

Project-Based Learning and Perceived Overlap of Self-Regulation and Project-based Learning Techniques for Students with Adverse Childhood Experiences: A Case Study

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Abstract

The purpose of this qualitative case study was to explore the perception of educators transitioning from a traditional learning environment to a project-based learning (PBL). Teachers' perception of student self-regulation in ages from 8 to 17 were captured. Data were collected from 1-1 interviews with five participants with Missouri teacher certification ranging in grade levels from elementary to high school working with a total of 175 students within a mental health residential school throughout Missouri. Additional data were collected from daily logs, participant interviews, behavioral logs, and regulation logs from classrooms of students with the same background as teacher participants over the last four school years, 2018-22, of teachers who have taught project-based learning units. Daily logs, regulation logs, behavioral logs, and participant interview responses were manually coded twice and then coded a third time using electronic coding via NVivo to ensure bias from Dr Foster was not present. This study supports using project-based learning units with students who have a history of adverse childhood experiences (ACEs). While study findings support the teacher perception that project-based learning activities increase self-regulation from interview responses, regulation logs, and daily logs data could not triangulate this perceived relationship. These findings support the importance of relationships with students with ACEs during PBL to increase self-regulation.

Keywords: Self-regulation, case study, mental health, adverse childhood experiences, project-based learning, residential students

1. Review of Literature

The focus on the residential school dealing with children and teens with mental health and behavioral issues and finding a curriculum that can positively impact students with adverse childhood experiences (ACEs) was the catalyst for this study. This study began as a quest to discover a curriculum framework that would complement Dr. Perry's Neurosequential Model of Education (NME) approach to regulating students (Hambrick et al., 2018; Hambrick et al., 2019.). The Neurosequential Model of Education emerged through Dr. Perry's unique approach to studying trauma's impact on the developing brain. Dr. Perry created NME not as an intervention or outcome measure but as a research-based concept to aid educators in creating a safe learning environment for children who have a history of ACEs using the concepts of regulate, reason, relate (NME core concepts and trauma-informed practices, n.d.; E. Hambrick, personal communication, April 7, 2022).

Over 20 years ago, Felitti et al. (1998) conducted research that noted a relationship between ACEs in childhood and academics and health issues in adults. As a result, the term adverse childhood experience or ACEs included any negative, traumatic, or stressful event a child encountered. Abuse, including physical, emotional, or sexual; neglect, both physical and emotional; incarceration of an adult family member, divorce, mental illness, substance abuse or alcoholism; parents separating; poverty, bullying, community violence, and discrimination were added to ACEs questionnaires through continued research (Cronholm et al., 2015; Finkelhor et al., 2015; Portwood, 2018).

Children exposed to ACEs often become caught in an impulse-response mode due to an inability to process content using executive functioning skills (Erol & Karaduman, 2018; Ferrero et al., 2021; Hambrick et al., 2019). Due to the lack of executive functioning skills and limited ability to self-regulate, students with ACEs often have behavioral problems that

further disrupt learning and the potential for academic success (Banyard et al., 2017; Erol & Karaduman, 2018; Hambrick et al., 2019).

Over the past 20 years, the focus of what it means for a student to be ready to learn shifted from academic skills to include a student's social, emotional, and behavioral skills. Research supports moving away from traditional learning environments, which offer little movement and minimal collaboration while pushing high academic stress (Redford & Pritzker, 2016). While project-based learning (PBL) has been studied to show how instructional practices can be an effective means to increase academic achievement (Lee & Blanchard, 2018; Study International Staff, 2019), there is a gap in literature noting modifications necessary for neuroatypical students and project-based learning as well as modifications necessary for students with ACEs.

2. Introduction

The problem is that traditional learning environments that offer little movement and high amounts of academic stress do not work well for students who have encountered ACEs, as evidenced by an apparent link to separation anxiety, oppositional defiant disorder, impulse control, attention issues, acts of aggression, as well as difficulty navigating relationships with peers and adults (Ford, 2017; Uzezi & Jonah, 2017; Van der Kolk, 2017). Students with ACEs have an increase in their fight or flight reactions and can often appear on edge due to the stress academic situations place on their brains and bodies (Taylor et al., 2018; Terrasi & de Galarce, 2017). In addition, children exposed to ACEs often become caught in an impulse-response mode due to an inability to process content using executive functioning skills (Erol & Karaduman, 2018; Ferrero et al., 2021; Hambrick et al., 2019). This inability to self-regulate makes it difficult for students with ACEs to learn and process cognitive information in a classroom (Erol & Karaduman, 2018; Ferrero et al., 2021; Hambrick et al., 2019).

Research Question

What are educators' perceptions of how self-regulation skills overlap project-based learning strategies specifically for students ages 8 to 17 with ACEs?

