Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 18s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Effect of Ethnomathematics in Teaching Functional Math Skills To Children With Intellectual Disability At Primary Level

N. Ilakkiya, Dr. V. Mrunalini

[1]B.Ed., M.Ed., M.Sc., Research scholar, Department of Special Education, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore- 641043, Tamil Nadu, India.

https://orcid.org/0009-0005-4253-1437

[2]M. A, M.R.Sc, Ph.D, Assistant Professor (SG), Department of Special Education, Avinashilingam Institute for Home Science and Higher Education for Women, https://orcid.org/0000-0002-2194-5957

Cite this paper as: N. Ilakkiya, Dr. V. Mrunalini, (2025) Effect of Ethnomathematics in Teaching Functional Math Skills To Children With Intellectual Disability At Primary Level. *Journal of Neonatal Surgery*, 14 (18s), 1338-1347.

ABSTRACT

Functional maths skills are important for everyone for an independent life. These skills are integrated with our cultural and traditional activities. This study aims to connect the ethnomathematics activities like Kolam and Pallanguzhi to practice functional math skills in children with mild to moderate intellectual disability. The Quasi-Experimental study design was used with an intervention group (n=19) and a control group (n=10), which included a pre-test and post-test. Madras Developmental Programming System and Functional Math Skills Assessment Tool, a teacher-made assessment tool, was used before and after the intervention. The study results were significant with $p < 0.05$. Intervention. Addition, subtraction, and multiplication showed a noticeable improvement. The limitations and future works are also discussed.

1. INTRODUCTION

Mathematics is an integral part of human existence. It is directly or indirectly related to the skills needed for leading an independent life. Functional math skills are essential for individuals to organize their lives and achieve independence. Unlike other subjects, teaching mathematical concepts to children remains a challenge even today (Fouze, A., 2017). This has led to an increasing perception that math skills are separate from daily life (Benson-O'Connor, 2019). Integrating regular academic schedules and subjects like science and math can be particularly difficult for children with disabilities. In particular, mastering math skills proves challenging for children with intellectual disabilities.

Children with intellectual disabilities require the functional arithmetic skills of addition, subtraction, and multiplication to succeed in their vocational education and lead independent lives. Our daily activities, from buying food, groceries, and clothes, organising communications, and maintaining schedules, etc., are dependent on basic math skills. Our everyday traditional and cultural practices, such as ethnomathematics, are closely linked to these math skills. Ethnomathematical activities can be applied in real-world situations directly (Zuhra,2021). Ethnomathematics can be used as a pedagogical, learning, and assessment tool. It is an affordable learning process (Kubuye, 2024). It was first introduced by D'Ambrosio in 1978 as the connection between culture and mathematics. These activities improve the capacity of sensory-motor development, critical thinking abilities, hand-eye coordination, number awareness (Vanitha Sidthartha, 2021), physical development, communication, problem-solving (Altay,2017; Lubis,2019), arithmetic operation, measurements and financial skills (Saunders, A. F., Browder, D. M., & Root, J. R. (2016)) cultivation of conceptual understanding, and information-processing abilities to the maximum extent. These activities are identified as effective means of instruction (Vanitha Sidthartha, 2021). The stakeholders are unaware of ethnomathematics, yet use it daily (Venketsamy, R.,2024). Learning math through these activities and games made learning fun, exciting, easier and connected to the culture. When context and engagement appear in the learning process, students find it easier to understand the lesson and are more likely to bring experience into their daily lives (Meaney 2012, Snounu 2019). The abstract concepts like "The sum of any group of increasing odd numbers is always a square" and "The sum of r rows of increasing odd numbers is r^2" (Syamala Chenulu, 2007) can also be learned using these activities.

Altay (2017) stated that students can develop skills like creativity, problem-solving, entrepreneurship and vocational skills, communication, connections and critical thinking from culturally oriented skills. These are important for sustainable development. Ethnomathematics skills are highly related to performing math skills (Pramesti, 2025). Mania S, & Alam S

(2021) stated that students can do math problems easily when they use ethnomathematics. They grasp arithmetic concepts easily. It is associated with food habits (barongko and tumpi), cultural practices, and games (engklek). Ethnomathematics is not only fun and meaningful but also more concrete in the students' minds. Besides learning math skills and preserving cultural aspects, contextual contribution to the curriculum is the most important feature. Teaching math through ethnomathematics is interesting and capable of presenting context and engagement.

Functional math skills, including addition, subtraction, and multiplication, can be taught to children with intellectual disabilities with adaptations and appropriate strategies. The suitable adjustments can enhance the mathematics learning of intellectually disabled children (Barr, 2021). Focusing on their attention could improve their performance in school subjects, particularly math (Zilaey, 2017). The first attempted to integrate the ethnomathematics activities to teach functional math skills. A few research studies are discussed below.

