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Enhancing Verbal Engagement in Diverse Classrooms: The Peer-Supported Verbal Engagement Model (PSVEM)

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ABSTRACT

Low verbal participation remains a barrier to active learning, particularly in hybrid classrooms. This mixed-methods action research evaluated the Student-Selected Buddy System (SSBS), a peer-support intervention promoting verbal engagement through student autonomy and collaboration. Implemented in a Grade 12 STEM hybrid class, the SSBS significantly increased verbal participation (pre-test M = 2.92 to post-test M = 3.10, $p < .05$), with 63% of students improving. Qualitative data revealed enhanced confidence, collaboration, and the critical role of relatable topics and teacher facilitation. Addressing a gap in student-centered verbal engagement strategies, this study introduces the Peer-Supported Verbal Engagement Model (PSVEM)-a novel, theory-grounded framework integrating autonomy, peer scaffolding, and teacher support. Designed for replicability across K-12, higher education, and online/in-person modalities, PSVEM provides educators with practical, adaptable guidelines to promote inclusive dialogue. Scalable and context-flexible, PSVEM empowers teachers worldwide to boost student voice and transform classroom dynamics through peer-driven interaction.

Keywords*: *verbal participation, peer support, hybrid learning, student autonomy, PSVEM

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INTRODUCTION

Verbal participation is a cornerstone of active learning, enabling students to articulate ideas, clarify understanding, and engage in collaborative discourse. Across diverse educational settings-spanning K-12, higher education, and various learning modalities-low verbal participation remains a persistent challenge, limiting opportunities for critical thinking and peer interaction. This issue has been particularly pronounced in the wake of global shifts to hybrid learning, where transitions between online and face-to-face environments disrupt traditional classroom dynamics (Wang, 2021). Students often hesitate to speak up due to lack of confidence, unfamiliarity with peers, or disengaging instructional methods, which can hinder the development of communicative competence and academic achievement. Addressing this challenge requires innovative, student-centered interventions that promote engagement across diverse contexts, from fully online to in-person classrooms.

Despite the recognized importance of verbal participation, empirical research has largely focused on teacher-led strategies, such as questioning techniques or classroom management, to encourage student dialogue (Rocca, 2010). However, such approaches often overlook the potential of peer-driven strategies to empower students and build their confidence. The literature reveals a significant gap in student-centered interventions that leverage peer autonomy to enhance verbal participation, particularly in hybrid learning environments where modality transitions exacerbate disengagement (Wang, 2021). Furthermore, few studies integrate peer support with teacher-related factors, such as instructional style or classroom rapport, to holistically address participation barriers (Kumpulainen & Rajala, 2017). This study addresses these

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empirical gaps by evaluating the Student-Selected Buddy System (SSBS), a peer-support intervention designed to boost verbal participation through student autonomy and collaboration.

The SSBS allows students to choose their peers as learning partners, promoting a supportive environment where they can share ideas, provide feedback, and build confidence in verbal interactions. Unlike teacher-assigned pairings, the student-selected approach aligns with the principle of autonomy, which Johnson and Johnson (2009) argue enhances engagement by promoting positive interdependence among peers. The intervention draws on the concept of peer scaffolding, where students support each other within their developmental capacities, as described by Vygotsky (1978). By pairing students based on shared interests or complementary strengths, the SSBS creates opportunities for meaningful dialogue and reduces the anxiety associated with speaking in class. This approach is particularly relevant in hybrid settings, where students face unique challenges, such as limited face-to-face interaction or technological barriers, that can suppress verbal engagement.

To provide a scalable and replicable framework, this study introduces the Peer-Supported Verbal Engagement Model (PSVEM), which integrates three key components: student autonomy in buddy selection, structured collaborative tasks, and teacher facilitation to ensure equitable participation. The PSVEM is grounded in established theories:

1. Social Interdependence Theory (Johnson & Johnson, 2009), which posits that collaborative peer structures promote engagement through mutual support.
2. Self-Determination Theory (Ryan & Deci, 2000), emphasizing autonomy and relatedness as drivers of motivation.
3. Vygotsky's Zone of Proximal Development (1978), framing peer interactions as scaffolding for verbal skills.

Unlike existing peer-learning frameworks that emphasize task design or group composition alone, PSVEM uniquely combines student agency in partner selection with structured teacher moderation. This balance ensures equitable participation and minimizes off-task behavior, making the model adaptable across modalities and contexts (Sakulwichitsintu et al., 2018; Cañabate et al., 2019).