Project-based learning conceptual framework outlining social interaction and hands-on learning appeared to blend with Dr. Perry's regulate, reason, and related framework. Moving from the bottom to the top of the brain, a dysregulated child can be supported in regaining control (Day et al., 2017; Hambrick et al., 2018; Hambrick et al., 2019; Jazulie et al., 2020). It is important to note that the formula regulates, reflects, and does not have a set formula, and teachers can move between different perspectives as determined by the child's regulation (Hambrick et al., 2019; Jazulie et al., 2020). One of the key concepts within PBL allowed students to show mastery of academic skills through the use of real-world projects (Jazulie et al., 2020). Using PBL, teachers began by regulating students as they used academic skills they had already mastered while giving students the freedom to complete rhythmic activities such as moving desks, carrying materials, and working with the same peers. Furthermore, using the framework of PBL, teachers can create a structured environment which is also a key concept within regulation in NME (Keels, 2018; Koh, 2020).

Participants of this study all work within a residential classroom located in mental health facilities throughout Missouri. Due to the nature of the clients, participants were aware of the egregious behavioral challenges of each student due to collaboration between education and residential teams. The principal educational diagnosis in the program is Emotional Disturbance; however, roughly 45 percent of students have an educational diagnosis of other health impaired, multiple disabilities, learning disabled, and/or speech-language impaired (Great Circle, 2019). Additionally, 20 percent of students have mental health concerns such as bipolar, schizophrenia, multiple personality disorder, and/or depression. Specific behaviors noted in these classrooms include: (a) emotional outbursts, (b) lack of appropriate boundaries, (c) oppositional, (d) oppositional defiance, (e) refusal to complete assigned tasks, (f) apathy, (g) lack of proper classroom socialization, (e) regulation concerns, and (f) avoidance techniques (A. Montoya, personal communication, January 17, 2022; D. Jones, personal communication, January 17, 2022; Great Circle, 2019; E. Rackers, personal communication, January 17, 2022).

Covid-19 restrictions noted limitations in lesson plan reflections, regulation logs, and behavioral logs. Specific to lesson plans, teachers noted challenges relating to virtual learning and students who did not have internet access or who had software issues. During the first part of the 2020-21 school year, several teachers conducted classes virtually due to COVID exposure and quarantines, limiting their perception of PBL activities. Moreover, the quarantine of student groups also disrupted lesson flow, groupings of students, and the requirement of six feet of separation impacted collaboration on PBL, as noted in several lesson plan reflections. Behavioral logs for 2020-21 and the beginning of the 2021-22 school year also noted challenges with expectations due to the continued use of quarantine and virtual/remote instruction as necessary due to COVID-19 restrictions and exposure. Furthermore, national staffing shortages resulted in the need for regulation staff to step into classrooms to aide teachers, limiting regulation logs and notes from the late March 2020 through December 2021 school year.

Within this study, there is a potential for bias due to Dr. Foster's personal experience with students with ACEs and have used PBL in the classroom both within a mental health facility and a public school. Therefore, an internal audit and peer debrief of analysis techniques and themes and member check of interview questions was conducted to overcome personal and participation bias. These discussions encouraged the sequencing of methods and helped articulate the rationale of the findings.

Dr. Foster conducted this research to complete an educational doctorate and received no compensation for this research. Dr. Foster has worked for the last seven school years within a school setting set within a mental health field, specifically with students aged 8 to 14 who have multiple ACEs. Working in this field, Dr. Foster noted a positive relationship between PBL and decreased negative classroom behaviors specific to Dr. Foster's classroom. Furthermore, Dr. Foster, as well as the study participants, have extensive training in trauma-informed practices. This training needed to be noted as all participants and lesson plans used will need to be identified within this study to reflect research on PBL activities through a trauma-informed care lens or practices.

The study received approval from Northcentral University's Instructional Review Board before data collection. Site approval was also required. A written proposal was submitted to the Senior Leadership Executive Teams of the site, and approval was given on 12/8/2021. Participation in this study was voluntary, and no compensation was given. Participants signed a waiver outlining involvement needs.

Confidentiality was ensured as all names were removed, and codes were assigned to participants before peer debriefs and analysis. Interviews were transcribed and reviewed by the participant to ensure no misinterpretation by the authors before coding and peer debriefing. Before peer debriefings, the material was typed for clarity, and each peer reviewer was assigned a different color to code.

3. Research Process

The study population was drawn from 50 teachers, 55 teacher assistants, five regulation coaches, four instructional coaches, seven directors of special education, and ten educational therapists who work within the mental health field in residential schools with approximately 500 students ranging in age from 5 to 19, with specific behavioral needs and have experienced ACEs throughout Missouri, Kansas, and Illinois (Great Circle, 2019; Great Circle: Our School, 2021). Unfortunately, teachers within the autism school could not be included as this program was shut down in late 2020.