2. RELATED WORKS

Brown (2011) studied game-based learning to improve the functional math skills of 16 students with intellectual disability. Eight students participated in the intervention group and demonstrated improved functional math skills. A group of researchers (Burton 2013) suggested that video-based interventions on autistic and intellectually disabled children teach functional academic skills, like problems related to money and getting back the change after spending money.

Ennis (2018) conducted a study on empowering teachers with low-intensity strategies to support instruction with choices on 3rd-grade math, with null effects. They found no functional relationship between instructional choices and increased student academic engagement. During the study, each teacher targeted students with low benchmarking and academic engagement. During tier 1, the instruction was given to the whole class for 45-60 minutes. Later, guided practice adopted textbooks and math assignments, and students began to have a math station consisting of games and teacher-supported group activities. In the above research work, participants completed the 15-item checklist, which includes true/false questions and multiple-choice questions. Those who scored below 90% were directed to repeat the module.

Faragher (2019) studied functional mathematics for learners with Down syndrome. They particularly studied numeracy in a digital world from the perspective of children with Down syndrome. The challenges in the mathematics curriculum in the digital age, with accessible devices, when performing functional maths, were focused. The study also explores the 5 mathematical principles for curriculum planning. Fletcher (2010) developed the Touch Math program to teach addition facts to middle school children with intellectual disabilities. Touch Math is a multisensory mathematics program used to teach single-digit mathematics problems. He conducted a study on three middle school participants with moderate and multiple disabilities. The results indicated that the program was effective in teaching.

Foster (2012) worked on indicators of mathematics skill acquisition in children with mild intellectual disability. He studied the relationship and effects of phonological awareness, naming speed, and vocabulary on mathematics skills. The study was done on 265 children with mild intellectual disabilities. The finding stated that the skills are highly related to mathematics skills. Key Math R was done to the students with subtests of numeration, geometry, addition, subtraction, measurement and time /money. AHMED (2023) aimed to describe the mathematical abilities of students with ID. He used the instruments as a questionnaire and an interview. He summarised the math abilities of the students with severe ID, who can count from 1 to 10, can solve addition problems and can solve math problems with the teacher. Moderate ID children had done the above work with less dependence on the teacher.

Jimenez (2018) worked on increasing efficiency in mathematics: teaching subitizing to students with moderate ID. He performed a single-case multiple probes across participants' design used to investigate the effects of simultaneous prompting subitizing and addition problems. This resulted in students with ID benefiting from learning mathematical strategies to support their conceptual understanding and mathematical fluency. After the study, the special education teacher also performed a 7-question survey based on a Likert scale (7 points), which says that usage of the dot plate and simultaneous prompting is good. They also answered aloud for 6 questions on a Likert scale. Students are more interested in participating in activities regularly

Park (2020) reviewed the works of literature on "Maintenance in Mathematics for Individuals with Intellectual Disability." He reviewed over 135 studies from the year 1975 to 2018. Participants involved in the study were categorized by age/ grade, level of ID, and IQ score. The methodological design included a single case experimental design and a group (quasi-experimental design). They were also included in the intervention package concepts such as place value, addition, subtraction, multiplication, division, volume, length, time, collection and organization of data, 2D & 3D, solving x, which are classified under the National Council of Teachers of Mathematics (2018) as number and operation, measurement, data analysis and probability, geometry, geometry and algebra. The researcher summarised that the study mostly used prompting and visual work as an appropriate method. Students in the study maintained the targeted skills for up to 6 weeks. He also suggested a longitudinal study. It also strongly suggests generalization through learning. Hence, applying knowledge in the community, activity, and solving word problems were suggested for future research. Finally, prompting is an evidence-based practice for individuals with ID in supporting maintenance, feedback, time delay, and instructional sequence were potentially important for ID in learning math.

Schnepel & Aunio (2022) reviewed nearly 20 articles from the year 2008 to 2020. They focused on the type of design, type of instruction, intervention studies, feedback, and use of manipulatives and strategies. The study revealed that effective interventions must be well-structured with high-intensity learning experiences adapted for the achievement of

students with ID. The intervention required careful consideration of intervention sessions per week and their duration. They also suggested further research on instructional strategies concerning particular skills. They also suggested that invention studies must also be on larger populations for better data on effective mathematics instruction for a group of people with ID. They also mention the necessity of recording the long-term effects, follow-up studies, and maintenance assessments. High-intensity interventions in general classrooms are suggested for future research.

Schnepel (2020) has also worked on "The mathematical progress of students with an ID in inclusive classrooms" as A Longitudinal study. The researcher used "the Krajeswski model" for the intervention, which includes 3 levels: basic numerical skills, quantity number concept and number relationships. TEDI MATH was used to assess the skills. The subsets of the tool include procedural counting, conceptual counting, writing numbers, reading numbers, seriation of quantities, number conversion tasks, base ten systems, addition, subtraction, and problem-solving. The results say that inclusion had an impact on the language of mathematics. It is difficult to conclude that the mathematical learning of ID is restricted because of insufficient or inappropriate support. The research also suggested focusing on a specific skill of mathematics competencies of ID. It also suggested that critically examining the program of teaching mathematics to ID must be focused primarily on addition and subtraction concepts. It also underlines the need to acquire the quantity number concept, adapt interventions to the student's specific profile and analyze students' development as future research.

