

The Utilization of the Classroom Mathematics Games in Boosting the Creative Thinking Skills of the Grade 2 Learners in Goa District, Division of Camarines Sur

Thelma A. Pacamarra¹

¹School of Graduate Studies, University of Northeastern Philippines

ARTICLE INFORMATION

Article history:

Published: March 2026

Keywords:

Interactive Classroom
 Mathematics Games
 Creative Thinking Skills
 Game-Based Mathematics
 Instruction

ABSTRACT

Interactive classroom mathematics games have increasingly been recognized as pedagogical tools that can enrich mathematical learning by making instruction more engaging, participatory, and cognitively stimulating. This study examined the utilization of interactive classroom mathematics games in boosting the creative thinking skills of Grade 2 learners in Goa District, Division of Camarines Sur during School Year 2024–2025. Specifically, it determined the extent to which selected games—Splash Learn, Round Robin Benefit, Fraction Action, Around the Block, 101 and Out, The Counting Game, Odds and Events, and Sequence Benefit—were utilized by teachers; tested the level of agreement in the rank orders of these games; assessed the extent to which these games enhanced learners’ creative thinking skills in terms of divergent, lateral, convergent, mindfulness, and flexibility; and determined the level of agreement in the rank orders of these creative thinking dimensions. The study also generated policy recommendations anchored on the empirical findings. The study employed a descriptive–evaluative–correlational research design. The respondents were sixty-one (61) Grade 2 teachers from Goa District, Division of Camarines Sur. Data were gathered through a researcher-made questionnaire. The statistical tools used were weighted mean, frequency count, percentage, rank, and Kendall’s Coefficient of Concordance (W) with the corresponding chi-square test at the 0.05 level of significance. This methodological approach allowed the researcher to determine both the degree of game utilization and the level of agreement among respondents regarding the contribution of these games to learners’ creative thinking development. Findings revealed that all interactive classroom mathematics games were “Very Much Utilized,” with Fraction Action (4.76) ranking highest, followed by Around the Block (4.73) and Round Robin Benefit (4.70). The least variable but still highly rated games were Splash Learn and The Counting Game at 4.62. In terms of statistical agreement on game utilization, significant concordance was found across all games except The Counting Game, indicating broad teacher consensus on the instructional value of most game types. With respect to creative thinking outcomes, all domains were rated “Very Much Evident,” with Divergent Thinking (4.74) ranking highest, followed by Lateral Thinking (4.70), Convergent Thinking (4.70), Flexibility (4.70), and Mindfulness (4.69). However, significant agreement among respondents regarding creative thinking outcomes was observed only in Convergent Thinking, while the other domains showed non-significant agreement, suggesting contextual variability in how teachers perceived the games’ influence on broader creative thinking processes. The study concludes that interactive classroom mathematics games are highly utilized and are perceived to make a strong contribution to the development of learners’ creative thinking skills. The findings further suggest that while convergent reasoning outcomes are more uniformly recognized across respondents, the effects of game-based learning on divergent, lateral, mindful, and flexible thinking may be shaped by instructional variation, facilitation style, and school context. The study therefore recommends the institutional integration of game-based mathematics strategies, centralized resource development, targeted professional development, and stronger alignment between curriculum design and creative thinking outcomes in elementary mathematics instruction.

1. Introduction

The teaching of mathematics in the elementary grades has long been challenged by learners’ perceptions that the subject is difficult, abstract, and heavily procedural. In the early grades, such perceptions can become barriers to conceptual understanding and long-term engagement if instruction is delivered through rigid and purely conventional methods. As a result, there has been growing interest in learner-centered strategies that can make mathematics more concrete, participatory, and developmentally

appropriate. Among these strategies, interactive classroom mathematics games have emerged as a promising pedagogical approach because they transform mathematical tasks into meaningful, motivating, and cognitively active learning experiences. In such environments, learners are not merely passive recipients of numerical procedures; they become active participants who manipulate ideas, test strategies, and engage in social interaction while learning mathematical concepts.