Data were collected from interviews with five participants who represented a sample of educators who teach students aged 8 to 17 within a mental health residential agency in Missouri.

Table 1. Demographics of Residential Mental Health Education Facility and Students

		17-18	18-19	19-20	20-21	21-22
Faculty	Men	65	54	57	63	54
	Women	121	114	116	123	95
	Total	193	168	173	186	149
Number of Students	Boys	219	223	227	229	216
	Girls	109	110	113	116	102
	Total	328	333	340	345	318

Table 1 shows the demographic breakdown of the mental health residential agency educational employees and students served over the last five years.

Table 2. Demographics of Project-Based Learning Teacher Interview Participants

Participant Number	Gender	Student Taught at Mental Health Residential Facility 2017-2022	Years of Experience with PBL with students with ACEs
1	Male	39	20 years
2	Male	61	5 years
3	Male	60	8 years
4	Female	41	3 years
5	Female	56	2 years

Table 2 shows a demographic breakdown of the five interview participants. Ethnicity was not included in Table 2 as a means to protect the identity of participants.

Teacher participants had a minimum of monthly training beginning in August 2021 and continuing monthly through April 2022 in Dr. Bruce Perry's Neurosequential Model of Education (NME). Additional training in regulate, reason, and relate techniques also known as trauma-informed training was provided by the mental health facility before participation in this study. Trauma-informed training was conducted monthly every year of the study, beginning in August and continuing through May 2022. Furthermore, each teacher had an established regulation area and regulation protocols before participation in the study.

This research study assumed that participants had a minimum of one year of training in trauma-informed care. Long-term staff members of the residential classrooms are considered experts in dealing with students within a residential classroom. Teachers, teacher assistants, regulation coaches, and educational therapists accept that student behavior within a residential classroom can be characterized as lacking neurodivergent development, creating a need for a smaller teacher-to-student ratio. These class sizes are smaller than the traditional classroom and are often capped at a ratio of one teacher to five students. Additionally, it is assumed that participants will be open, honest, and truthful in their interview responses. Furthermore, lesson plans are assumed to reflect both positive and negative outcomes.

To better identify the perceived impact of PBL and the perceived impact on behavior and any overlap with PBL strategies, teachers' experiences were conducted via interview questions that had been field-tested. The authors transcribed each interview and returned it to the participants for a member check. Once participants confirmed their responses accuracy, the authors began coding manually.

Coding was conducted using the following method for all interview questions, lesson plan reflections, and behavioral log notes. For the first round of coding, the authors began with deductive coding, as outlined by Linneberg and Kargaard (2019). To generate deductive codes, the authors first reviewed themes noted in the literature review, explicitly using academic engagement, student engagement, and behavioral impact, as well as commonalities identified in interview questions, engagement, regulation, and implementation. Next, the authors reviewed each transcript and highlighted each of the above codes using a different color. The authors then broke down each of these more extensive codes into an evaluation and thematic analysis (Clarke & Braun, 2017; Gibbs, 2018; Saldaña, 2021) to note specific trends in the teacher's perspective relating to behaviors.

During this first coding process, the authors noted a positive relationship by eighty percent of participants regarding interview sub-question seven, which asked, "would you say behavior(s) is/are comparable to what you would see when you do more traditional lecture activities?" Four interview participants stated from their perspective that behaviors were better during PBL activities. Participant 2 stated, "definitely better." Participant 5 shared a noted decrease in passive defiant "I'm just not going to do"; however, a slight increase in bullying "just because of different levels and perhaps students are embarrassed." Participant 5 went on to share that once expectations were re-established during collaboration, "peers began to support each other and offer suggestions for success including reminders of regulation techniques and to keep trying." Participant 3 was the only participant to note no change in behaviors and shared, "I would say that the behaviors I am trying to address in my class currently exist regardless of my pedagogical approach."

In the second coding cycle, conducted approximately a week after the first codes, the authors used pattern coding to condense large amounts of data into smaller analytical units to help find categories and themes (Saldaña, 2021). The categories the authors generated included specific unit examples, behavioral changes, and control. In addition to manual coding, electronic coding via NVivo was used to auto-generate themes and ensure bias from Dr. Foster was not present in generating codes and themes to be analyzed. NVivo auto-generated themes and first-round and second-round manual coding were compared to see how well each code aligned (Saldaña, 2021). Overlapping categories of behavioral changes, techniques, expectations, support, and knowledge emerged. From these categories, the authors then generated a word tree to note additional overlap and to begin to move into generating themes.

