

ACTIVITY-BASED TEACHING IMPROVES GROSS MOTOR SKILLS AND EARLY ACADEMIC ACHIEVEMENT AMONG NORTH CHENNAI NURSERY STUDENTS: A TEACHER'S PERSPECTIVE

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ABSTRACT

Objective: Gross motor skills and cognitive skills are essential prerequisites for the physical development of an early childhood. The World Health Organization (WHO) has developed normal age ranges for the achievement of motor milestones by healthy children. The current study aimed to assess the gross motor skills, cognitive skills related to development achievements and its associated factors among North Chennai nursery students.

Materials and Methods: A prospective study was conducted among nursery students from B.V. Victory Nursery and Primary School, Thiruvotriyur, North Chennai, India. Gross motor skills and cognitive skills were assessed through 14 and 13 activities, respectively. The assessment and the scores evaluated as per standard methods and it was recorded and analyzed using Microsoft Excel based tools.

Results: Overall, 16 children aged 3-4 years old were included in the study. Of the 16 students, 9 boys and 7 girls were assessed for the gross motor skills and cognitive skills using various activities. From this study, girl's performance was better than the boy's performance in various activities. Activities performance and their physical and mental growth were significantly associated with the timely achievement of gross motor and cognitive milestones.

Conclusion: This study suggests that students' gross motor skills and cognitive skills may explore during activity-based teaching module compared to blackboard based study. Hence, we conclude, the activity-based teaching methods for nursery and primary students may help in exploring the student's potential to the maximum extent with the acquisition of various skills.

Keywords: Gross motor skills, Cognitive skills, Activity-based teaching, Nursery students, Curriculum-based activity, Academic growth, Skill development, North Chennai.

INTRODUCTION

The first 6 years of life play a major role in the development of a human life. Acquisition and progression of skills during these periods are more rapid than any other age of life [1]. Every individual has its own pace for the development, and they cross through sequential developmental stages. They are physical, cognitive, and emotional growth or change. Each child may reach these stages very quickly or later than other child based on various internal and external factors [2,3].

Few children may advance in a particular area or domain, such as language, but lack in some other motor developments. It becomes the duty of every parent and a teacher to know the specific characteristics of a child to meet their needs [4]. In case if some issues rise on a specific child's behavior or development, the parents should consult an appropriate profession for child development. Physical and sports related functions require motor and balance skills as a primary development in the preschool children. Children acquire motor skills during the age of 3-5 years. The fundamental skills such as motor and balance plays key role in the children's developmental milestone [5].

Motor and balance skills are part of the prerequisites for physical development and sports performance [6-8]. Most motor skills are gained by children in the period of preschool [9]. Both motor and balance skills are cornerstone of physical developmental landmark in children. These skills include complicated movements such as running, hopping, and other sports activities.

Movements of stronger muscle or motion are defined as motor skills [10]. Further, motor skills are classified into two major skills; they are gross motor skills and fine motor skills [11]. Gross motor skills refer to large physical movements of the body. Fine motor skills comprised

smaller movements in the hands and fingers. Thus, performing fine motor movements among preschool children's was found to be difficult task compared to gross motor movements [12].

In this context, we carried out this study to assess the gross motor skills, cognitive skills, and curriculum-based skills among Nursery School Children from North Chennai, Tamil Nadu, India. Since, gross motor skill activities involve in exploring the strength of a child in the early age group. Practicing and performing gross motor activities between 3 and 4 years age group children, strengthening their muscles and other movements related to leg, arms, also movements involving in small muscles such as hand and wrist. Regular activities in the school for the children make them more voluntary toward the activities as they are more competitive toward their peer such as walking, running, moving, handling things, jumping, and climbing [13-15].

METHODS

The current study was conducted at B. V. Victory Nursery and Primary School, Shanmugapuram, Thiruvotriyur, North Chennai, Tamil Nadu, India - 600019 from July 1, 2019, to March 10, 2020 (8 months, and 10 days). Since, the study used the routine educational methods and the data generated during this study period. It does not require consent from the parents as we do not perform any extra activities for this study purpose. To maintain the student's identity, hereupon, we mention as student 1 to student 16 as per the alphabetical order with male from student 1 to student 9 and the female begins at student 10 and ends at student 16.

We carried multiple experiments to assess the gross motor skills and cognitive skills through Astragen curriculum-based teaching methodology using various test [16-20]. The entire test was repeated

twice to confirm the reproducibility with a specific interval period, henceforth to avoid making stress or tiredness of students/kids.