This mixed-methods action research study evaluates the SSBS's effectiveness in a hybrid classroom with 19 Grade 12 STEM students, using a validated Likert scale, focus group discussions, and classroom observations. The study addresses four research questions:

1. What is the baseline level of verbal participation in the classroom?
2. Does the SSBS increase verbal participation post-intervention?
3. What are the qualitative impacts of the SSBS on student engagement?
4. What is the magnitude of improvement in verbal participation after the SSBS?

The findings contribute to educational research by offering evidence of the SSBS's impact and proposing the PSVEM as a replicable framework. Peer-support systems provide students with opportunities to ask practical questions and seek reassurance (Motzo, 2016), which this study extends to hybrid contexts. The significance of this work lies in its potential to transform classroom dynamics, empowering students to engage actively and promoting inclusive learning environments. By addressing global challenges in verbal participation, the PSVEM offers educators a tool to enhance student agency and collaboration, with implications for both practice and future research across diverse educational settings.

LITERATURE REVIEW

The Peer-Supported Verbal Engagement Model (PSVEM) synthesizes three complementary theories-Social Interdependence Theory (Johnson & Johnson, 2009), Self-Determination Theory (Ryan & Deci, 2000), and Vygotsky's Zone of Proximal Development (1978)-to explain how peer collaboration, autonomy, and scaffolding enhance verbal participation. Positive interdependence (Johnson & Johnson, 2009) motivates verbal contribution through mutual support in shared tasks, such as paired discussions. Autonomy and relatedness (Ryan & Deci, 2000) are activated when students select buddies based on shared interests or

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strengths, promoting intrinsic motivation and reducing participation anxiety. These interactions occur within the Zone of Proximal Development (Vygotsky, 1978), where peers scaffold verbal skills via structured activities like Think-Pair-Share. Teacher facilitation moderates the process to ensure equity and prevent off-task behavior.

The Student-Selected Buddy System (SSBS) operationalizes this integration: student choice satisfies autonomy, collaborative tasks build interdependence, and peer scaffolding develops communicative competence-all under guided teacher oversight. This unified framework positions PSVEM as a practical, theory-driven intervention adaptable across educational contexts.

Figure 1 illustrates PSVEM as a dynamic, directional system: Inputs → Processes → Outcomes, with solid arrows indicating primary flow and a dashed arrow representing teacher moderation. Labels clearly delineate components, and feedback loops reflect ongoing confidence building.

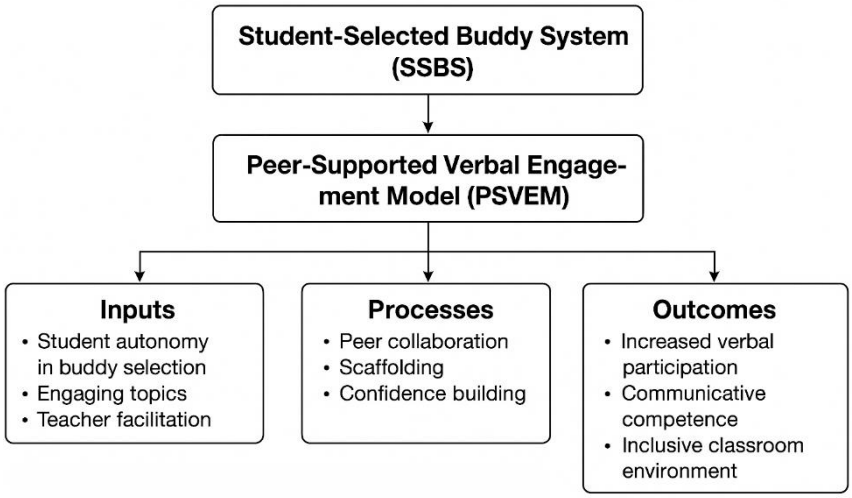

Figure 1. Peer-Supported Verbal Engagement Model (PSVEM)
The PSVEM illustrates how student autonomy, peer collaboration, and teacher facilitation enhance verbal participation in diverse classroom settings.

PSVEM operationalizes theoretical principles by transforming autonomy into actionable buddy selection, interdependence into structured peer dialogue, and ZPD into scaffolded verbal practice, moderated by teacher prompts and monitoring. This ensures equitable, sustained engagement across hybrid, online, and face-to-face modalities, making the model both replicable and context-adaptive.