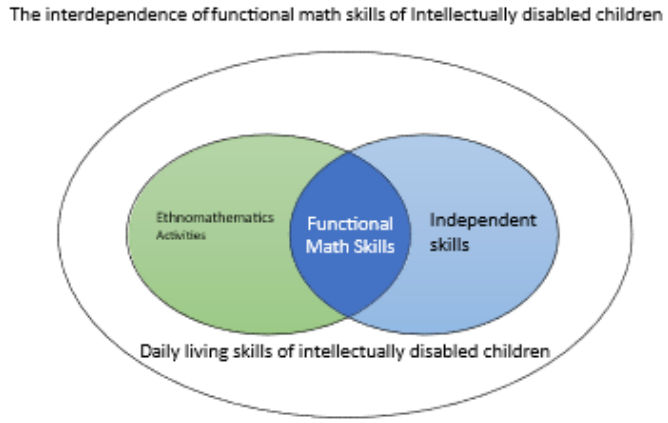
Zilaey (2017) said in her paper on the research about attention programs and the math performance of students with intellectual disability. The study aims to determine the effectiveness of attention training on the math performance of elementary school students aged 10-12 years. They used a quasi-experimental study with pre- and post-tests on 30 students, 15 students in the experimental group and 15 control group. The Raven's progressive matrices and math performance tests were used as tools. In math performance tests, the concepts include rational numbers, geometry, addition, multiplication, division, mental calculation, time, money, estimation, data analysis and problem-solving. The intervention consists of 18 sessions that focus on improving attention towards math. The results proved that attention is one of math's most important and complex factors. The type of attention training given to the students could help them focus well.

A review (Alhwaiti, 2022) recommended focusing on the functional mathematics skills of ID need in their daily lives. In addition, it also recommended that the government develop a curriculum to enhance the ability to solve real-life situations of the ID. The review also highlights the emerging usage of educational and intervention packages. Keenly relaying the need for functional mathematics skills of ID, addition, subtraction, and the least targeted skills like multiplication.

Supri (2024) worked on Sundanese traditional games to teach addition, subtraction, integers and fractions in didactical situations in ethnomathematics learning. The research was done on 524 children from grade 1 to 6in elementary school. Data collection instruments including tests, documentation, observations, and worksheets were used. Through iterative didactical design and revisions, the traditional egg game was developed. The results show that traditional games can serve as an effective tool to make learning math more engaging, accessible and culturally relevant.

78% of recent studies (Alhwaiti, 2022) focus only on academic math without functional elements linked to the real-life experience of children with ID. The present study focused on academic math concepts that are related to the elements of day-to-day life, most importantly, the skills required to pursue vocational studies and live independently by earning their daily bread on their own. Word problems in addition, subtraction and multiplication in functional math skills (Jiyoon Park 2019) were focused. Using special teaching strategies and methods is needed urgently (Browder,2008). Considering all the above studies, the researcher planned the intervention to help children with intellectual disabilities learn functional math skills. This study integrated ethnomathematics activities.

Functional math skills and Ethnomathematics activities Training



Kolam

Koolam is a traditional art form in Tamil Nadu, southern India. It is also called by different names in many parts of the world. For example, Malekula in the Republic of Vanuatu, Tshokwe in the western Central Bantu area of Africa, and

Bushoong in the Republic of Congo (Dave M.S). It is a temporary drawing pattern, drawn in the morning by women using rice flour. The still practiced activity enhances eye-hand coordination, patterns, and counting. It is also viewed as a mark of welcome and grace, the ability to concentrate (Dave MS). The author adapted the kolam sheets by giving space between the dots and making the dots thicker.

Pallanguzhi

The pallanguzhi board is also easily available in the market. Prabavathy M (2023) worked on the traditional game pallanguzhi to enhance basic arithmetic skills of children with mathematics difficulties and found that the game improved their math skills as a fun-filled activity. It also serves as an effective tool for promoting enjoyable learning. In addition, traditional games are also effective in teaching various life skills, particularly social skills. In the Indian context, children often engage in playing traditional games such as five stones, Pallanguzhi, Paandi, Hide and Seek, Spinning Tops, Paramapada, Sopaanam, SolanuKattam, Ludo, Goli, Snake and Ladder, Seeds Game, and Sack Race. Traditional games play an important role in the development of different skills in children. Pallankuzhi has been found to have a positive impact on enhancing children's attention span (MDA, 2021). Traditional games provide an optimal environment and resources for both educational and recreational purposes. Engaging in traditional games serves as an enjoyable and intellectually stimulating approach to acquiring knowledge about numerical concepts.