As per the standard procedures, the following tasks were given to all the 16 students involved in this study and they were assessed by two individual teachers and the scores were recorded and consolidated accordingly. The scores were recorded in three categories, 1. Performed (score 2); partially performed (score 1); not performed (score 0), and the same were recorded on Microsoft Excel sheet and the data were analyzed for various parameters [20-22].

Gross Motor Skill based activities

To assess the gross motor skills among the students, we carried out multiple activities such as standing on tiptoes, running speed, agility (ability to move quickly and easily), touching fingers, building tower, stringing beads, walk on the curve line, trace the curve, transferring cereals from one bowl to another, ball balancing, eye and hand coordination (Visuomotor skills) activities on identifying fruits and transferring them to a bowl using a spatula, handling with wet objects, color identification, and handling with fine objects (small pebbles and buttons) were performed as per the standard protocol [20-25].

Curriculum-based activities

To assess the cognitive skills among students, we carried out activities such as letter identification, arranging numbers in order, letter names with toys, fruit identification, classroom objects, body parts matching, oral development skill on introducing themselves and family members, coloring, arranging letters with the use of sticks and scales, identifying same and different objects, big and small, and tall and short identification were performed as per the standard protocol [26].

RESULTS AND DISCUSSION

The study included totally 16 nursery students ranging from 3 years (36 months) to 4 years (48 months) on an average of 3.5 years old. To maintain the confidentiality of the student's identity, we included the student's name as Student 1 to Student 16, in which boys (gender) constitute from student 1 to student 9 and girls (gender) from student 10 to student 16, respectively.

Skill based activity

We evaluated the gross motor skills among students using 14 activities which helped us to assess the motor skills among students. Out of 14 activities only two activities (transferring cereals and color identification) were performed completely by 11 students, partially performed by 5 students. Followed by, building tower completely performed by 10 students, 4 partial, and 2 students not performed. Eye and hand coordination 9 completely, 7 partially performed. Hence, the student's eye and coordination are efficient among all the students, which show the visuomotor skills were well developed among students.

Walk on the curve line is the least performed activity among all other activities performed in our study. Only 5 students performed completely on a walk on the curve line and seven partial and four not performed.

Since, the students find this activity as tough to coordinate with the walking on the curve line due to its understanding difficulty. Running speed and stringing beads were equally carried out by eight students completely and eight students performed partially, Fig. 1.

Analysis of skill based activity scores among the nursery students indicated few activities such as transferring cereals from one bowl to another using a spoon, handling with wet objects and color identification was performed completely by 11 students out of 16. Since many students showed interest toward it and had fun transferring the cereals, color identification activity was also found to be much easier for students since it is based on our day to day activities.

In activities like testing the agility and balancing a ball, handling with wet objects an average of 9-11 of 16 students were able to partially perform it. Since, those activities have been a bit challenging and it involved activities like moving from one place to another while students could not catch up with it in the first move itself.

A skill based activity to test the gross motor skills among students like walking on the curved line was found difficult by 5 students of the 16, its due to lack of understanding by the kids and they found it difficult to coordinate with this activity.

We arranged the students list as per the total scores gained from the 14 activities, maximum a student can score $2*14=28$ (performed all); or $1*14=14$ (partially performed) or $0*14=0$ (not performed). Out of 16 students, student 10 (a girl) has scored 100% (28 score), followed by student 4 and student 7 (Boy) achieved second place with 96.4%, student 12 and 15 (Girl) with 89.3%, student 14 (Girl) 85.7%, student 1 (Boy) 82%, student 2 (Boy) 78.6%, student 11 (Girl) 71.4%, student 13 (Girl) 67.9%, student 16 (Girl) 57%, student 6 (Boy) 53.6%, student 8 (Boy) 46.4%, student 5 (Boy) 42.9%, student 3 (Boy) 32%, and student 9 (Boy) 28.6%, as shown in Fig. 2.

Every student has unique nature and they have their own individual talent either acquired or inborn due to their family background and environment. Student 10 was able to perform well due to her better listening skill, interest toward activities, eagerness, and enthusiastic nature in performing skill based activities regularly. We observed student 10 was outstanding in all the skill based activities, which may be due to her age factor, well-educated parent's background and smart in all the activities.