Data analysis began with reviewing regulation logs which outlined activities, beginning heart rate, ending heart rate, area of the brain regulation addressed, and effectiveness of the activity on regulating as noted on a five-point Likert scale with 1 ineffective and 5 being highly effective. Logs for the 2019-2020 school year discontinued the start/end time and start/end heart rate and included a brief description of activities. Regulation logs were not kept from late March 2020 to the end of the 2020 school year due to COVID-19 and the nationwide school transition to virtual/remote learning. Additionally, the 2020-21 school year and the start of the 2021-22 school year had COVID-19 restrictions continued to be in place by the residential mental health agency, limiting regulation staff interactions. Logs for October-December 2020, January 2021-April 2021, and October 2021-December 2021 consisted of a brief sentence stating student dysregulation or need. The student met with a regulation staff and was regulated before returning to class. There was no specific activity listed.

At the start of the 2021-22 school year, regulation staff could meet again as a group with an onsite trainer with certified NME trainer certification through the mental health agency. From reviewing regulation training notes, it appears calibration regarding activities was discussed, and through regulation staff collaboration, a list of activities was generated for each region of the brain. Furthermore, the regulation logs changed to include start/end time and start/end heart rate. In addition to a description of the activity, staff also listed the area of the brain the activity focused on as well as the perceived effectiveness of the activity on regulating using a Likert Scale of 1- not practical, 3- moderately effective, 5- high effective (T. Howard, personal communication, May 4, 2022). In addition to monthly meetings to discuss the effectiveness of the collaborated list of activities, the staff was also able to discuss strategies for specific behaviors (E. Rackers, personal communication, May 4, 2022).

It should be noted that regulation activities were primarily conducted 1-1 with a specifically trained staff trained on regulation techniques from the NME model of trauma-informed practices taught by Dr. Bruce Perry and the Neurosequential Team. Students were selected to participate in the regulation team by classroom teachers. They were identified as students needing outside assistance in regulating (E. Rackers, personal communication, May 4, 2022). The regulation logs included beginning and end times, enabling me to correlate the regulation logs with PBL activities included in staff weekly lesson plan overviews. Using this relationship, the authors could only link PBL activities and regulation logs for PBL units for the 2021-22 school year.

The authors began by sorting regulation logs for the 2021-22 school year by activities by brain region regulation activity addressed.

Table 3. Regulation Activities Broken Down by Brain Region

Region of the Brain	Number of Activities	Average Effectiveness Score	Average Heartrate	Starting	Average Heartrate	Ending
<i>Brainstem</i>	42	3.66	95			87.5
<i>Diencephalon</i>	48	3.6	98.2			90
<i>Brainstem and Diencephalon</i>	2	4	98			n/a
<i>Limbic</i>	2	3.5	109.5			102.5

This scoring broke down into 43 activities specific to the brainstem, 48 activities specific to the diencephalon, two activities specific to both the brainstem and diencephalon, and two activities specific to the limbic system. Next, the authors averaged the Likert scale to identify the average effectiveness score by brain region. For example, the brainstem averaged a 3.66 or moderately effective; the diencephalon also averaged a 3.6 or moderately effective, and limbic activities averaged a 3.5 or moderately effective. The authors then calculated the average starting and ending heart rates by brain region.

For brainstem activities, the average starting heart rate was 95 beats per minute, and the average ending heart rate was 87.5 beats per minute. For diencephalon activities, the average starting heart rate was 98.2 beats per minute, and the ending heart rate was 90 beats per minute. For Limbic activities, the average starting heart rate was 109.5 beats per minute, and the ending heart rate was 102.5 beats per minute.

After breaking down regulation logs, I compared notes from lesson plan reflections that directly correlated with students who participated in regulation activities directly before or after PBL activities. For example, lesson plan reflections noted "active engagement during outside activities" and "Students did not need external regulation items during work time." From these two pieces of data, it is unclear what caused students to appear more engaged or not require external regulation items.

I then used behavioral logs to investigate further the perceived impact of self-regulation and any intertwining with PBL activities. I coded using deductive coding, looking for critical terms regulated, self-regulate alone, self-regulate with assistance, green zone, focused, and appropriate interactions. Autism behavioral logs recorded the need for movement breaks in March 2018 and 2019. Increments notes on behavioral logs were 1, 2, 3, 4, 5, and 10 minutes.

The decrease in the need for movement or sensory breaks suggests a positive relationship between self-regulation and PBL strategies; however, specific times for PBL activities were not noted on lesson plans or behavioral logs for the autism classrooms. Therefore, while there appears to be a positive relationship, the relationship could or could not be related to PBL strategies.