Interactive mathematics games are especially relevant in the context of elementary education because they allow young learners to explore concepts through action, collaboration, repetition, and immediate feedback. These games support a classroom climate in which learners are encouraged to think, respond, revise, compare, and justify. Rather than treating mathematics as a narrow domain of right-or-wrong answers alone, game-based instruction opens opportunities for experimentation, reasoning, and multiple solution pathways. This makes it particularly valuable not only for strengthening numeracy but also for cultivating broader cognitive dispositions associated with creative thinking. In the present study, the selected game formats—Splash Learn, Round Robin Benefit, Fraction Action, Around the Block, 101 and Out, The Counting Game, Odds and Events, and Sequence Benefit—represent a range of strategies that can support fluency, conceptual understanding, and strategic engagement in Grade 2 mathematics.

Creative thinking is increasingly recognized as an essential outcome of quality education. In mathematics education, creative thinking does not simply mean inventiveness detached from rigor; rather, it involves the ability to generate multiple approaches, consider alternative interpretations, shift strategies, solve problems in novel ways, and make reasoned decisions under varying conditions. In this study, creative thinking was operationalized through the dimensions of divergent thinking, lateral thinking, convergent thinking, mindfulness, and flexibility. These dimensions collectively reflect the learner's ability to explore possibilities, connect ideas, focus attentively, regulate responses, and adapt strategies appropriately during mathematical activity. The integration of interactive mathematics games into classroom practice is therefore pedagogically significant because these games create opportunities for both structured reasoning and creative exploration within the same learning space.

The local context of the study also makes the inquiry important. Grade 2 is a critical stage in foundational mathematics, where learners transition from basic counting and simple operations toward more structured problem solving, number relationships, and conceptual reasoning. The use of classroom mathematics games during this stage may influence not only academic performance but also how learners experience mathematics as a subject. In districts such as Goa, where classroom realities may vary across schools in terms of resources, instructional exposure, and teacher strategies, understanding the extent to which teachers utilize interactive mathematics games and perceive their effects on learners' thinking becomes a meaningful basis for pedagogical improvement and policy development. The present study was therefore designed to determine the extent of game utilization, test the agreement of teacher perceptions, assess the contribution of games to creative thinking, and formulate recommendations that can strengthen mathematics instruction and creative cognition in the elementary classroom.

Ultimately, the study contributes to a broader educational concern: how mathematics instruction can move beyond procedural mastery and toward intellectually richer outcomes. By examining game-based strategies in relation to specific creative thinking dimensions, the research situates mathematics teaching within a wider discourse on quality education, learner agency, and cognitive development. Its findings are relevant not only to classroom teachers but also to school heads, curriculum planners, instructional leaders, and policy makers who seek more developmentally responsive and cognitively empowering approaches to elementary mathematics teaching.

2. Methodology

This study utilized a descriptive–evaluative–correlational method of research. The descriptive dimension was used to determine the extent to which interactive classroom mathematics games were utilized by teachers across the specified game formats. The evaluative dimension was applied in assessing how these games were perceived to boost learners' creative thinking skills along divergent, lateral, convergent, mindfulness, and flexibility domains. The correlational component was employed in testing the significant agreement on the rank orders of both the mathematics games and the creative thinking dimensions using Kendall's Coefficient of Concordance. This combined methodological design was appropriate because the study sought not only to describe classroom practice but also to evaluate perceived outcomes and determine the degree of consensus among respondents.

The respondents of the study were sixty-one (61) Grade 2 teachers in Goa District, Division of Camarines Sur. These respondents were selected as the primary sources of data because they were directly involved in planning, implementing, and observing classroom mathematics instruction for Grade 2 learners. As practitioners handling early elementary mathematics, they were well-positioned to assess both the utilization of interactive games and the extent to which such strategies appeared to foster learners' creative thinking skills. The study was delimited to their perceptions and instructional experiences during School Year 2024–2025.

The principal data-gathering instrument was a researcher-made questionnaire. The instrument was designed to capture two major areas: first, the extent of utilization of eight interactive classroom mathematics games, and second, the extent to which these games boosted learners' creative thinking skills across the five specified dimensions. The items in the questionnaire reflected classroom practices such as differentiation, feedback, strategic reasoning, participation, reflection, and conceptual reinforcement. These indicators enabled the generation of detailed descriptive statistics and inferential measures related to agreement in rank ordering.

For data analysis, the study employed weighted mean, frequency count, percentage, and rank to describe the extent of utilization and the extent of creative thinking enhancement. To determine whether respondents significantly agreed on the ranking of indicators within each game or creative thinking domain, the study used Kendall's Coefficient of Concordance (W) together with the corresponding chi-square test, with the significance level set at 0.05. This statistical treatment allowed the study to move beyond simple mean descriptions and examine the degree of shared perception among teachers across the district.