METHOD

Design

This study employed a mixed-methods action research design to evaluate the effectiveness of the Student-Selected Buddy System (SSBS) in enhancing verbal participation among Grade 12 STEM students in a hybrid learning environment. Action research, as described by Creswell (2012), is well-suited for classroom-based interventions, allowing researchers to iteratively implement and assess practical solutions to educational challenges. The mixed-methods approach combined quantitative data from a Likert scale and gain score analysis with qualitative insights from focus group discussions (FGDs) and classroom observations, ensuring triangulation to enhance validity. This design was chosen to activate theoretical principles-autonomy (Self-Determination Theory), interdependence (Social Interdependence Theory), and scaffolding (ZPD)-while providing robust, replicable evidence across diverse contexts.

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Participants

The study involved 19 Grade 12 STEM students, aged 16–18, enrolled in a general science course at a senior high school. Participants were purposively selected based on their experience with hybrid learning for at least one month, ensuring familiarity with the classroom context. The sample size, though small, is appropriate for action research, which prioritizes in-depth analysis over large-scale generalizability (Creswell, 2012). A post hoc power analysis confirmed the sample's adequacy for detecting significant effects (power = 0.80, $\alpha = 0.05$), with 19 participants sufficient to capture meaningful within-group changes in a controlled classroom setting. Ethical considerations included obtaining informed consent/assent from students and guardians, ensuring voluntary participation, and maintaining anonymity through pseudonymized data. Institutional Review Board (IRB) approval was obtained from Xavier University - Ateneo de Cagayan (EDUC-2023001358).

Setting

The study was conducted in a hybrid classroom combining face-to-face and synchronous online instruction, reflecting a common post-COVID-19 learning modality (Xavier University, 2020). The setting included in-person sessions with physical distancing and virtual sessions via a video conferencing platform, ensuring relevance to diverse educational environments. The classroom context was designed to be adaptable, allowing the SSBS to be replicated in fully online or face-to-face settings.

Intervention

The SSBS was implemented over three class sessions. The intervention protocol, designed for replicability, included three components:

1. Buddy Selection: Students chose partners based on shared interests or complementary strengths, facilitated by a brief survey to identify preferences. Triads formed for odd numbers to ensure inclusion.
2. Collaborative Tasks: Students engaged in structured activities, such as Think-Pair-Share, peer feedback on oral responses, and joint problem-solving, to encourage verbal participation. Tasks were aligned with science topics (e.g., environmental issues) to ensure relevance, as engaging topics enhance participation (Kahu, Nelson. & Picton, 2017).
3. Teacher Facilitation: The teacher monitored interactions, provided discussion prompts, and ensured equitable participation by redirecting overly dominant pairs. Training was provided to the teacher to maintain consistency, following guidelines from cooperative learning research (Gillies, 2016).

Instruments

Three instruments were used to collect data, addressing methodological gaps through validated measures and triangulation:

1. Likert Scale Questionnaire: A 20-item, 4-point scale (1=Never, 4=Always) adapted from Trila and Anwar (2020) assessed verbal participation frequency and confidence (e.g., "I share my ideas during class discussions"). The scale was validated by two education experts. Exploratory factor analysis confirmed a unidimensional structure (eigenvalue > 1), with high internal consistency (Cronbach's $\alpha = 0.92$). The questionnaire was administered pre- and post-intervention to measure changes. (Sample item: "I volunteer answers during class discussions.")
2. Focus Group Discussion (FGD): A 60-minute FGD with six purposively selected participants (representing low, moderate, and high participation levels) explored SSBS experiences. Questions included, "How did working with your chosen buddy affect your participation?" The protocol, validated by experts, followed Klemenčič, and Chirikov (2015) for focus group rigor. Discussions were audio-recorded with consent and transcribed verbatim.
3. Classroom Observation Rubric: A rubric adapted from England, Brigati, Schussler, and Chen (2019) quantified verbal contributions (frequency: number of speaking turns; quality: relevance and clarity of

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responses) during two pre- and two post-intervention sessions. Observations were conducted by the researcher and a trained assistant, with inter-rater reliability established (Cohen's kappa = 0.85).

