Lab 11 & 12

Results

In general, students' performance level increased on the final assessment when manipulatives were applied on the worksheets. There was a changed in improvement and students scored higher on the last post-test after using manipulatives. In regards of level performance and the two types of instruction, the research hypothesis for student performing better using manipulatives than without manipulatives was accepted and the null hypothesis was rejected, since there was a significance difference relationship with manipulatives and without manipulatives.

Results of analysis of data

The histogram in Figure 1.1 shows that students performed low using only worksheets without manipulatives. The histogram in Figure 1.2 showed there was a little bit of improvement when manipulatives were implemented when using worksheets and manipulatives.

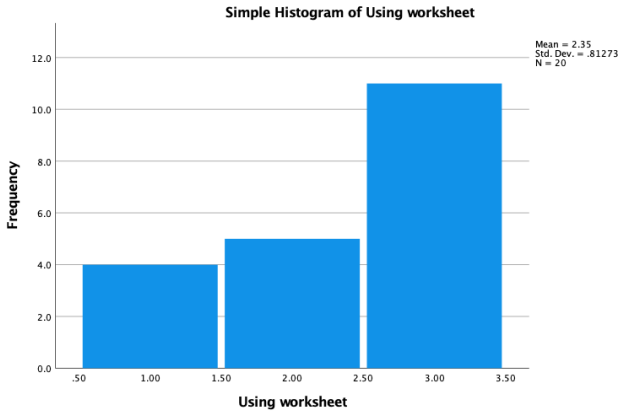

Figure 1.1. Histogram of performance on only using worksheets without manipulatives.

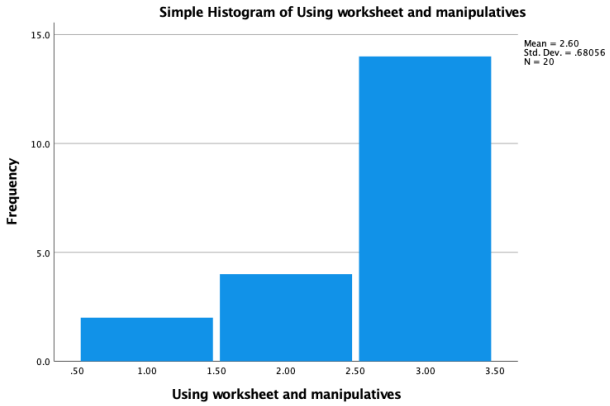

Figure 1.2. Histogram of performance using worksheet plus manipulatives.

In Figure 1.3. On scale of 1 (Poor Performance) to 3 (Excellent performance) using manipulatives, four students scored less on performance (*m* =43.75, *sd* = 8.09, *n*= 4) than that group of students that performed good (*m* =68.30, *sd* = 7.78, *n*= 10) and excellent (*m* =91.50, sd = 9.31, *n*= *6*).

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Reported scores without Manipulatives * Performance Level	20	100.0%	0	0.0%	20	100.0%

Report

Reported scores without Manipulatives

Performance Level	Mean	N	Std. Deviation
Poor	43.7500	4	8.09835
Good	68.3000	10	7.78959
Excellent	91.5000	6	9.31128
Total	70.3500	20	18.82405

Figure 1.3. Means and Standard deviations without using manipulatives.

Table 1.1
Means and Standard Deviations of level performance without manipulatives.

Performance Level	Mean	Standard Deviation
Excellent (*n= 6)*	91.50	9.31
Good (*n= 10)*	68.30	7.78

Poor (*n= 4)*	43.75	8.09

On scale of 1 (Poor Performance) to 3 (Excellent performance) using manipulatives, only one student scored less on performance (*m* =50, *sd* = .0, *n*= 1) than that group of students that performed good (*m* =65.33, *sd* = 6.47, *n*= 6) and excellent (*m* =90.30, sd = 7.66, *n*= 13).

Report

Reported scores with Manipulatives

Performance Leves	Mean	N	Std. Deviation
Poor	50.0000	1	.
Good	65.3333	6	6.47045
Exellent	90.3077	13	7.66360
Total	80.8000	20	15.34378

Figure 1.4. Means and standard deviation using manipulatives.

Table 1.2
Means and Standard Deviations of level performance with manipulatives.