The student 9 (boy) was unable to perform the skill based activities, due to his reserved nature which made him not comfortable with the teachers. In spite, the effort and special care taken toward this child, he was not able to cooperate with all teachers except his class teacher. He lacks behind in the oral skills and was not very keen to listen to the teacher, he did not show much interest in participating in activities, as he joined in the middle of academic year than other children, and this could be an additional reason behind his performance. While student 3 also performed below average in most of the activities, initially the teacher

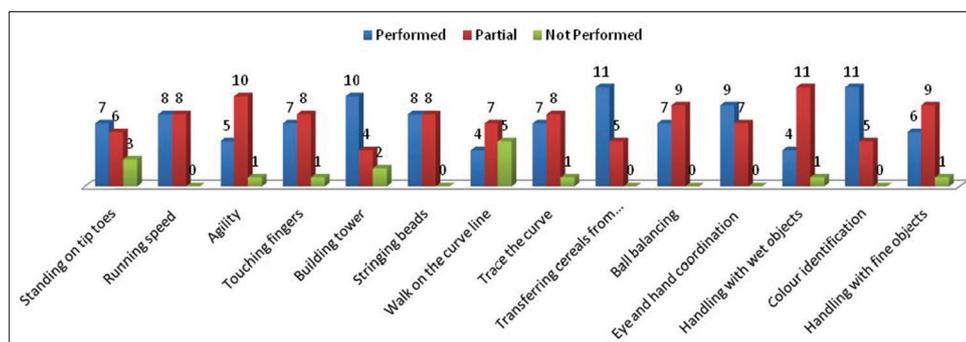


Fig. 1: Skill based activity scores among nursery students

suspect him to be an autism affected boy, as he behave like an attention deficit hyperactivity disorder child, and informed his parents for further study. However, he was found to be better at the end of academic year than the initial period. He showed symptoms such as closing his eyes and ears often noticed and informed to his parent for the respective treatment. Hence, teacher plays key role in identifying nursery students behavioral, motor skills, and cognitive skills development.

Skill based activity has been performed by girls better than boys in various activities studied, except handling with fine objects (boys 4 and girls 2) Fig. 3. Especially, building tower (boys 4 and girls 6), transferring cereals from one bowl to another (boys 4 and girls 7), and color identification (boys 4 and girls 7) were well executed by girls.

Whereas in the partially performed category boys performance was comparatively better than girls (Fig.4). Especially, in activities such as ball balancing (boys 6 and girls 3), stringing beads (boys 6 and girls 2), and handling with wet objects (boys 6 and girls 5). This indicates that girls can do activities completely than boys and most of the boys performed partially.

Only walk on the curved line was difficult for both genders of the 9 boys and 4 boys could not perform it, of the 7 girls and 5 girls were not able

to perform this activity and this may be due to the lack of understanding on how to walk over the line, in spite of this activity was instructed and explained well, performance of each child were not achieved till three chances tried Fig. 5. Other than this walk on curve line activity, all other activity has been either completely performed or partially performed by the boys. Whereas few of the activities could not be carried out by girls, they are standing on tiptoes (girls 3), building tower (girls2), and handling with wet objects (1 girl).

Curriculum/cognitive-based activities

Evaluation of curriculum based skills among nursery students was carried out using Astragen Syllabus. (<http://www.astragen.in/>), curriculum was designed in such a way to develop the cognitive skills, and hence we refer that as curriculum instead of cognitive skills.

Out of 16 students, 15 performed completely in activities such as fruits identification and identifying big and small objects Fig. 6. Students were comfortable with the materials such as fruits and other big and small objects, as they had experience on their day-to-day basis; hence, they found it easy to carry out and expressed huge interest toward the kind of activities. In curriculum-based activities such as letter identification 10 students out of 16 were able to do partially. We predict the reason may due to students introduced recently to letters and strokes; they

