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USING EMERGENCE THEORY-BASED CURRICULUM TO TEACH COMPROMISE SKILLS TO STUDENTS WITH AUTISTIC SPECTRUM DISORDERS

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Abstract
This study addressed the compromise skills taught to students with autistic spectrum disorders (ASD) and related social and communication deficits. A private school in the southeastern United States implemented an emergence theory-based curriculum to address these skills, but no formal analysis was conducted to determine its effectiveness. Guided by cognitive development and constructivist theories, a concurrent, mixed-methods case study design was used to investigate the impact of this curriculum on teaching compromise skills to middle school students with ASD and related deficits. Teacher observations and compromise interventions were open coded and analyzed thematically using descriptive statistics. For the quantitative sequence, an ANCOVA and descriptive statistics were used to analyze posttest scores between the treatment group and the control group while controlling for pretest scores. The three most frequently occurring themes that emerged were in regard to teachers’ need to (a) understand the cognitive deficits exhibited by students, (b) receive instruction in emergence theory-based curriculum, and (c) plan lessons together using emergence theory. The ANCOVA revealed a significant interaction between the pretest scores and the curriculum used. This study indicated the importance of remediating the cognitive deficits of students with ASD and improving educator understanding and success in working with this student population.

Keywords: autistic spectrum disorders, emergence theory-based curriculum, teaching compromise skills, ASD compromise, emergence theory

Introduction
This study examined the effects of emergence theory-based curriculum as a method of teaching compromising skills to students with autistic spectrum disorders (ASD).

Background
Students with ASD have difficulty compromising because their brains interpret everything literally and their perspectives of the world are precise, perhaps even strict, and leave no room for concessions (Rucklidge, 2009). This inability to compromise creates a multitude of problems for students with ASD within and outside the school setting (Huimin & Lay Wah, 2011). The private school that was the focus of this study caters to children and adolescents who have been diagnosed with ASD and related communication and social deficits. Beyond the actual diagnosis, these children are characterized by their inability to see other points of view and their impaired ability to symbolize when communicating and playing with others (Morris, 2008).

Emergence Theory
Emergence theory can be found in a wide array of sciences. Similar to synergy, emergence theorists have stated that the whole not only is greater than the sum of the parts but also is more complex, dynamic, and structured. According to emergence theory, the most complex structures...
and patterns develop from the self-organization of simple processes (Hotton & Yoshimi, 2011). Emergence theory was built on the framework that establishing a few simple rules that every part of a system can follow produces highly complex behaviors and results.

Despite the acceptance of emergence theory among scientists, the theory has not been applied to teaching compromise and communication skills to children and adolescents with ASD.

Case Study Design

Research Questions

Specifically, the case study sought to answer two research questions:

1. Qualitatively, what changes in compromise skills were observed by teachers of middle school students with ASD who followed an emergence theory-based curriculum?

2. Quantitatively, was there a difference between a treatment group that used an emergence theory-based curriculum and a control group on the posttest scores measuring the compromise skills of middle school students with ASD while controlling for pretest scores?

Details About the Data

The design incorporated deidentified quantitative data from student assessments and deidentified qualitative data from teachers’ observations of students, student summaries of events, and teacher feedback.

Data Approach

The quantitative data were obtained by PNSUS from 58 students selected from five middle school classrooms, three classes (Classes A, B, and C) served as the treatment group, and two classes (Classes D and E) served as the control group. PNSUS exposed the students in the treatment group to the new emergence theory-based curriculum for 12 weeks and the control group to their standard cognitive skill curriculum. Quantitative data was collected through pretesting and posting of all participants using the Test of Problem Solving 2 (TOPS 2), a preestablished, standardized instrument.

Qualitative data was collected through the middle school teachers who participated in this study and directly observed students during implementation of the emergence theory-based curriculum. Teachers documented observations during specific class times and during students’ social interactions throughout the day; all incidents with students were in written summaries that could be referenced chronologically. The data were coded (see Figure 1) and analyzed for frequency changes during the curriculum implementation period and help to test the hypothesis.

Additional qualitative data (i.e., agendas and summaries) were collected during staff meetings with teachers and administration. The principal deidentified students and teaching staff prior to distributing the notes in an effort to maximize the protection of all participants’ privacy.