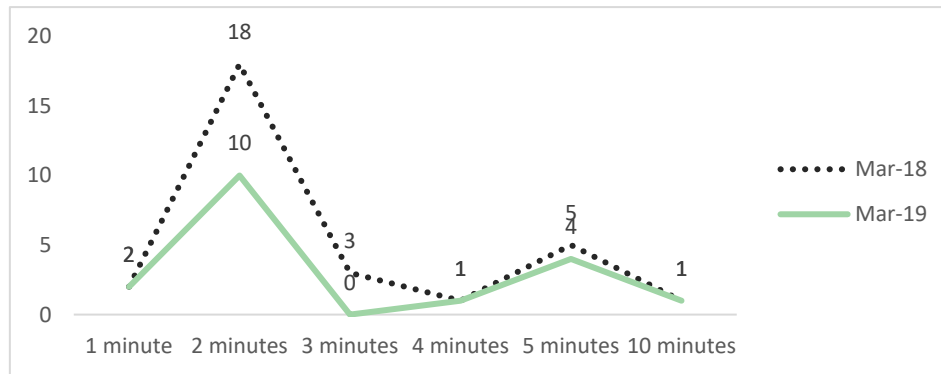


Figure 1. Autism Classrooms Sensory Breaks by Minutes

Unfortunately, behavioral logs for the 2017-2019 school years did not list regulation techniques or self-regulation. Beginning with 2019-2020 and continuing with the 2020-21 and 2021-22 school years, behavioral logs included a Zones and Zones Tools Accessed section. I learned that Zones of Regulation was meant to be used interchangeably with identifying if a student was self-regulating. Zones Tools should list self-regulation and staff-initiated regulation techniques (E. Rackers, personal communication May 4, 2022). Additionally, I could only pull behavioral logs for one region due to errors in TEAMS folders and technology issues with Credible's online charting system.

4. Results and Discussion

The authors were able to identify students regulating with staff 1.2 times more than regulating without staff during the 2019-2020 school year. Specifically for the 2019-2020 school year, regulation techniques with staff assistance included students relying on proximity, process with a staff member, taking a 1-1 break suggested by staff, and staff initiating a timeout away from the classroom, activity, or peers. Concerning regulation techniques without staff assistance, students listened to music, played with dough, read, cleaned, colored, used a hand fidget, pedal desk, or pedal under the desk, and asked for a break. During the 2020-21 school year, regulation techniques were not recorded from September to December due to modifications in teaching methods due to COVID-19 restrictions. During the 2021-22 school year, some logs listed regulation techniques but did not indicate whether the technique was with or without staff. While logs did break down into the a.m. zone and p.m. zone, which could be a measure to show students' perception of their emotions, regulation techniques were not the same. While the Zone information could be triangulated with interview responses, lesson plan timing guides, and lesson reflections, Zones from behavioral logs did not state how or what the student used to regulate and, therefore, would not provide positive or negative insight towards this research question.

Interview questions two and eight were reviewed specifically relating to research question three. Research question two asked participants to share regulation techniques currently used throughout general instruction. Responses were manually coded using a thematic coding outlined by Clarke and Braun (2017) and Gibbs (2018), as the authors were looking specifically for regulation techniques, PBL strategies, and self-regulation. The authors then used NVivo automatic coding to ensure personal bias was removed.

Participants 1 and 2 stated they use music and pedals to allow students to regulate during all instruction. Participant 2 elaborated on the type of music sharing "I generally always have music on that is about 60 beats a minute. If not lower. I always have it kind of just in the background. Students hear the beats, and research has said this helps lower heart rates and produce an air of calm. Participants 3 and 5 stated they use brain breaks and personal fidget items. Participant 4 outlined the importance of setting firm expectations to ensure regulation within the classroom environment. Specific to PBL activities, Participant 5 shared, "I sometimes use project-based learning activities to keep them (the students) more engaged and busy instead of using worksheets."

All participants agreed that behavioral regulation techniques are interwoven within lessons. Participant 1 shared that students are always offered some regulation activity "that's the nature of a residential classroom. Students bike while they read. I don't tell them they need an item to regulate, nor do I give permission to use any of the items within my classroom. Students know they are an option." Participant 3 stated that regulation is interwoven...I feel this is what makes my classroom a special education environment." Participants 2 and 5 argued that regulation is both interwoven and external. Specifically, Participant 5, shared regulation is interwoven "by our use of brain breaks. Still, sometimes they (a student) need our help, so that's when regulation is also external." Participant 2 agreed with the use of brain breaks and extended breaks. Participant 5 further explained that classroom regulation also includes pacing or flipping activities. "Because I know afternoons can be harder for kids, I make sure my final two subjects of the day classes are flexible. If I can do both, great, but I plan to alternate if needed. Flexibility is key."