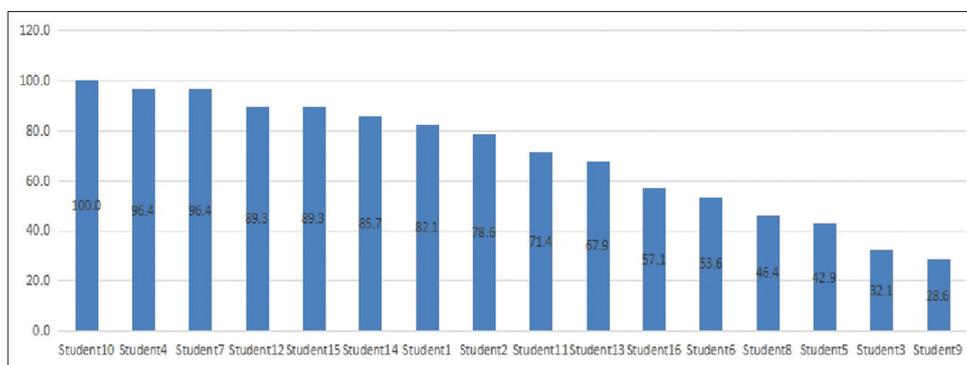


Fig. 2: Skill based grade/percentage among nursery students

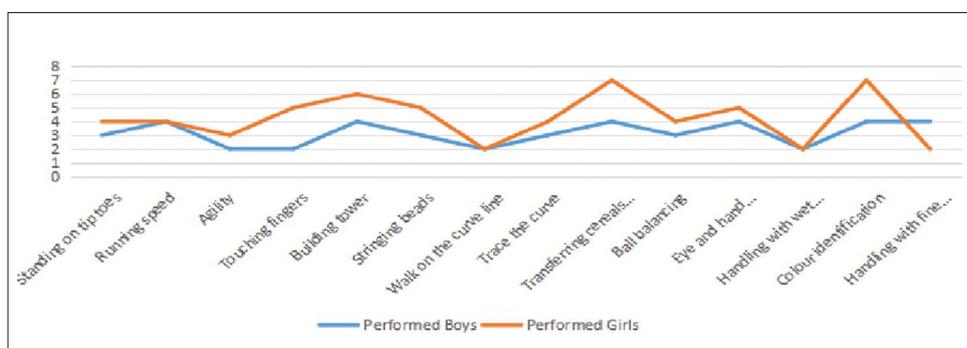


Fig. 3: Results of skill based activity among boys and girls who performed the activities completely

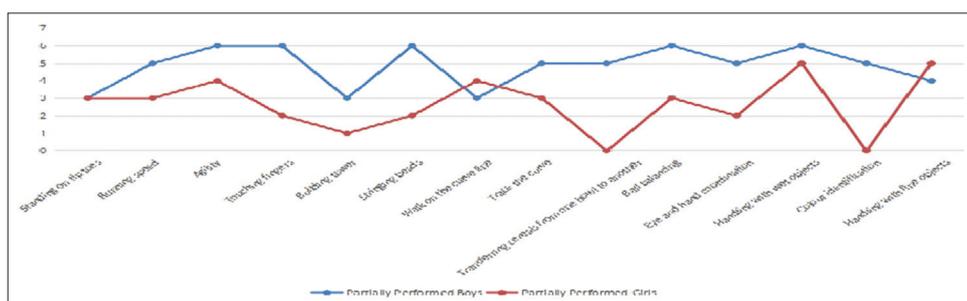


Fig. 4: Results of skill based activity among boys and girls who partially performed the activities

had little confusions on identifying the correct letter but were able to express them orally towards teachers and parents. Other curriculum-based activities such as myself introduction were conducted orally to test their communication skills but 4 students out of 16 were not able to do this activity since, the remaining students lacked behind in communication skills and 2 students were able to partially do as they can sound only their names or a single word at the time and found difficulty in expressing the sentences.

As compared to the skill based activities and curriculum-based activities student 4 scored 100% in curriculum-based activities. He was very attentive toward the multimedia classes taken in school and also had great memory skills by nature so that he could perform it with ease to achieve all curriculum-based activities, conducted by teachers online. In addition, the parenton involvement toward their child knowledge growth plays key role in skill development.

Out of 16 students, student 4 (Boy) has scored 100%, followed by student 10 (Girl) and 2 (Boy), student 7 (Boy), student 11 (Girl), student 12 (Girl), student 15 (Girl) achieved second place with 88.5%, student 1 (Boy) with 80.8%, student 14 (Girl) 73.1%, student 8 (Boy), student 13 (Girl), student 16 (Girl) 65.4%, student 6 (Boy) 57.7%, student 3 (Boy), student 5 (Boy) 53.8%, and student 9 (Boy) 38.5% Fig. 7.