3. METHODOLOGY

The study used a Quasi-Experimental study design (Zilaey,2017) with a pre-test and a post-test on 19 students in the intervention group and 10 students in the control group.

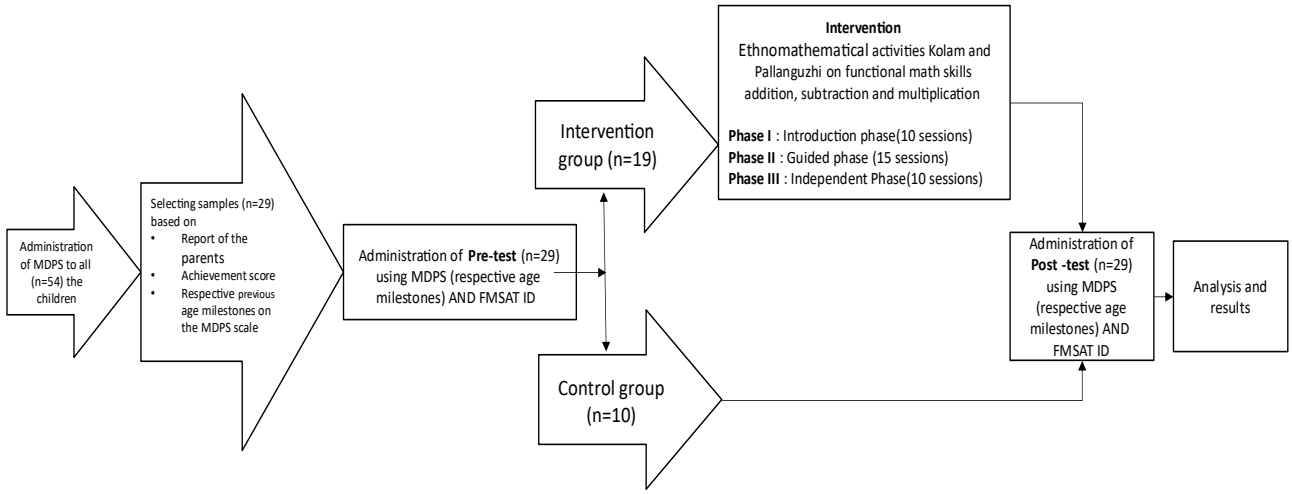


Figure 2: Impact of Ethnomathematical activities on functional math skills of children with Intellectual Disability at primary level

Participants

Twenty-nine primary school children from a special school with intellectual disability participated in the study. Mild and moderate children (Bouck et al., 2018; Karabulut & Özmen, 2018; Bouck & Long, 2020, Saunders et al., 2018; Browder et al., 2018; Orihuela et al., 2019; Jimenez & Saunders, 2019; Chapman et al., 2019) were included in the study considering the educational ground of the severe and profound ID children renders them unable to acquire skills (McKenzie et al., 2017, J.C. Wright, et al,2020). Though the prevalence of ID is greater in males (McKenzie et al., 2016), the present study aimed to include both genders to promote equality. Since a strong base for basic functional maths skills can be well built at the primary level and fewer studies are focused on functional math skills of ID at the primary level, for ages from 6 to 14. Table 1 shows the demographic information of the participants. These children are studying in a special school that follows the state board syllabus. The medium of instruction for the students is English.

Table 1: Demographics of the participants in the intervention group

Variables	Category	Number	%
Gender	Male	11	58
	Female	8	42
Age	6 to 9	9	47
	9 to 12	10	53
Grade	2 & 3	8	42
	4 & 5	11	58
	ID	12	63

Primary diagnosis	ID & ASD	3	16
	ID & SLD	4	21

The children were recruited through the advice of the class teacher. Students were eligible to participate based on the following criteria: i) parent report of participation in 2^{nd},3^{rd},4^{th} and 5^{th} grade; ii) achievement score; iii) the child's respective previous age criteria from MDPS (Domain 12). Throughout the study, all the children (n=29) received regular mathematics class instruction from their respective grade mathematics teachers. Since digital media are not allowed inside the class, no video or photographs are taken. The first author is a research scholar in special education and a former mathematics teacher and special educator, and also served as an interventionist among the other 8 intervention teachers. Seven special education teachers from the same school were included in the study as interventionists who had more (mean = 12) than ten years of experience in teaching special children and hold a bachelor's degree in special education. All the special teachers received the 2-hour orientation session on the objectives, procedures, materials and methods of the study. Every 5^{th} day of the session, a review meeting was conducted to ensure the development of practices, materials, methods and growth. To reduce bias, participants and personal data were blinded (J.C. Wright et al., 2020). Considering the school activities, the intervention classes were scheduled after or before the regular school hours. The study cleared the Institutional Human Ethical Committee (IHEC) regulation from the institute researcher belongs.