3. Results and Discussion

3.1 Extent of the Utilization of Interactive Classroom Mathematics Games

Table 1. Summary of the Extent of the Utilization of Interactive Classroom Mathematics Games Employed by the Teachers

Interactive Mathematics Game	Mean	Interpretation	Rank
Fraction Action	4.76	Very Much Utilized	1
Around the Block	4.73	Very Much Utilized	2
Round Robin Benefit	4.70	Very Much Utilized	3
Odds and Events	4.66	Very Much Utilized	4
Sequence Benefit	4.65	Very Much Utilized	5
101 and Out	4.63	Very Much Utilized	6
Splash Learn	4.62	Very Much Utilized	7.5
The Counting Game	4.62	Very Much Utilized	7.5

As shown in Table 1, all interactive classroom mathematics games were rated “Very Much Utilized,” indicating that teachers in Goa District extensively used game-based strategies in Grade 2 mathematics instruction. The uniformly high means suggest that teachers did not view these games as occasional enrichment devices only; rather, they treated them as integral components of day-to-day mathematics teaching. This overall pattern indicates a strong pedagogical orientation toward active, learner-centered instruction and implies that the classroom climate in the district is already receptive to game-based mathematical engagement.

Fraction Action ranked first with a mean of 4.76, suggesting that teachers regarded it as the most extensively utilized game. This high rating may be explained by the game’s alignment with visual modeling, contextualized examples, group-based tasks, and reflective discussion, all of which are especially effective in making abstract fraction ideas concrete for young learners. The top indicators for Fraction Action emphasized visual aids, real-life situations, multiple representations, collaboration, and reflective explanation. This implies that teachers value games that not only drill answers but also help learners articulate reasoning and connect mathematical ideas to authentic contexts. In journal terms, Fraction Action appears to be a high-value instructional strategy because it integrates conceptual understanding, collaborative learning, and formative assessment into a single classroom routine.

Around the Block and Round Robin Benefit followed closely, with means of 4.73 and 4.70, respectively. These games emphasize structured turn-taking, rapid-response review, peer interaction, and verbalization of strategies. Their strong rankings suggest that teachers see considerable value in interactive formats that promote oral participation and immediate cognitive engagement. Such results are important because they indicate that game utilization is not confined to digital or app-based platforms; teachers also rely heavily on interpersonal, orally mediated, and classroom-managed game structures. These findings support the interpretation that interactive mathematics games serve as vehicles for both mathematical thinking and classroom participation.

The relatively lower, though still very high, means for Splash Learn and The Counting Game deserve careful interpretation. Their ratings of 4.62 do not indicate weak utilization; rather, they suggest that these games may be more dependent on contextual factors such as access to digital tools in the case of Splash Learn, or perceived simplicity and familiarity in the case of The Counting Game. In pedagogical terms, some games may be seen as foundational or routine, while others may be perceived as more novel or cognitively expansive. The important point is that even the lowest-ranked games remained within the highest descriptive category, indicating a broad-based culture of game utilization across instructional formats.

3.2 Test of Significant Agreement on the Rank Orders of the Utilization of Interactive Classroom Mathematics Games

Table 2. Significant Agreement on the Rank Orders of the Utilization of Interactive Classroom Mathematics Games

Game	Kendall’s W	Chi-Square	p-value	Decision
Splash Learn	0.97	17.46	<0.01	Significant
Round Robin Benefit	0.98	20.58	<0.005	Significant
Fraction Action	0.96	23.04	<0.005	Significant
Around the Block	0.83	14.94	<0.05	Significant
101 and Out	0.74	15.54	<0.05	Significant
The Counting Game	0.64	15.36	>0.05	Not Significant
Odds and Events	0.93	16.74	<0.025	Significant
Sequence Benefit	0.89	18.69	<0.01	Significant

The Kendall analysis reveals that teachers significantly agreed on the rank ordering of nearly all interactive mathematics games, with the sole exception of The Counting Game. This is a strong result because it indicates that teachers shared a broadly common view about the relative instructional value and prominence of the various games. Particularly high concordance values for Round Robin Benefit (W = 0.98), Splash Learn (W = 0.97), and Fraction Action (W = 0.96) suggest that these games are not only highly utilized but also consistently perceived across respondents in similar ways. Such uniformity strengthens the credibility of the descriptive findings and implies that these game types have become well-established pedagogical practices within the district.