Interview question 8 asked participants to share regulation techniques they observed during PBL activities and compare them to regulation during traditional instruction. All participants shared a decrease in external regulation, including needing assistance from teachers during PBL activities. Participant 1 shared that students "respond better to the music and concentrate more. Students who normally ask for a fidget item aren't during project-based learning activities. They are keeping their hands busy with something they are interested in versus using a manipulative to keep their minds engaged." Participant 2 continued with this line of thought by sharing, "I always know what regulation items kids like, and I have them in a basket. I will pass them out when I think a kid needs them. While I still provide the items, most kids (during PBL) seem to be doing a pretty good job, interacting with peers and having a bit of fun. And I don't have to do as much regulating because they are doing it themselves." Participant 3 echoed the lowered use of outside regulation items sharing that "one individual spends less time in the regulation corner during project-based learning." Participant 4 shared that students will ask to continue to work. They will only ask for a break "when they really, really need to take a moment. Unlike when I use worksheets, kids are always asking for a walk, to pace, or use the corner (regulation area)." Participant 5 shared that while they have seen a slight increase in bullying, there is "always an increase in peer support. Peers are encouraging each other to keep trying. By doing this, the student will take a deep breath, doodle, or talk with their peer for a moment before finishing the activity."

Relationships

The authors were able to note the theme of relationships to perceive the use of self-regulation techniques as well as selecting PBL strategies. The relationship between students and their teachers plays a significant role in their academic and social development. In contrast to students with conflicting relationships with their teachers, those with positive and supportive relationships will perform better (Harper & Temkin, 2019). For example, participant 2 shared, "I always know what regulation items kids like, and I just have them in a basket. I will just pass them out when I think a kid needs them. While I still provide the items, most kids (during PBL) seem to be doing a pretty good job, interacting with peers and having a bit of fun. And I don't have to regulate much because they are doing it themselves."

To motivate students to use their abilities, teachers need to establish relationships with them and guide them in a direction that can lead to success in the classroom and life (Ferlazzo, 2020). Furthermore, when schools promote positive development for all children by fostering caring, supportive relationships and developing social-emotional skills, children who have been exposed to trauma begin to see positive relationships that will allow them to recover and overcome future challenges (Harper & Temkin, 2019; Jazulie et al., 2020; Uzezi & Jonah, 2017; Viljoen et al., 2018). Participant 1 echoed this sentiment "(students) appear to concentrate more. Students who normally ask for a fidget item aren't during project-based learning activities. They are keeping their hands busy with something they are interested in versus using a manipulative to keep their minds engaged."

Educators should establish relationships with students and guide them in a direction that will lead to success in the classroom and life (Ferlazzo, 2020). Children who have been exposed to trauma will see positive relationships that will help them recover and overcome future challenges when schools promote positive development for all children by fostering caring, supportive relationships and developing social-emotional skills (Harper & Temkin, 2019; Jazulie et al., 2020; Uzezi & Jonah, 2017; Viljoen et al., 2018). Participant 1 echoed this sentiment "(students) appear to concentrate more. Students who normally ask for a fidget item aren't during project-based learning activities. They are keeping their hands busy with something they are interested in versus using a manipulative to keep their minds engaged."

Recommendations for Educational Practices

Teachers need to be given time to grow and cultivate relationships with students. Cummings et al. (2017) study involving 14 community professionals working with students with ACEs highlights the importance of positive relationships and positive relationship building. Administrators and State Boards of Education need to put as much, if not more, emphasis on a teacher's ability to know the needs, likes/ dislikes, and what motivates a student as they do on standardized test scores. McDaniel et al.'s (2017) narrative review of five students with emotional and behavioral disorders upheld the importance of social relationships. It indicated that positive social relationships are essential to achieving academic success.

Teachers need workshops and training on ways to positively grow relationships and relationship strategies when dealing with students with ACEs within a residential mental health classroom, as this population typically has maladapted social skills (Harper & Temkin, 2019). In addition, Gray (2017) indicated that relationship building is a struggle for students with ACEs as they often pull away from adults. Nemer et al. (2019) further share how ACEs create a fundamental challenge for students and teachers. Due to these challenges, teachers not only need time to build relationships, but they also need support staff such as nurses, psychologists, case managers, therapists, and teacher assistants to ensure all students' needs, including social-emotional and mental health, are being met and addressed as positive relationships are built (Ford, 2017; Harper & Temkin, 2019; Terrasi, & de Galarce, 2017).

5. Recommendations for Future Research

Combining the findings of this study with those of previous studies indicates additional research studies need to be conducted across three main areas. Firstly, the research could focus on the impact of new methodologies, such as trauma-informed education practices or growth mindsets that overlap and/or intertwine PBL strategies. For example, Ijodi-Maghsoodi et al. (2017) highlighted the impact curriculum centered around understanding trauma has on students.

Secondly, additional studies could be conducted to discover how PBL units are selected and how formalized training specific to PBL, and trauma-informed care impacts teachers' confidence regarding the implementation, selection, and engagement of PBL for students with ACEs. Participants in this study indicated they had limited formal training in PBL. Participant 2 indicated that a book was ordered to increase PBL through a professional learning community. While this participant read the book, they do not recall any formalized professional learning community or professional development.