4. MATERIALS

Madras Developmental Programming System (MDPS) table 3 is a tool developed to assess the functional skills of intellectually disabled children in the Indian context. It consists of 18 domains. Domain 12 focuses on numbers, which are highly related to the functional math skills of intellectually disabled children. It is sequenced based on the years. Pre-requisites to learn age-appropriate functional math skills are considered. For example, if the child is in the 4th grade, the previous skills are considered prerequisites.

To achieve the objective of the study, the researcher created and validated the FMSAT-ID (Table 4) as a teacher-made tool. Addition, Subtraction, and Multiplication were its three main fields. There are 10, 10, and 8 criteria in each domain. Every criterion is established after thoroughly considering the demands of the pupils. After the consultation with parents, professionals, special educators, and other stakeholders, the FMSAT ID was established. After the establishment of FMSAT ID, it was validated by 9 special teachers, 4 experts and 21 students.

5. INTERVENTION DESIGN

The intervention consisted of 35 sessions and was divided into 3 phases continuously in two months. Phase 1 consists of an introduction with 10 sessions, the second phase is the guided phase with 15 sessions and the third phase is an independent phase with 10 sessions. Each session has a duration of 40 minutes. The activities planned are student-centered. They are allowed to ease and take breaks in between the sessions. All the students were given orientation about the study and the materials in the kolam, pallanguzhi. A few activities were also shown to the students in the orientation sessions. For each student, an Individualised Education Plan (IEP) was prepared by the teacher according to the needs and level of the student. Each session consisted of an activity based on kolam and pallanguzhi alternatively. The word problems, which are highly related to independent skills and vocational skills, are taken from their regular textbook. The selected problem will go through the steps in Table 3. Students will be assessed every 5^{th} class of the study as an informal test.

Phase 1 will be an essential and rapport-building stage between the student and the teacher. In this stage, students are introduced to the kolam sheets and the pallakuli boards and coins. Basic and single-digit addition, addition without carry over and subtraction without borrowing were practised. The teacher-to-student ratio was 1:2. During the introduction phase, children were given directions for placing the kolam sheets on the table, drawing the lines, and placing coins of pallanguzhi. Prompting like "Did you find the number?", "What operation to be done?", "Any difficult words?" was asked. Errors were corrected after each step (Sarah, 2020). The verbal and non-verbal reinforcements are given when needed.

During the initial guided phase, a few problems are demonstrated. Each step is guided by the teacher using a task analysis. Statements like "very good", "you can do more", "you are the best", and "that's great work" were used to encourage the participants to complete steps and problems. Mistakes in the problem were corrected in parallel during each session. Guidance and prompting were gradually reduced in the later part of the phase.

In the independent phase, the students were encouraged to solve the problems independently. Encouraging statements are given only at the end of the solution. Though students required assistance at the beginning of the phase, independence in solving problems was practiced by the students at the end of the phase. Students started to answer independently in the last week of the phase, a problem in each session.

Follow-up sessions were also conducted after the intervention. In this phase, only the Kolam sheets and problems were given as homework. Students are asked to solve the problem on the kolam sheets and pallanguzhi. During the follow-up sessions, the majority (79%) of the children solved the given problem independently.

6. RESULT

The pre-test was conducted just before the intervention. There was no introduction of the Kolam sheets and the pallanguzhi board. The children were not aware of the intervention, methods and materials during the pre-test. The post-test was conducted after the 35 sessions of intervention.

TABLE 3: Mean score of the participants on Functional Math Skills in %

Participants	Functional Math skills	PRE TEST		POST TEST		FOLLOW UP	
		MDPS	**FMSAT-ID**	**MDPS**	**FMSAT-ID**	**MDPS**	**FMSAT-ID**
Intervention group	+	47	60	93	95	94	98
	-	30	40	35	48	52	58
	X	46	59	70	88	70	90
	Total (mean)	41	53	66	77	72	82
Control group	+	46	60	47	62	48	66
	-	31	40	32	41	32	42
	X	46	58	46	59	46	60
	Total (mean)	41	52	42	54	42	56

During the pre-test, the mean score of children on MDPS was 47%. In the post-test, the score on MDPS increased to 93%. It shows that the intervention was effective. The score on FMSAT -ID was significantly high after the post-test (95%). The follow-up sessions were highly beneficial for the children, with a score of 82%. The score of the control group on MDPS and FMSAT ID shows less difference, indicating that there was no significant difference in the regular teaching. The scores of the intervention group (47%) and the control group (46%) during the pre-test were almost equal. The post-test scores of both groups are significant.

Scores of subtractions were low (mean = 35) when compared to addition (mean = 93) and multiplication (mean = 70) in the post-test on MDPS. It is because of the difficulty level of the concept. Problems in subtraction with “what is remaining”, “How many left?”, “How much spent?” is tougher than “What is the total of…?”, “How many, if you put together?”, “What is the sum of?” in addition and multiplication. However, the post-test score in the intervention group on the MDPS scale shows a higher difference of 35% with the control group. The score was significant when compared with the control group score.