The non-significant result for The Counting Game is analytically important. Although the game itself was rated “Very Much Utilized,” respondents did not significantly agree on the rank order of its indicators. This suggests that teachers may be using the

counting game in varied ways, prioritizing different elements such as kinesthetic activity, skip counting, oral fluency, sequencing, or formative checking depending on their classroom context and learner needs. In other words, The Counting Game appears to be widely used but more flexibly interpreted. This makes it pedagogically useful, yet less standardized in practice than the other games. From a journal standpoint, this points to an opportunity for curricular clarification and structured exemplars so that foundational counting routines can be more consistently aligned with instructional objectives across schools.

3.3 Extent of the Utilization of Interactive Classroom Mathematics Games in Boosting Learners' Creative Thinking Skills

Table 3. Summary of the Extent of the Utilization of Interactive Classroom Mathematics Games in Boosting Learners' Creative Thinking Skills

Creative Thinking Dimension	Mean	Interpretation	Rank
Divergent Thinking	4.74	Very Much Evident	1
Lateral Thinking	4.70	Very Much Evident	2.5
Convergent Thinking	4.70	Very Much Evident	2.5
Flexibility	4.70	Very Much Evident	2.5
Mindfulness	4.69	Very Much Evident	5

The results in Table 3 show that all five creative thinking dimensions were rated “Very Much Evident,” indicating that teachers strongly perceived interactive mathematics games as supportive of learners’ creative cognition. The highest mean was obtained by Divergent Thinking (4.74), suggesting that teachers most strongly observed learners generating alternative possibilities, experimenting with approaches, modifying strategies, and considering “what-if” situations during gameplay. This is a major pedagogical finding because it implies that mathematics games are not simply reinforcing fixed-answer computation. Instead, they are opening intellectual space for idea fluency, experimentation, and risk-taking—traits central to creative thought.

The strong results for Lateral Thinking, Convergent Thinking, and Flexibility further reinforce the multidimensional value of mathematics games. Lateral thinking indicators emphasized humor, analogy, alternate interpretations, and reframing of tasks; convergent thinking emphasized selecting accurate and efficient solutions; and flexibility emphasized adapting strategies, representations, and responses to changing conditions. Taken together, these outcomes show that interactive mathematics games can support both exploratory and disciplined forms of thinking. This balance is important because genuine mathematical creativity often requires both novelty and control, imagination and accuracy, openness and structure. The games used by teachers appear to support this balance effectively.

Mindfulness obtained the lowest mean, though it remained within the “Very Much Evident” category. This indicates that learners were still perceived to demonstrate attention, reflection, emotional regulation, and deliberate pacing during gameplay, but perhaps with slightly less observable strength than the more overt cognitive dimensions. One possible explanation is that mindfulness-related behaviors are subtler and may depend more heavily on teacher facilitation, classroom routines, and reflective debriefing. Unlike divergent or convergent responses, mindful behavior may not emerge automatically from gameplay itself; it may need structured prompts, pauses, and reflective questioning to become more consistently visible. This interpretation is consistent with the policy recommendations in the study, which emphasized mindfulness prompts, guided pauses, and self-monitoring tools.

3.4 Test of Significant Agreement on the Rank Orders of the Creative Thinking Dimensions

Table 4. Significant Agreement on the Rank Orders of the Extent of the Interactive Classroom Mathematics Games in Boosting Learners' Creative Thinking Skills

Creative Thinking Dimension	Kendall's W	Chi-Square	p-value	Decision
Divergent	0.18	3.24	>0.05	Not Significant
Lateral	0.47	9.87	>0.05	Not Significant
Convergent	0.70	16.80	<0.05	Significant
Mindfulness	0.34	6.12	>0.05	Not Significant
Flexibility	0.64	13.44	>0.05	Not Significant

The inferential results show that Convergent Thinking was the only dimension for which respondents demonstrated significant agreement in rank ordering. This suggests that teachers most consistently recognized the games’ contribution to accuracy, procedural reasoning, strategy selection, and correct solution finding. This is understandable within the context of mathematics teaching, where many classroom tasks are traditionally oriented toward arriving at valid and precise answers. Even in game-based environments, teachers may more readily observe and agree upon convergent reasoning because it is visible, measurable, and closely aligned with established mathematics outcomes.