Data Analysis

Quantitative and qualitative data were analyzed to address the research questions comprehensively:

1. Quantitative Analysis: Pre- and post-intervention Likert scale scores were compared using a paired t-test to assess significant changes ($p < 0.05$), with Cohen's d calculated for effect size. Gain scores, defined as post-test minus pre-test scores, were computed to quantify improvement, following Yavuz and Kutlu (2019). Descriptive statistics (means, percentages) summarized participation levels (e.g., considerable: 2.5–3.24; high: 3.25–4.0).
2. Qualitative Analysis: FGD transcripts were analyzed using Braun and Clarke's (2006) six-phase thematic analysis: familiarization, coding, theme generation, review, definition, and reporting. Two researchers coded transcripts independently, achieving high inter-rater reliability (Cohen's kappa = 0.87). Themes were triangulated with observation data to validate findings.

Triangulation: Likert scale results, FGD themes, and observation data were cross-referenced to ensure consistency, addressing methodological gaps in relying solely on self-reports.

RESULTS AND DISCUSSION

This study evaluated the effectiveness of the Student-Selected Buddy System (SSBS) in enhancing verbal participation among 19 Grade 12 STEM students in a hybrid classroom. Using a mixed-methods action research design, data were collected via a 20-item Likert scale, focus group discussions (FGDs), and classroom observations, addressing the research questions: (1) What is the baseline level of verbal participation? (2) Does the SSBS increase verbal participation post-intervention? (3) What are the qualitative impacts of the SSBS? (4) What is the magnitude of improvement in verbal participation?

Quantitative Findings

Verbal participation was measured using a four-point Likert scale (1 = Never, 4 = Always) that captured both frequency and confidence before and after the intervention. Prior to the intervention, students already demonstrated considerable participation ($M = 2.92$, $SD = 0.45$). Most students (63%, n = 12) were within this range, while smaller groups showed moderate (21%, n = 4) or high (16%, n = 3) participation. After the intervention, the overall mean increased to 3.10 ($SD = 0.42$), indicating a positive shift in verbal participation. The majority (68%, n = 13) remained in the considerable range, with fewer students in the moderate (11%, n = 2) and high (16%, n = 3) categories. Statistical analysis using a paired t-test revealed that this increase was significant, $t(18) = 2.78$, $p = .012$, with a moderate effect size (Cohen's $d = 0.41$). Taken together, these results suggest that the intervention meaningfully enhanced students' frequency and confidence in verbal participation, moving the class as a whole toward higher engagement levels.

Gain scores, calculated as post-test minus pre-test scores, quantified improvement (Yavuz & Kutlu, 2019). Results showed 63% of students (n=12) improved (gain score > 0), 32% (n=6) declined (gain score < 0), and 5% (n=1) remained unchanged (gain score = 0). The mean gain score was 0.18 ($SD = 0.39$), reflecting a modest but significant improvement. Figure 2 illustrates the gain score distribution, highlighting the proportion of students with positive changes. Classroom observations corroborated these findings, showing an increase in speaking turns (pre: $M = 2.3$ turns/session; post: $M = 3.1$ turns/session) and improved response quality (e.g., more relevant, elaborated answers).

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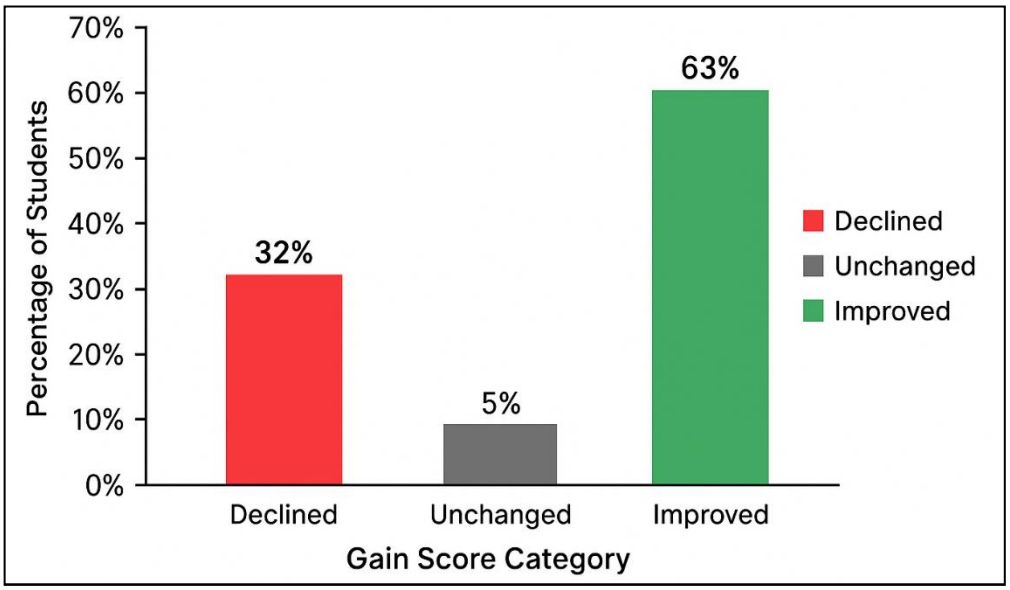