The mean score for multiplication on the MDPS scale was 46% during the pre-test and increased to 70% in the post-test. The percentage increase in the intervention group compared to the control group was 66% during the post-test on the MDPS scale. The FMSAT-ID indicates a 49% increase in the intervention group versus the control group.

The post-test scores of the intervention group (n=19) on the MDPS scale were higher than those of the control group (n=10), with a p-value of 0.0000019. There was a 60% increase in the post-test score on MDPS compared to the pre-test. When comparing both the group's post-tests on FMSAT-ID, the intervention was significantly useful with a p-value of 0.0000336. The intervention in multiplication was feasible due to the earlier implementation of the addition in the intervention. With a p-value of 0.000344, the intervention achieves a level of significance. The paired test was performed on the MDPS. When analyzing the pre-test and post-test scores, it stands significantly with a p-value of 0.0000000172. Since the $p < 0.05$ intervention had a significant impact on the experimental group.

7. DISCUSSION

A total of thirty-five sessions were scheduled. The number of sessions for each student varied (mean=35) because each student's IEP (Alber et al,2001) was customized. Better performers required fewer sessions than those who needed more time to grasp the content. During the first phase, students faced problems adapting to the teacher and materials.

The feedback from the students was “the kolam and pallanguzhi activities made the bored math class more active and interesting. We practiced more problems not only with paper and pen but also on the boards”. Most students agreed to take the activities regularly in their math classes to make their math classes fun. “Though we do these ethnomathematics activities daily in our home, we realized the importance and impact of ethnomathematics activities in teaching math, particularly to children with intellectual disabilities,” said the teachers. “Children started to do their morning traditional activity called kolam at their home every day”, said by the parents. This shows that the students were interested in doing their daily activities more independently than ever before. The teachers regularly reported that the students started to think and connect other concepts, like division and fractions, into the ethnomathematical activities. By doing those activities, children also developed their eye-hand coordination, healthy habits, and happiness in living an independent life. Unconsciously, they develop skills like problem-solving and critical thinking. Additionally, non-targeted skills like cooperation among the team, listening, waiting for the turn, spelling, reading and understanding the meaning of the sentences are also achieved. The findings show that these activities not only help in developing functional maths skills but also in the preservation of culture in the Indian context. It’s evident that functional math highly relies on cultural

aspects. The skills needed for modern independent life are outcomes of refined cultural aspects like games. As a result, teaching math through cultural aspects like kolam and pallanguzhi teaches not only functional math but also philosophical values. The results line up with the earlier findings of the contribution of ethnomathematics to academics.

8. FUTURE WORK

Based on the study, it can be recommended to learn the other concepts in math, including division and fractions. Other traditional activities, including foods, games, fabrics, patterns, and architecture, are highly related to learning concepts like algebra, symmetry, and science. The activities must be planned for outside the class (Alhwaiti, 2022). The activities on the field, like taking them to the shop, buses, scheduling and planning, must be done in future studies. More studies should be done on children with severe intellectual disabilities (Spooner, 2018), with a larger sample in teaching functional math skills. Functional math skills are highly related to vocational skills, which are an important key factor in leading an independent life. The calculation involving one and two digits was performed on the board and was noted as a limitation of these activities.

9. CONCLUSION

Ethnomathematics is not only fun but also encourages students to think in ways they can understand. They may explore various traditional games, foods, and activities. This fosters a child's curiosity about cultural aspects, the connection between general academics and traditional activities, and the philosophical values underlying these cultural elements. The functional skills are rooted in ethnomathematical skills and transactional activities. It illustrates that there is no strict division between independent skills and traditional activities. All traditional activities contribute to a healthy and independent human lifestyle.

REFERENCES

[1] Fouze, A. Q., & Amit, M. (2017). Development of mathematical thinking through integration of ethnomathematic folklore game in math instruction. Eurasia Journal of Mathematics, Science and Technology Education, 14(2), 617-630.

[2] Benson-O'Connor, C. D., McDaniel, C., & Carr, J. (2019). Bringing Math to Life: Provide Students Opportunities to Connect Their Lives to Math. Networks: An Online Journal for Teacher Research, 21(2), 3.

[3] Zuhra, M., Anwar, A., & Mailizar, M. (2021, April). The development of ethnomathematics-based mathematics students worksheet for junior high schools using contextual approach. In AIP Conference Proceedings (Vol. 2331, No. 1). AIP Publishing.

[4] Kabuye Batiibwe, M. S. (2024). The role of ethnomathematics in mathematics education: A literature review. Asian Journal for Mathematics Education, 3(4), 383-405.

[5] Altay, M. K., Yalvaç, B., & Yeltekin, E. (2017). 8th Grade Student's Skill of Connecting Mathematics to Real Life. Journal of Education and Training Studies, 5(10), 158-166.