By contrast, the absence of significant agreement in Divergent, Lateral, Mindfulness, and Flexibility suggests that while teachers generally rated these outcomes highly, they did not rank the indicators within these domains in a statistically consistent way. This result does not weaken the descriptive finding that the dimensions were “Very Much Evident.” Rather, it indicates variability in how teachers experienced, observed, or prioritized these forms of creative thinking in their own classrooms. Such variability may stem from differences in facilitation style, classroom management, learner readiness, school context, and the degree to which teachers explicitly debrief or scaffold creative behaviors during and after gameplay. In journal terms, the findings suggest that

broader creative thinking outcomes are present but less uniformly interpreted across instructional settings than convergent reasoning outcomes.

This distinction between high mean ratings and non-significant agreement is theoretically and practically important. A domain can be widely valued and frequently observed, yet still be interpreted differently by different teachers. That appears to be the case here. Convergent thinking is more standardized, but divergent, lateral, mindful, and flexible thinking are more context-sensitive. This reinforces the study's recommendation for clearer instructional frameworks, exemplars, and teacher development focused on identifying and nurturing multiple creative thinking domains in mathematics classrooms.

4. Integrated Discussion

Viewed holistically, the findings establish that interactive classroom mathematics games occupy a meaningful place in Grade 2 mathematics instruction in Goa District. Teachers are not only using these games frequently, but they also perceive them as making substantial contributions to creative thinking development. The strongest descriptive evidence points to Fraction Action, Around the Block, and Round Robin Benefit as especially prominent strategies, and to Divergent Thinking as the most strongly enhanced creative thinking outcome. At the same time, the inferential results indicate that Convergent Thinking is the most consistently recognized effect across respondents. This means that game-based instruction is both exploratory and disciplinary: it promotes creativity, but it does so within a mathematics environment that still strongly values accuracy, reasoning, and formal solution paths.

The results also reveal a practical tension that is pedagogically productive. On one hand, mathematics games create room for openness, experimentation, and strategic variation. On the other hand, teachers still agree most strongly about outcomes tied to structured reasoning and correct answers. This tension suggests that interactive mathematics games may be functioning as a bridge between conventional mathematics pedagogy and more creativity-oriented instruction. They preserve mathematical rigor while expanding the forms of participation and cognition available to young learners. Such a pattern is especially promising for elementary education, where the formation of mathematical attitudes and thinking habits can have long-term consequences for learner confidence and achievement.

Overall, the findings support the central claim of the study: that the utilization of interactive classroom mathematics games is pedagogically beneficial and is strongly associated, in teacher perception, with the enhancement of learners' creative thinking skills. However, they also indicate that further work is needed to standardize teacher understanding of broader creative thinking outcomes beyond convergent reasoning. This is precisely why the study's policy recommendations emphasize centralized resource development, differentiated modules, digital infrastructure support, teacher training, reflection prompts, and curriculum alignment with creative thinking indicators.

5. Conclusions

Based on the findings of the study, it can be concluded that interactive classroom mathematics games are highly integrated into the teaching practices of Grade 2 teachers in Goa District. All of the selected games were rated "Very Much Utilized," indicating that teachers widely recognize the instructional value of game-based strategies in elementary mathematics. This confirms that mathematics games are not peripheral classroom activities but meaningful pedagogical tools that support engagement, concept development, and active participation in the learning process.

It can also be concluded that teachers demonstrated significant agreement on the rank ordering of most interactive classroom mathematics games, except for The Counting Game. This suggests that while the majority of games are consistently perceived and prioritized across respondents, some foundational games may be implemented more flexibly and interpreted differently depending on classroom needs and teacher preferences. Thus, standardization is stronger for some game types than for others.

The study further concludes that the utilization of interactive classroom mathematics games contributes substantially to the enhancement of learners' creative thinking skills. All creative thinking dimensions—divergent, lateral, convergent, mindfulness, and flexibility—were rated "Very Much Evident." This implies that game-based mathematics instruction is perceived to foster not only correct computation and procedural understanding but also broader capacities such as experimentation, strategic adaptation, reflection, and alternative reasoning.