Figure 2. Gain Score Distribution for Verbal Participation
Percentage of students showing decline, no change, or improvement in verbal participation post-SSBS. Gain score = post-test – pre-test.

Table 1. Pre- and Post-Intervention Verbal Participation Scores (n=19)

Measure	Pre-Intervention	Post-Intervention
Mean (SD)	2.92 (0.45)	3.10 (0.42)
Mean Difference	—	0.18
95% CI for Difference	—	[0.04, 0.32]
Participation Level		
Moderate (*n*, %)	4 (21%)	2 (11%)
Considerable (*n*, %)	12 (63%)	13 (68%)
High (*n*, %)	3 (16%)	3 (16%)
Paired *t*-test	—	$t(18) = 2.78$, $p = .012$
Cohen's *d* (95% CI)	—	0.41 [0.09, 0.73]

Note: Scale: 1=Never, 4=Always. N = 19.

Qualitative Findings

FGD data from six participants, analyzed using Braun and Clarke's (2006, as cited in Creswell, 2012) thematic analysis, revealed four themes:

1. Enhanced Collaboration: Students reported that working with self-selected buddies enabled trust and idea sharing. One participant noted, "I felt comfortable sharing because my buddy listened and gave feedback" (FGD, Participant 3).
2. Increased Confidence: The SSBS reduced anxiety, encouraging shy students to speak. Participants attributed this to familiar partners who provided reassurance, aligning with peer support benefits (Motzo, 2016).
3. Role of Topic Relevance: Engaging, relatable topics (e.g., real-world science issues) motivated participation, as students felt their contributions were meaningful (Kahu, Nelson, & Picton, 2017).

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4. Teacher Facilitation: Supportive teacher behaviors, such as open-ended prompts and equitable monitoring, enhanced the SSBS's effectiveness. However, some noted challenges, such as distractions from overly familiar buddies.

Observation data supported these themes, noting increased peer interactions and more confident verbal contributions post-intervention. Table 2 summarizes key FGD themes with illustrative quotes.

Table 2. FGD Themes and Sample Quotes

Theme	Sample Quote	Interpretation
Enhanced Collaboration	"My buddy helped me explain my ideas better" (P2)	Trust in self-selected peers promotes idea exchange and reduces silence.
Increased Confidence	"I was shy, but my buddy encouraged me to talk" (P5)	Familiar partners lower anxiety, enabling shy students to participate.
Topic Relevance	"When topics were interesting, I wanted to share more" (P1)	Engaging content activates intrinsic motivation and relevance.
Teacher Facilitation	"The teacher's questions made it easier to join in" (P4)	Structured guidance prevents off-task behavior and ensures equity.

Discussion

The findings demonstrate that the Student-Selected Buddy System (SSBS) significantly enhanced verbal participation, with a mean increase from 2.92 to 3.10 ($p = 0.012$, Cohen's $d = 0.41$) and 63% of students showing improvement. Qualitatively, students reported greater collaboration, confidence, and motivation, driven by peer support, engaging topics, and teacher facilitation. These results align with theoretical predictions and address empirical and methodological gaps, but they also invite critical reflection on the intervention's mechanisms, limitations, and broader implications.

Interpretation and Theoretical Alignment

The significant increase in verbal participation supports Social Interdependence Theory (Johnson & Johnson, 2009), which posits that peer collaboration promotes engagement through mutual support. The SSBS's student-selected buddy structure created positive interdependence, as students relied on each other for idea generation and feedback. The qualitative theme of enhanced collaboration reflects this, as students described buddies as trusted partners who encouraged verbal contributions.