The least performance was attributed to student 9 with 38.5% was found to be a slow learner and was not able to recollect what he has learn through activities. It could be due to the age factor and physical strength and found to be irregular in attendance during this academic period. Student 5 and student 3 with 53.8% were found to be little behind but performed better in curriculum-based activities than skill based activities.

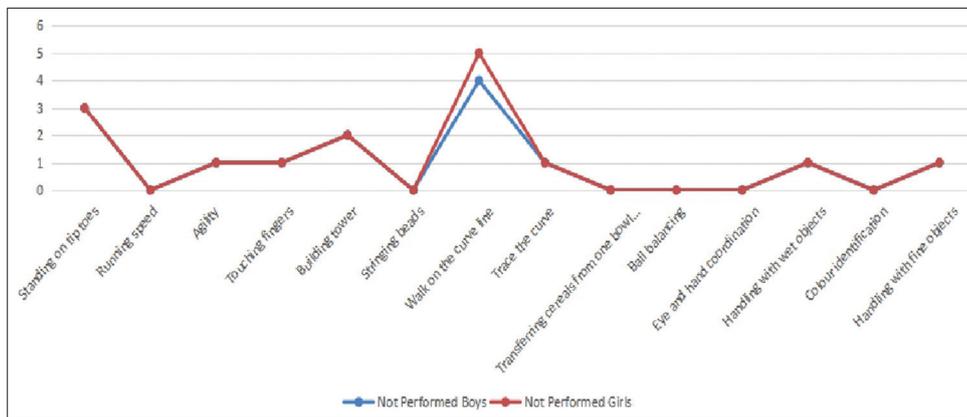


Fig. 5: Results of skill based activity among boys and girls who not performed the activities

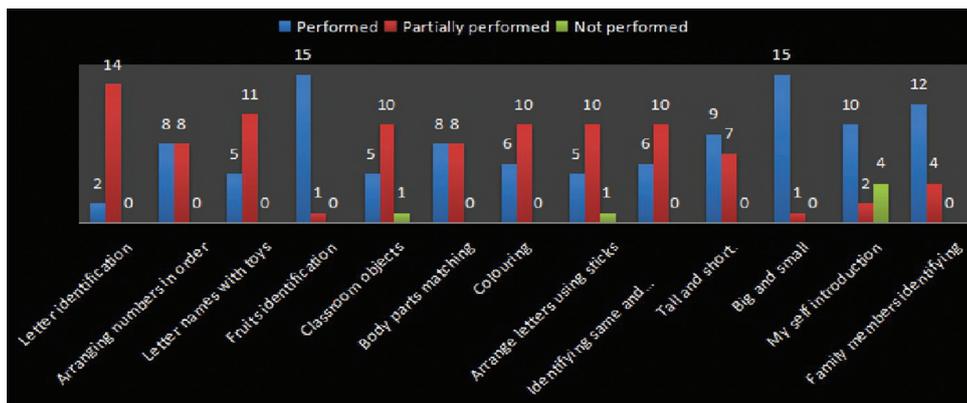


Fig. 6: Results of Curriculum-based activity among nursery students

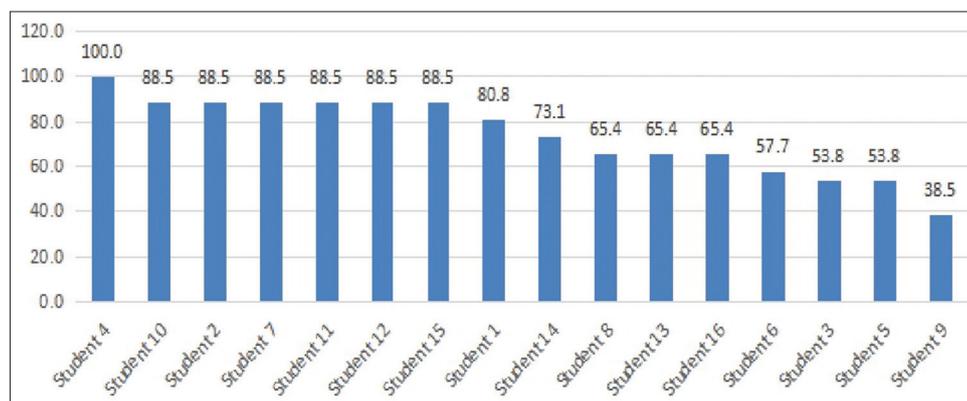


Fig. 7: Results of curriculum-based grade among nursery students

In the curriculum-based activities Fig. 8, boy's performance seems to be better than girls, especially, in activities such as fruits identification (boys 8, and girls 7), identifying same and different objects (boys 4, and girls 2), and big and small objects comparison activities (boys 8, and girls 7), whereas in few other activities such as body parts matching (boys 3, and girls 5), oral skill testing activities on introducing themselves and family members (boys 4, and girls 6), and girls performance were eventually better than boys based on the curriculum.