[6] Saunders, A. F., Browder, D. M., & Root, J. R. (2016). Teaching mathematics and science to students with intellectual disability. In Handbook of research-based practices for educating students with intellectual disability (pp. 351-372). Routledge.

[7] Venketsamy, R. Ethnomathematics: The use of cultural games in mathematics in the early grades: A South African case study.

[8] Mania, S., & Alam, S. (2021). Teachers' Perception toward the Use of Ethnomathematics Approach in Teaching Math. International Journal of Education in Mathematics, Science and Technology, 9(2), 282-298.

[9] Chenulu, S. (2007). Teaching mathematics through the art of kolam. Mathematics Teaching in the Middle School, 12(8), 422-428.

[10] Pramesti, A. R., Kamid, K., & Rohati, R. (2025). Description of Process Skills of Students with Dyscalculia in Understanding the Concept of Counting Operations Through Ethnomathematics. Journal of General Education and Humanities, 4(1), 69-80.

[11] Mania, S., & Alam, S. (2021). Teachers' Perception toward the Use of Ethnomathematics Approach in Teaching Math. International Journal of Education in Mathematics, Science and Technology, 9(2), 282-298.

[12] Barr, F., & Mavropoulou, S. (2021). Curriculum accommodations in mathematics instruction for adolescents with mild intellectual disability educated in inclusive classrooms. International Journal of Disability, Development and Education, 68(2), 270-286.

[13] Zilaey, S., Adibsereshki, N., & Pourmohamadreza-Tajrishi, M. (2017). Attention program and math performance of students with intellectual disability. Iranian Rehabilitation Journal, 15(4), 333-340.

[14] Brown, D., Standen, P., Saridaki, M., Shopland, N., Roinioti, E., Evett, L., ... & Smith, P. (2013). Engaging

students with intellectual disabilities through games based learning and related technologies. In Universal Access in Human-Computer Interaction. Applications and Services for Quality of Life: 7th International Conference, UAHCI 2013, Held as Part of HCI International 2013, Las Vegas, NV, USA, July 21-26, 2013, Proceedings, Part III 7 (pp. 573-582). Springer Berlin Heidelberg.

[15] Ennis, R. P., Lane, K. L., Oakes, W. P., & Flemming, S. C. (2020). Empowering teachers with low-intensity strategies to support instruction: Implementing across-activity choices during third-grade reading instruction. Journal of Positive Behavior Interventions, 22(2), 78-92.

[16] Faragher, R. (2019). The new 'functional mathematics' for learners with down syndrome: Numeracy for a digital world. International Journal of Disability, Development and Education, 66(2), 206-217.

[17] Foster, M. E. (2012). Indicators of Mathematics Skill Acquisition in Children with Mild Intellectual Disability: Phonological Awareness, Naming Speed, and Vocabulary Knowledge.

[18] Ahmad, J., Agustina, R., Farida, N., & Nurlaila, S. (2023, May). Mathematics ability of students with intellectual disability. In AIP Conference Proceedings (Vol. 2595, No. 1). AIP Publishing.

[19] Jimenez, B., & Saunders, A. (2019). Increasing efficiency in mathematics: teaching subitizing to students with moderate intellectual disability. Journal of Developmental and Physical Disabilities, 31(1), 23-37.

[20] Park, J., Bouck, E. C., & Josol, C. K. (2020). Maintenance in mathematics for individuals with intellectual disability: A systematic review of literature. Research in Developmental Disabilities, 105, 103751.

[21] Schnepel, S., & Aunio, P. (2022). A systematic review of mathematics interventions for primary school students with intellectual disabilities. European Journal of Special Needs Education, 37(4), 663-678.

[22] Schnepel, S., Krähenmann, H., Sermier Dessemontet, R., & Moser Opitz, E. (2020). The mathematical progress of students with an intellectual disability in inclusive classrooms: results of a longitudinal study. Mathematics Education Research Journal, 32(1), 103-119.

[23] Alhwaiti, M. M. (2022). An updated evidence-based practice review on teaching mathematics to students with intellectual disabilities. International Journal of Computer Science & Network Security, 22(5), 255-265.

[24] Park, J. (2019). Supporting maintenance in mathematics using the virtual-representational-abstract instructional sequence intervention package. Michigan State University.

[25] Dave, M. S. ETHNOMATHEMATICS: AN EFFECTIVE PEDAGOGICAL TOOL TO ENRICH MATH TEACHING.

[26] Prabavathy, M., & Sivaranjani, M. R. (2023). Utilizing Traditional Game-Pallanguzhi as a tool to Enhance the Basic Arithmetic Skill of Children with Mathematical Difficulties. Journal for Re Attach Therapy and Developmental Diversities, 6(10s2).

[27] Bouck, E. C., Park, J., Shurr, J., Bassette, L., & Whorley, A. (2018). Using the virtual–representational–abstract approach to support students with intellectual disability in mathematics. Focus on Autism and Other Developmental Disabilities, 33(4), 237-248.