Finally, the research could continue with the population outlined within this study; however, the focus would shift toward specific subject engagement, grade level, gender, and/or ethnicity. Additionally, the framework and research questions from this study could be repeated for other groups of exceptional children, such as gifted, to gain teacher perception of how PBL impacts their behaviors and PBL strategies.

6. Conclusions

Traditional learning environments that offer little movement and high amounts of academic stress do not work well for students who have encountered ACEs, as evidenced by an apparent link to separation anxiety, oppositional defiant disorder, impulse control, attention issues, acts of aggression, as well as difficulty navigating relationships with peers and adults (Ford, 2017; Uzezi & Jonah, 2017; Van der Kolk, 2017). This qualitative case study aimed to explore teachers' perception of students' self-regulation techniques, specifically during PBL activities in Mid-Missouri residential mental health facilities.

This study supports using project-based learning activities with students across grade levels from elementary to high school who have encountered adverse childhood experiences. Study findings support the teacher perception that PBL activities decrease negative behaviors for students with ACEs while increasing engagement and academic skills. Participants' interviews noted a perceived link between an increase in self-regulation and PBL activities; however, daily logs, regulation logs, and behavioral logs could not triangulate teachers' positive perceptions of students' use of self-regulation techniques while engaged in PBL activities. Implications from these findings support that PBL activities increase relationships allowing students within a residential mental health classroom to increase self-regulation skills. Through positive relationships and the use of relevant, nontraditional techniques, teachers appeared to keep students engaged, becoming "the cheese around the skill, tricking students into doing more academic work" Participant 2.

The authors declare that they have no conflict of interest.

References

- Banyard, V., Hamby, S., & Grych, J. (2017). Health effects of adverse childhood events: Identifying promising protective factors at the intersection of mental and physical well-being. *Child Abuse & Neglect*, 65, 88-98. <https://doi.org/10.1016/j.chiabu.2017.01.011>
- Clarke, V., & Braun, V. (2017). Thematic analysis, *The Journal of Positive Psychology*, 12(3), 297-298. <https://doi.org/10.1080/17439760.2016.1262613>
- Cronholm, P. F., Forke, C. M., Wade, R., Bair-Merritt, M. H., Davis, M., Harkins-Schwarz, M., ... & Fein, J. A. (2015). Adverse childhood experiences: Expanding the concept of adversity. *American Journal of Prevention Medicine*, 49, 354- 361. <https://doi.org/10.1016/j.amepre.2015.02.001>
- Cummings, K., Addante, S., Swindell, J., & Meadan, H. (2017). Creating supportive environments for children who have had exposure to traumatic events. *Journal of Child and Family Studies*, 26(10), 2728-2741. <https://doi.org/10.1007/s10826-017-0774-9>
- Day, A. G., Baroni, B., Somers, C., Shier, J., Zammit, M., Crosby, S., ... & Hong, J. S. (2017). Trauma and triggers: Students' perspectives on enhancing the classroom experiences at an alternative residential treatment-based school. *Journal of School Health*, 85, 223-230.
- Erol, M., & Karaduman, G. B. (2018). The effect of activities congruent with brain-based learning model on students' mathematical achievement. *NeuroQuantology*, 16(5), 13-22. <https://doi.org/10.14704/nq.2018.16.5.1342>
- Ferlazzo, L. (Host). (2020, May 26). Ways to make lessons 'relevant; to students' lives. [Podcast transcript]. Education Week.

