References

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Tier 2: Cover Copy Compare

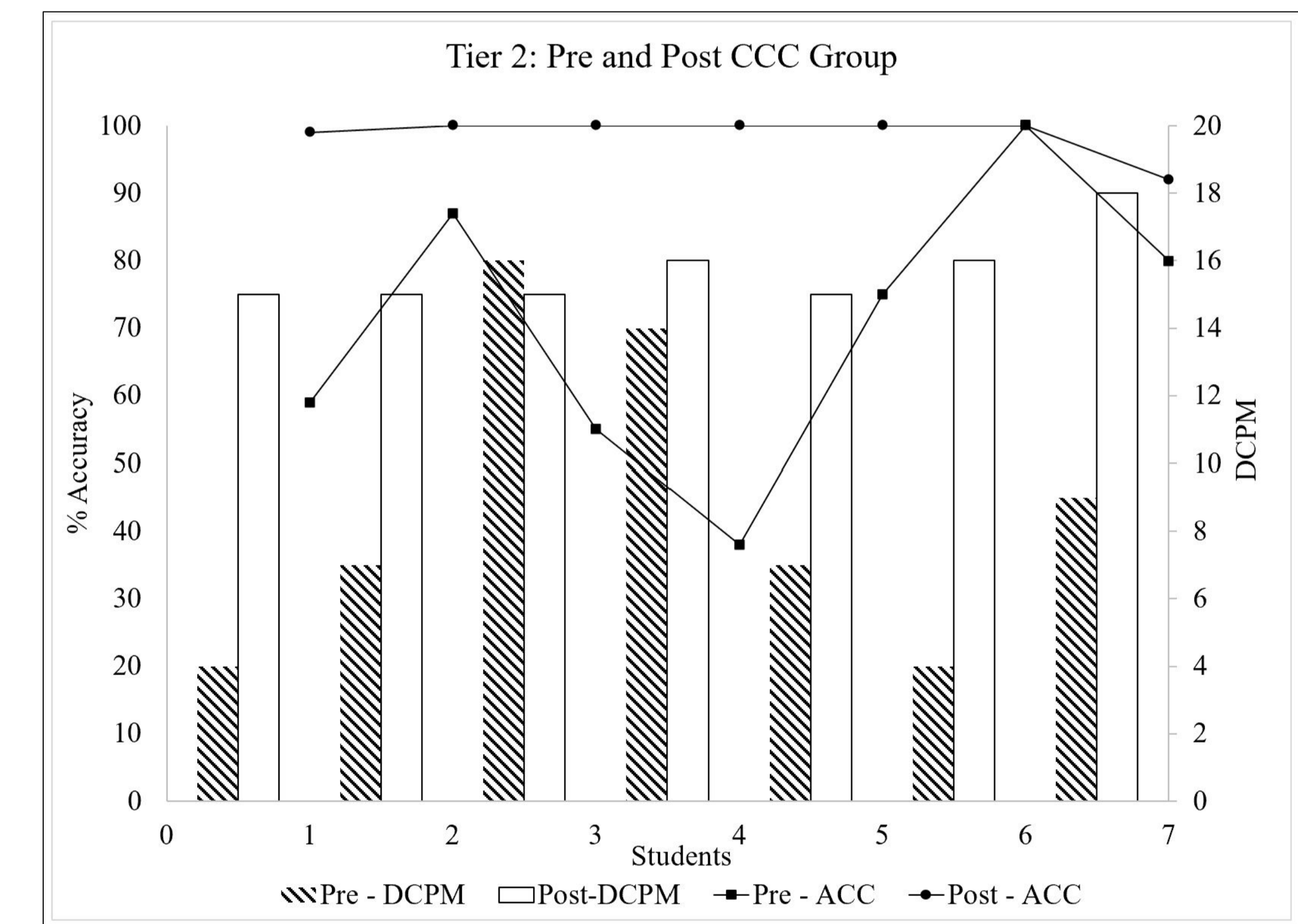


Figure 5. Notes. This figure shows the pre and post-data collected from students who were identified as needing Tier 2 intervention (CCC). All students were able to be transitioned back into Tier 1 after meeting the criteria.