However, the level of agreement regarding these creative thinking outcomes was not uniform. Significant agreement was found only in Convergent Thinking, while the other dimensions did not show statistically significant concordance. This indicates that convergent outcomes are more consistently recognized by teachers, whereas other forms of creative thinking may be more sensitive to context, facilitation style, and interpretation. Consequently, although interactive mathematics games are broadly valued as creativity-enhancing, the specific ways in which they foster non-convergent forms of creative thought may differ across classrooms.

Finally, the study concludes that the policy recommendations derived from the findings are both necessary and evidence-based. The observed strengths in game utilization, combined with the variability in perceptions of creative thinking outcomes, justify the need for stronger instructional design, centralized resources, professional development, and curriculum alignment focused on creative cognition in mathematics education.

Implications

The findings of the study have important implications for classroom practice. Teachers may view interactive mathematics games not merely as motivational devices but as structured pedagogical interventions that can cultivate multiple dimensions of thinking. The strong ratings for divergent, lateral, convergent, flexible, and mindful thinking imply that mathematics instruction can be enriched when gameplay is paired with questioning, reflection, differentiation, and debriefing. This suggests that effective game-based learning requires pedagogical intentionality, not just activity implementation.

For school leadership and curriculum implementation, the study implies that school heads and instructional leaders should support the systematic inclusion of interactive mathematics games in planning, supervision, and teacher development. Since some creative thinking outcomes were not uniformly ranked by respondents, schools should create common frameworks for identifying, nurturing, and documenting these outcomes. Community-of-practice sessions, demonstration teaching, shared rubrics, and structured reflection tools may help harmonize expectations and practices across schools.

For policy and system-level planning, the findings imply that game-based mathematics instruction deserves stronger institutional support. The study's recommendations regarding centralized repositories, differentiated modules, digital pedagogy sessions, offline-capable resources, contextualized materials, and teacher manuals point to the need for sustained investment in instructional resources and teacher capability-building. If mathematics games are to serve as equitable tools for creative thinking development, then access, quality, and implementation support must be addressed at division and curriculum levels.

For research, the results imply that future studies should move beyond perception-based description and examine longitudinal, comparative, and intervention-based evidence regarding the effects of mathematics games on learners' actual creative thinking performance. The non-significant agreement in most creative thinking dimensions suggests that these constructs may require richer forms of assessment, observation, and qualitative inquiry. Further studies may also investigate how teacher facilitation, learner disposition, school type, and game modality influence the cognitive outcomes of game-based mathematics instruction.

References

- [1] Bragg, L. A. (2012). Testing the effectiveness of mathematical games as a pedagogical tool for children's learning. *International Journal of Science and Mathematics Education*, 10(6), 1445–1467.
- [2] Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). Routledge.
- [3] Ginsburg, H. P., Lee, J. S., & Boyd, J. S. (2008). Mathematics education for young children: What it is and how to promote it. *Social Policy Report*, 22(1), 1–24.
- [4] Griffin, S. (2004). Building number sense with number worlds: A mathematics program for young children. *Early Childhood Research Quarterly*, 19(1), 173–180.
- [5] Hinebaugh, J. P. (2009). *A board game education*. Rowman & Littlefield Education.
- [6] Ke, F. (2008). Computer games application within alternative classroom goal structures: Cognitive, metacognitive, and affective evaluation. *Educational Technology Research and Development*, 56(5), 539–556.
- [7] Kirkley, J., & Kirkley, S. (2005). Creating next generation blended learning environments using mixed reality, video games and simulations. *TechTrends*, 49(3), 42–53.
- [8] Piaget, J. (1972). *The psychology of the child*. Basic Books.
- [9] Polya, G. (1957). *How to solve it* (2nd ed.). Princeton University Press.
- [10] Prensky, M. (2007). *Digital game-based learning*. Paragon House.
- [11] Silver, E. A. (1997). Fostering creativity through instruction rich in mathematical problem solving and thinking. *ZDM Mathematics Education*, 29(3), 75–80.
- [12] Torrance, E. P. (1974). *Torrance tests of creative thinking*. Scholastic Testing Service.
- [13] Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- [14] Worthington, M., & Carruthers, E. (2005). *Children's mathematics: Making marks, making meaning*. SAGE Publications.