Data Analysis and Validation

All deidentified data were analyzed at the end of the 12-week emergence theory-based curriculum implementation. Statistical analysis of the quantitative data was performed by comparing the pretest and posttest results for significance. Qualitative feedback from the teachers regarding student interactions proved meaningful and revealed changes in compromise skills and consensus skills that could not be measured quantitatively.
Qualitative Results

Descriptive statistics were performed on the qualitative data as a whole without accounting for group differences (see Table 1). The frequency of each occurrence was measured during the first 55 days (55A) of data from PNSUS and the last 55 days (55B) of data for each coded theme.

The descriptive statistics for the treatment group of 33 students revealed a decrease in four of five incident types from 55A to 55B of the case study (see Table 2).

The descriptive statistics for the control group of 25 students revealed a decrease in four of five incident themes from the first half to the second half of the intervention (see Table 3).

The results of the dependent paired-sample t tests showed significant decreases in the frequency of behavioral, teacher sent, and aggressive incidents (see Table 4).

Quantitative Analysis

ANCOVA was chosen as the statistical analysis tool, using pretest scores as the covariate and the groups as the factor. The results of the regression assumption analysis (see Table 5) showed a significant interaction between the pretest scores and the IV, $F(2, 50) = 33.901, p < .001$. Therefore, ANCOVA was not appropriate and could not be used for further analysis. Additional analysis was performed by running a repeated-measures ANOVA. These results were not significant.

As part of the repeated-measures analysis, a between-subject ANOVA without regard to the within-subject effect was performed. These average scores between the treatment and control groups were then compared (see Table 6). These results were significant, $F(2, 52) = 9.107, p = .004$. Although this test did not account for groupings, it did indicate a significant difference between the average pretesting and posttesting score totals of the control group per participant and the treatment group per participant.

Descriptive statistics were performed on the pretesting and posttesting scores for the control and treatment groups. The scores for both groups dropped from pretest to posttest (see Table 7). Expected results would be either no change or an increase from pretest to posttest for both the control group and the treatment group. One possible reason for scores dropping from pretest to posttest was that PNSUS did not have the same person administer the pretesting and posttesting.

Conclusion

In this case study, the merits of an emergence theory-based curriculum were assessed as one way to teach students with ASD how to compromise and see alternate perspectives. The triangulation of the literature review, qualitative feedback, and quantitative data indicated the potential of emergence theory-based curriculum and the need for additional PD focusing on implementation of emergence theory-based curriculum for use with students with ASD and related social and communication disorders.
## References


Table 1 indicates the total number of incidents across all groups comparing the first half and the second half of the intervention. According to the study results, there was a 47.76% decrease in frequency of 149 incidents, down from 312 to 163.

Table 2 contains the descriptive statistics of the treatment group, including 33 individual students, and revealed a decrease in four of five incident types from 55A to 55B of the case study. The frequency of group incidents was the only one that did not decrease from the first half of intervention to the second half; instead, it increased from 12 to 15, an increase of 25%. The greatest percentage decrease in the treatment group was in the frequency of aggressive incidents, which dropped from 14 to 1, a reduction of 92.86%. The greatest decrease in occurrences was in the teacher sent frequency, which dropped from 116 to 63, a reduction of 53 occurrences. The average change in frequencies was a reduction of 52.45% across all incident types.
Table 3 contains the descriptive statistics of the combined control group, including 25 individual students, and revealed a decrease in four of five incident themes from the first half to the second half of intervention. Aggressive incidents did not decrease, but remained the same between the first half and the second half of intervention at four. The greatest percentage decrease in the control group was evident in the self-sent frequencies, which dropped from 8 to 2, a reduction of 75%. The greatest decrease in occurrences was in the teacher behavioral frequency, which dropped from 26 to eight.

Dependent paired-sample t tests were performed. The results are illustrated in Table 4. The t tests revealed significant decreases in frequency of behavior, teacher sent, and aggression incidents. The only decrease that was not significant from the first half of the study to the second half was the frequency of group incidents reported.