[28] Karabulut, A., & Özmen, E. R. (2018). Effect of "understand and solve!" strategy instruction on mathematical problem solving of students with mild intellectual disabilities. International Electronic Journal of Elementary Education, 11(2), 77-90.

[29] Bouck, E. C., & Long, H. (2023). Academic Mathematics Instruction and Intervention for Students with Mild Intellectual Disability: An Updated Review. Education & Training in Autism & Developmental Disabilities, 58(2).

[30] Browder, D. M., Spooner, F., Lo, Y. Y., Saunders, A. F., Root, J. R., Ley Davis, L., & Brosh, C. R. (2018). Teaching students with moderate intellectual disability to solve word problems. The Journal of Special Education, 51(4), 222-235.

[31] Orihuela, S. M., Collins, B. C., Spriggs, A. D., & Kleinert, H. (2019). An instructional package for teaching geometric shapes to elementary students with moderate intellectual disability. Journal of Behavioral Education, 28, 169-186.

[32] Chapman, S. M., Ault, M. J., Spriggs, A. D., Bottge, B. A., & Shepley, S. B. (2019). Teaching algebra with a functional application to students with moderate intellectual disability. Education and Training in Autism and Developmental Disabilities, 54(2), 161-174.

[33] McKenzie, J. (2021). Intellectual disability in inclusive education in South Africa: Curriculum challenges. Journal of Policy and Practice in Intellectual Disabilities, 18(1), 53-57.

[34] Wright, J. C., Knight, V. F., & Barton, E. E. (2020). A review of video modeling to teach STEM to students with autism and intellectual disability. Research in Autism Spectrum Disorders, 70, 101476.

[35] Supri, S. (2024). Didactical Situations in Ethnomathematics Learning: A Case Study on Addition,

Subtraction, Integers, and Fractions Using Sundanese Traditional Games: A Case Study on Addition, Subtraction, Integers, and Fractions Using Sundanese Traditional Games. Jurnal Gentala Pendidikan Dasar, 9(2), 210-229

[36] Browder, D. M., Spooner, F., Lo, Y. Y., Saunders, A. F., Root, J. R., Ley Davis, L., & Brosh, C. R. (2018). Teaching students with moderate intellectual disability to solve word problems. The Journal of Special Education, 51(4), 222-235.

Table:2 MDPS DOMAIN 12: NUMBER

Age level in years	Item number	Domain-12 Number	Score
0-5	1	Rote counts 1-5	
	2	Separates one object from a group upon request	
	3	Discriminates between less and more	
	4	Matches identical number of concrete objects	
5-7	5	Recognises written numbers from 1-10	
	6	Write numbers sequentially from 1-10	
	7	Picks up specified number of objects up to five	
	8	Arranges the number symbols sequentially from 1-5 in an order	
	9	Follows directions to fill up to half a glass	
	10	Add single-digit numbers up to 10	
	11	Subtracts a single digit number within 10	
	12	Writes numbers up to 100 on random dictation	
7-9	13	Does a two-digit addition without carry over	
	14	Does a two-digit subtraction without borrowing	
	15	Does two-digit addition with carryover	
	16	Does two-digit subtraction with borrowing	
9+	17	Name math symbols	
	18	Measures liquid using measuring cups	
	19	Weighs objects using a weighing scale	
	20	Uses a calculator for basic arithmetic operations	

Table 4: Functional Math Skills Assessment Tool for children with Intellectual Disability FMSAT-ID

Rubrics to assess the Functional Math Skills of children with intellectual disabilities at the Primary Level

Signature of the Teacher: _____ Date: _____

S. No	RUBRICS	YES (✓)	NO(X)
I	**ADDITION**		
A	Reading the question		
B	Understanding the question		
C	Identifying numbers		
D	Identifying a solution requires an addition		
E	Identifying the symbols – addition		
F	Writing the numbers in the correct place values		
G	Performing 1-digit addition		
H	Performing 2-digit addition		
I	Performing Carryover up to 2 digits		
J	Arriving at the correct answer		
II	**SUBTRACTION**		
A	Reading the question		
B	Understanding the question		
C	Identifying number		
D	Identifying a solution requires subtraction		
E	Identifying the symbol - subtraction		
F	Writing the numbers in the correct place values		
G	Performing 1-digit subtraction		
H	Performing 2-digit subtraction		
I	Performing barrow up to two digits		
J	Arriving at the correct answer		
III	**MULTIPLICATION**		

A	Reading the question		
B	Understanding the question		
C	Identifying numbers		
D	Identifying the arithmetic as multiplication		
E	Identifying the symbols -multiplication		
F	Writing the numbers in the correct place values		
G	Applying the tables		
H	Arriving correct answer		

Directions: The teacher will mark yes/no after careful observation and assessing the questions.