Self-Determination Theory (Ryan & Deci, 2000) explains the role of autonomy in buddy selection, which promoted relatedness and motivation. Participants' reports of increased confidence align with this, as choosing familiar partners reduced anxiety. However, the decline in participation for 32% of students (n=6) reveals a critical limitation of unmoderated autonomy. FGD and observation data identified two primary mechanisms:

1. Over-familiarity: Socially close pairs shifted to off-task conversation, diluting academic dialogue.
2. Uneven scaffolding: High-ability students dominated, marginalizing quieter partners and reinforcing silence.

This variability underscores that autonomy is a double-edged sword-powerful when structured, counterproductive when unchecked. PSVEM must therefore mandate proactive teacher monitoring (e.g., 5-minute check-ins) and pairing guidelines (e.g., "one academic focus per session") to mitigate decline risk.

Vygotsky's Zone of Proximal Development (1978) frames the SSBS as a scaffolding mechanism, where peers supported each other's verbal skills. Observation data showing improved response quality (e.g., more elaborated answers) support this, but the variability in outcomes highlights the need for structured tasks

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to ensure effective scaffolding. Critically, the intervention's success depended on teacher facilitation, as students noted that supportive prompts and monitoring were pivotal, aligning with Kumpulainen and Rajala, (2017) on the importance of teacher-student relationships.

Comparison with Prior Research

The findings extend prior studies on peer-supported learning. Motzo (2016) and Thalluri et al. (2014) found that peer coaching enhances engagement, but these studies focused on teacher-assigned pairs in face-to-face settings. The SSBS's student-driven approach addresses an empirical gap by leveraging autonomy in hybrid contexts, where modality transitions exacerbate disengagement (Wang, 2021). The role of topic relevance aligns with Kahu, Nelson, and Picton (2017), who emphasize interest as a driver of engagement, but the study's integration of peer and teacher factors offers a novel, holistic perspective absent in prior work.

This study contributes three advancements beyond confirming existing findings:

1. Quantifies decline risk (32%) and links it to over-familiarity—offering actionable safeguards (teacher check-ins, task boundaries).
2. Introduces teacher moderation as a core PSVEM pillar, absent in autonomy-only models.
3. Demonstrates feasibility in hybrid environments, extending face-to-face findings to post-COVID realities.

Critically, the modest effect size (Cohen's d = 0.41) suggests that while the SSBS is effective, its impact may be context-dependent or moderated by factors such as topic design or teacher expertise. This contrasts with more robust effects in cooperative learning studies (e.g., Herrmann, 2013), raising questions about the SSBS's scalability without tailored adaptations.

The Peer-Supported Verbal Engagement Model (PSVEM)

The findings inform the Peer-Supported Verbal Engagement Model (PSVEM), a novel framework integrating:

1. Student Autonomy: Buddy selection promotes motivation but requires oversight to prevent off-task behavior.
2. Collaborative Tasks: Structured activities (e.g., Think-Pair-Share) scaffold verbal skills, but their effectiveness depends on topic relevance.
3. Teacher Facilitation: Supportive teacher behaviors are critical but demand training for consistency.
4. Contextual Adaptation: The model is adaptable to diverse settings (e.g., online, K-12, higher education).

The PSVEM provides a replicable guide for educators, addressing the empirical gap in student-centered interventions. Its visual representation (Figure 1) illustrates how inputs (autonomy, tasks, facilitation) drive processes (collaboration, scaffolding) to achieve outcomes (increased participation, inclusive environments).

Implications for Practice and Research

The PSVEM offers educators a practical tool to enhance verbal engagement globally, particularly in hybrid settings where disengagement is prevalent (Wang, 2021). Teachers can implement the SSBS by incorporating brief training on buddy selection and task design, ensuring scalability across subjects and modalities. However, the critical challenge lies in balancing autonomy with structure—overly familiar pairs may disengage, necessitating teacher monitoring.

For research, the study addresses methodological gaps by combining robust statistics (paired t-test, effect sizes) with triangulated qualitative data, improving on descriptive analyses in prior work (Yavuz & Kutlu, 2019). Yet, the small sample (n=19) limits generalizability, a common critique of action research. Future studies should test the PSVEM in larger, multi-site samples across cultural and subject contexts to assess its robustness. Experimental designs (e.g., RCTs comparing student- vs. teacher-assigned pairs) and

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model testing in non-STEM subjects (e.g., humanities) or grade levels (K-6, tertiary) are essential for validation.