- <https://www.edweek.org/teaching-learning/opinion-ways-to-make-lessons-relevant-to-students-lives/2020/05#:~:text=Developing%20relationships%20with%20students%20provides,can%20engage%20and%20help%20them>
- Ferrero, M., Vadillo, M. A., & Leo'n, S. P. (2021). Is project-based learning effective among kindergarten and elementary students? A systematic review. *PLoS One*, *16*(4), 1-14. <https://doi.org/10.1371/journal.pone.0249627>
- Ford, D. E. (2017). The community and public well-being model: A new framework and graduate curriculum for addressing adverse childhood experiences. *Academic Pediatrics*, *17*(7), 9-11. <https://doi.org/10.1016/j.acap.2017.04.011>
- Gibbs, G. (2018). Thematic coding and categorizing. In *Analyzing qualitative data* (pp. 53-74). SAGE Publications Ltd, <https://doi.org/10.4135/9781526441867>
- Gray, L. (2017). *Analysis of implementing trauma informed programs in grade schools*. Retrieved from https://sophia.stkate.edu/cgi.viewcontent.cgi?article=1746&context=msw_papers.
- Great Circle. (2019). *2019 Great Circle ISSAC Self Study*. International Council Advancing Independent School Accreditation.
- Great Circle: Our schools*. (2021). Retrieved from <https://www.greatcircle.org/index.php/services-by-program/education/our-schools>
- Hambrick, E. P., Brawner, T. W., & Perry, B. D. (2018). Examining developmental adversity and connectedness in child welfare-involved children. *Children Australia*, *43*(2), 105-115. <https://doi.org/10.1017/cha.2018.21>
- Hambrick, E. P., Brawner, T. W., & Perry, B. D. (2019). Timing of early-life stress and the development of brain-related capacities. *Frontiers in Behavioral Neuroscience*, *13*(183), 1-14. <https://doi.org/10.3389/fnbeh.2019.00183>
- Hambrick, E. P., Brawner, T. W., Perry, B. D., Brandt, K., Hofmeister, C., & Collins, J. O. (2019). Beyond the ACE score: Examining relationships between timing of developmental adversity, relational health and developmental outcomes in children. *Archives of Psychiatric Nursing*, *33*(3), 238-247. <https://doi.org/10.1016/j.apnu.2018.11.001>
- Harper, K., & Temkin, D. (2019). *Responding to Trauma Through Policies to Create Supportive Learning Environments*. Child Trends. https://www.childtrends.org/wp-content/uploads/2019/01/RespondingTraumaPolicyGuidance_ChildTrends_January2019.Pdf
- Jazuli, L. O. A., Solihatin, E., & Syahrial, Z. (2019). The effects of brain-based learning and project based learning strategies on student visual learning styles. *Pedagogical Research*, *4*(4), 1-8. <https://doi.org/10.29333/pr/5949>
- Keels, M. (2018). *Supporting students with chronic trauma*. <https://www.edutopia.org/article/supporting-students-chronic-trauma>
- Koh, J. (2020). The importance of context in predicting the motivational benefits of choice, task value, and decision-making strategies. *International Journal of Educational Research*, *102*, 101579. <https://doi.org/10.1016/j.ijer.2020.101579>
- Lee, H., & Blanchard, M. R. (2019). Why teach with PBL? Motivational factors underlying middle and high school teachers' use of problem-based learning. *Interdisciplinary Journal of Problem-Based Learning*, *13*(1), 1-19. <https://doi.org/10.7771/1541-5015.1719>
- Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. *Qualitative Research Journal*, *19*(3), 259-270. <https://doi.org/10.1108/QRJ-12-2018-0012>
- McDaniel, S. C., Bruhn, A. L., & Troughton, L. (2017). A brief social skills intervention to reduce challenging classroom behavior. *Journal of Behavioral Education*, *26*, 53-74. <https://doi.org/10.1007/s10864-016-9259-y>
- National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1978). *The Belmont report: Ethical principles and guidelines for the protection of human subjects of research*. [Bethesda, Md.]: The Commission.
- Nemer, S. L., Sutherland, K. S., Chow, J. C., & Kunemund, R. L. (2019). A systematic literature review identifying dimensions of teacher attributions for challenging student behavior. *Education and Treatment of Children*, *42*(4), 557-578. <https://doi.org/10.1353/etc.2019.0026>
- Portwood, S. (2018). *Adverse childhood experiences: Current research and practice applications*. Retrieved from <https://www.apa.org/pi/families/resources/newsletter/2018/11/adverse-experiences>
- Redford, J., & Pritzker, K. (2016). *Teaching traumatized kids*. <https://www.theatlantic.com/education/archive/2016/07/teaching-traumatized-kids/490214/>

- Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). London, England: Sage.
- Study International Staff. (2019, March 18). *Problem-based learning in the classroom - yay or nay?* Retrieved from <https://www.studyinternational.com/news/problem-based-learning-in-the-classroom-yay-or-nay/>
- Taylor, J., Riden, B., & Markelz, A. (2018). The arts, project-based learning, and students with challenging behaviors: The alignment of standards with student characteristics. *VSA Kennedy Center Intersection: Exemplary Programs and Approaches Professional Papers Series, 4*, 55-69.
- Terrasi, S., & de Galarce, P. C. (2017). Trauma and learning in America's classrooms. *Phi Delta Kappa, 98*(6), 35-41. <https://doi.org/10.1177/0031721717696476>
- Uzezi, J., & Jonah, K. (2017). Effectiveness of brain-based learning strategy on students' academic achievement, attitude, motivation, and knowledge retention in electrochemistry. *Journal of Education, Society and Behavioral Science, 21*(3), 1-13. <https://doi.org/10.9734/JESBS/2017/34266>
- Van der Kolk, B. A. (2017). Developmental trauma disorder: Toward a rational diagnosis for children with complex trauma histories. *Psychiatric Annals, 35*(5), 401-408. <https://doi.org/10.3928/00485713-20050501-06>
- Viljoen, J. L., Cochrane, D. M., & Jonnson, M. R. (2018). Do risk assessment tools help manage and reduce risk of violence and reoffending? A systematic review. *Law and Human Behavior, 42*(3), 181-214. <https://doi.org/10.1037/lhb0000280>

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