Performance Level	Mean	Standard Deviation
Excellent (*n=13)*	90.30	7.66
Good (*n= 6)*	65.33	6.47
Poor (*n= 1)*	50.00	.0

The mean and standard deviation were used to compare students using only worksheets without manipulatives displayed in Figure 1.3. On a scale of 1 (Poor Performance) to 3 (Excellent performance) using manipulatives, four students scored less on performance (m =43.75, sd = 8.09, n= 4) than the group of students that performed good (m =68.30, sd = 7.78, n= 10) and excellent (m =91.50, sd = 9.31, n= 6). On a scale of 1 (Poor Performance) to 3 (Excellent performance) using manipulatives, only one student scored less on performance (m =50, sd = .0, n= 1) than that group of students that performed good (m =65.33, sd = 6.47, n= 6) and excellent (m =90.30, sd = 7.66, n= 13).

A paired sample t-test was conducted to compare the performance scores of students using worksheets without manipulatives and using worksheets plus manipulatives displayed in Figure 1.5. The mean performance score before manipulatives increased from 66.60 (sd= 23.14) on the pretest to 80.80 (sd=15.34) on the posttest after using manipulatives. These results indicated that the difference between the two means is statistically significant (t (19) = -2.70, p <.014). Using manipulatives can increase student learning outcomes.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest without manipulatives	66.6000	20	23.14576	5.17555
	Posttest with manipulatives	80.8000	20	15.34378	3.43097

Paired Samples Correlations

		N	Correlation	Significance One-Sided p	Significance Two-Sided p
Pair 1	Pretest without manipulatives & Posttest with manipulatives	20	.308	.093	.186

Paired Samples Test

		Paired Differences					t	df	Significance One-Sided p	Significance Two-Sided p
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper				
Pair 1	Pretest without manipulatives – Posttest with manipulatives	-14.20000	23.49826	5.25437	-25.19753	-3.20247	-2.703	19	.007	.014

Figure 1.5. SPSS statistics output for the paired samples *to* test on pretest using worksheet only and posttest using worksheet plus manipulatives.

Results of testing the hypothesis

In regards of level performance and the two types of instruction, the research hypothesis for student performing better using manipulatives than without manipulatives was accepted and the null hypothesis was rejected, since there was a significance difference relationship with manipulatives and without manipulatives.

Discussion

Limitation and recommendation for future Research

There is no question that manipulatives engage students and capture their attention. If students are more engaged, this would mean that the manipulatives support learning in most cases. Manipulatives, like any educational tool, can help or hinder learning. Understanding the research can help educators make more informed decisions about the use of manipulatives in their classrooms. Additionally, manipulatives with unnecessary features can hinder learning by drawing the learner's attention away from important aspects of the objects and the intended concept.

Future research in a few manipulative instruction-related fields is necessary. Future studies should think about including a no-manipulative, extended baseline phase right after instruction and training. Results from this stage may rule out the possibility that good instruction and less so the instructional tools being used are responsible for student growth. By examining whether students can generalize the skill of setting up, solving the problem, and then doing it again using both, research should evaluate the advantages of both types of manipulatives for promoting greater independence. Previous studies showed instructional guidance and realistic manipulatives can affect the effectiveness of mathematics instructional strategies with preschool children. Carbonneau & Marley (2015) suggests that educators should be careful in their choice of concrete objects because the types of manipulatives used to introduce new mathematical concepts can influence student learning. However, more research is needed to provide practitioners with sound recommendations on how to use manipulatives effectively in early childhood education.

Implications for practice

Lessons involving the use of manipulative materials also allow students with different learning styles to benefit equally because concepts are explained (to auditory learners), demonstrated for viewers (to visual learners), and made available for kinesthetic learners to manipulate or model themselves. It also offers students the freedom they might need for learning. The classroom environment and experiences help students learn more. Students can draw lessons from their experiences and relate mathematical concepts to them. Students' interest in learning is sparked when they are actively engaged with manipulatives.

Conclusions

This study provided insight into how instructional guidance and using manipulatives may influence the effectiveness of instructional strategies with preschool children. The findings in this study concluded that students could improve their learning when using manipulatives in the concept. However, since the type of manipulative used to introduce new concepts can have an impact on student learning, educators should be careful in their choice of concrete objects. To give practitioners sound advice on how to utilize manipulatives in early childhood education, however, more research is required.