The aggression assumption was performed on the data; the results (see Table 5) indicated a significant interaction between the pretest scores and the control group or the treatment group, suggesting that the differences on the posttest scores varied as a function of the pretest scores, not treatment. The results of the regression assumption analysis showed a significant interaction between the pretest scores and the IV, $F(2, 51) = 33.901, p < .001$. Therefore, ANCOVA was not appropriate and could not be used for further analysis. Additional analysis was performed by running a repeated-measures ANOVA. These results were not significant.

### Table 3

**Descriptive Statistics: Control Group**

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Sum</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSA behavioral</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>SSA behavior</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>SSA teacher</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>SSA self-sent</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>SSA group</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>SSA aggression</td>
<td>25</td>
<td>0</td>
<td>7</td>
<td>26</td>
<td>(69.23)</td>
</tr>
<tr>
<td>Total participants</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 4

**Paired-Sample t Tests**

<table>
<thead>
<tr>
<th>Category (SSA-SSB)</th>
<th>MD</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSA to SSB behavior</td>
<td>0.67</td>
<td>1.72</td>
<td>2.58</td>
<td>.004</td>
</tr>
<tr>
<td>SSA to SSB teacher</td>
<td>1.69</td>
<td>2.44</td>
<td>3.39</td>
<td>.001</td>
</tr>
<tr>
<td>SSA to SSB self-sent</td>
<td>0.57</td>
<td>1.22</td>
<td>3.26</td>
<td>.001</td>
</tr>
<tr>
<td>SSA to SSB group</td>
<td>0.63</td>
<td>1.00</td>
<td>6.13</td>
<td>.896</td>
</tr>
<tr>
<td>SSA to SSB aggression</td>
<td>0.22</td>
<td>0.82</td>
<td>2.60</td>
<td>.041</td>
</tr>
<tr>
<td>SSA to SSB - Total</td>
<td>2.57</td>
<td>1.70</td>
<td>5.26</td>
<td>.000</td>
</tr>
</tbody>
</table>

### Table 5

**Regression Assumption: Tests of Between-Subjects Effects**

<table>
<thead>
<tr>
<th>Between-subjects factors</th>
<th>Value of labels</th>
<th>N</th>
<th>1.2</th>
<th>p</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP</td>
<td>0 Control</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Treatment</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DV: POST TOT</td>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>1345.814</td>
<td>2</td>
<td>722.907</td>
<td>33.901</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>105.115</td>
<td>1</td>
<td>105.115</td>
<td>4.039</td>
<td>.043</td>
</tr>
<tr>
<td>GROUP * PRE_TOT</td>
<td>1345.814</td>
<td>2</td>
<td>722.907</td>
<td>33.901</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>1087.530</td>
<td>51</td>
<td>21.324</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>28944.090</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected total</td>
<td>2533.333</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. $p = .571$ (total $p = .524$)
As part of the repeated measures analysis, a between-subject ANOVA without regard to the within-subject effect was performed. These average scores were then compared between the treatment and control groups (see Table 6). These results were significant, $F(2, 52) = 9.107, p = .004$. Although this test did not account for groupings, it did indicate a significant difference between the average pretesting and posttesting score totals of the control group per participant and treatment group per participant.

Descriptive statistics were performed on the pretesting and posttesting scores for the control and treatment groups. Table 7 shows that the scores for both groups dropped from pretest to posttest. The mean control group scored fell from 28.217 to 25.174, with a standard deviation of 5.2824 pretest and 5.2105 posttest. The mean treatment group score fell from 23.194 to 19.839, with a standard deviation of 8.1052 pretest and 7.2115 posttest. Expected results would be either no change or an increase in testing scores from pretest to posttest for both the control group and the treatment group. One possible reason for scores dropping from pretest to posttest was that PNSUS did not use the same person to administer the pretesting and posttesting.

Ultimately, five major themes developed (see Figure 1) based upon the teachers’ reports and students’ perspectives as to why they had been asked to leave the class:

- **B (Behavior)**: Student was involved in a behavioral incident with another student.
- **T (Teacher sent)**: Student was asked to leave the classroom for being disruptive or noncompliant.
- **S (Self-sent)**: Student requested to leave the classroom.
- **G (Group incident)**: Student had an issue with two or more other students.
- **A (Aggression)**: Student exhibited aggressive or threatening behavior.