Future Directions

Critically, the PSVEM's scalability hinges on addressing distractions in buddy pairings and ensuring teacher training. Multi-site studies could test its efficacy in diverse contexts, while comparative analyses (e.g., student- vs. teacher-assigned pairs) could refine its mechanisms. Integrating digital tools, such as online discussion platforms, could extend the SSBS to virtual classrooms, addressing emerging needs in post-COVID-19 education.

CONCLUSIONS AND RECOMMENDATION

This mixed-methods action research study demonstrated the effectiveness of the Student-Selected Buddy System (SSBS) in enhancing verbal participation in a hybrid Grade 12 STEM classroom. The intervention significantly increased engagement, with qualitative insights revealing improved collaboration, confidence, and the critical role of engaging topics and teacher facilitation. These findings highlight the power of peer-driven strategies to promote active participation, particularly in hybrid environments where verbal engagement is often challenging. However, 32% of students declined due to over-familiarity and uneven scaffolding, a key refinement for PSVEM requiring structured teacher check-ins and pairing guidelines to balance autonomy with focus. The primary contribution is the Peer-Supported Verbal Engagement Model (PSVEM), a novel, theory-grounded framework integrating student autonomy, collaborative tasks, teacher facilitation, and contextual adaptability. Unlike prior models relying on teacher-assigned pairs in face-to-face settings, PSVEM uniquely introduces student-driven autonomy in hybrid contexts, quantifies decline risk, and embeds teacher moderation as a core safeguard. The PSVEM offers educators a replicable, scalable approach to promote inclusive dialogue across K-12, higher education, and online to face-to-face modalities. By empowering students to choose learning partners and engage in structured tasks, the model creates a supportive environment that reduces anxiety and promotes meaningful verbal contributions, addressing a critical need in modern education. Practically, PSVEM can be implemented in under 10 minutes per session with minimal training, making it accessible for resource-constrained classrooms. School administrators should integrate PSVEM into teacher induction programs and curriculum frameworks to promote equitable participation. Targeted training in moderated peer pairing and real-world task design can empower educators to transform passive learning spaces into inclusive, verbally active environments worldwide.

Recommendations

The Peer-Supported Verbal Engagement Model (PSVEM) offers a practical, scalable framework to enhance verbal participation. Educators and researchers should adopt and extend the model as follows:

1. Implement SSBS with preference-based buddy selection and structured tasks (e.g., Think-Pair-Share) tied to real-world topics.
2. Monitor interactions every 5-7 minutes to ensure equity and prevent off-task behavior.
3. Integrate PSVEM into teacher training and curriculum policies for consistent, school-wide application.
4. Conduct multi-site RCTs comparing student-selected vs. teacher-assigned pairings to refine mechanisms.
5. Adapt digitally (e.g., AI-supported virtual buddies) for fully online and hybrid environments.

Educators can promote inclusive dialogue, and scholars can validate its global impact on student agency and classroom dynamics by embedding PSVEM in practice and research.

Limitation

The small sample size, while suitable for action research and justified by power analysis, constrains broader applicability, and self-reported Likert data may reflect social desirability bias, though mitigated by observation triangulation; the hybrid context, while relevant, may not fully represent fully online or face-to-

face settings, a critical limitation given global variability in learning modalities. Cultural context further limits generalizability, conducted in a Philippine senior high school within a collectivist, teacher-centered culture where verbal participation is often restrained by *hiya* (fear of embarrassment) and *pakikisama* (social harmony), these values may suppress SSBS effects compared to individualistic Western classrooms, requiring cautious cross-cultural interpretation. Future directions should prioritize experimental replication (e.g., RCTs comparing SSBS vs. teacher-assigned pairs) and PSVEM testing across subjects (e.g., humanities), grade levels (K-6, tertiary), and cultural contexts to validate scalability and refine implementation protocols.

Credit authorship contribution statement

First Author (Ronald Quileste): Conceptualization, Supervision, Methodology, Formal analysis, Validation, Writing – review and editing, Project administration, Funding acquisition. Second Authors (Djevonah Ogoy, Christhie Jean Roble, Alexandria Yzzabelle Gonzalez, Michaela Grace Golez): Investigation, Data curation, Methodology, Visualization, Writing – original draft. Last Author (Wayne Mark Caberoy): Resources, Project administration, Supervision (as cooperating teacher), Validation, Writing – review and editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical Declaration

All participants provided informed consent prior to their involvement in the study. They were informed about the study's purpose, procedures, and their right to withdraw at any time without consequence.

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