In curriculum-based activities under partially performed category Fig. 9 boy's performance were better than girls. In particular, activities such as identifying the classroom activities (boys 6, and girls 4), and coloring (boys 7 and girls 3) boys' performance were preferably better than girls. Few activities such as letter identification, arranging letters with sticks, identifying same and different both genders performance were parallel.

Whereas in the curriculum-based activities under the not performed level Fig. 10, boys performance lacked behind in few places such as

classroom objects identifying and arranging letters using sticks, a boy was not able to perform it, but in testing oral skill on a small introduction about them 4 boys were not able to achieve it. In this comparative study in curriculum-based activities, all the girls were able to complete it either completely or partially.

This study suggests that activity-based teaching encourages children to be more attentive and actively participate through practical activities which develop the visuomotor skills (Eye-hand coordination) [27-29]. Activity-based learning boost our children to be more creative in their own way. Added, it also helps children to understand the real life and solve realistic problems. This kind of self-directed learning process reinforces the acquisition of knowledge outside as well as inside the educational environment.

While, on the other hand, gross motor skills help children to strengthen the tenacity on their body. It also helps children to do more complex in future [30,31]. Habitually, girls perform better than boys at the early age and this was proved in many studies. Girls naturally get matured

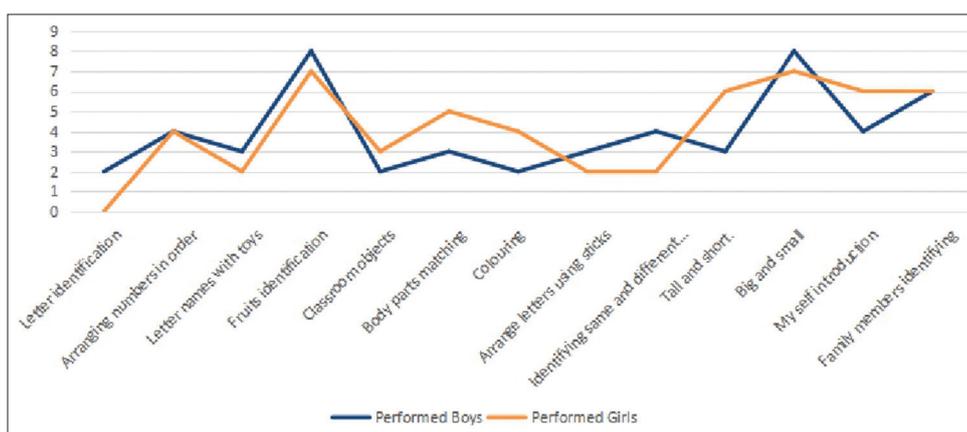


Fig. 8: Results of curriculum-based activity among boys and girls who performed the activities completely

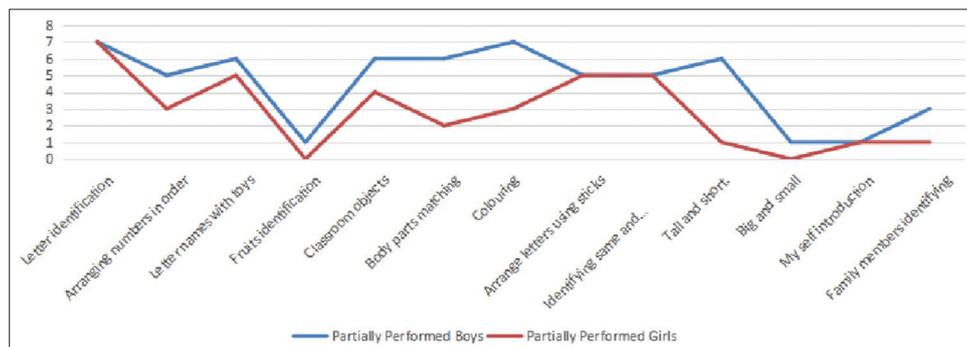


Fig. 9: Results of curriculum-based activity among boys and girls who performed the activities partially

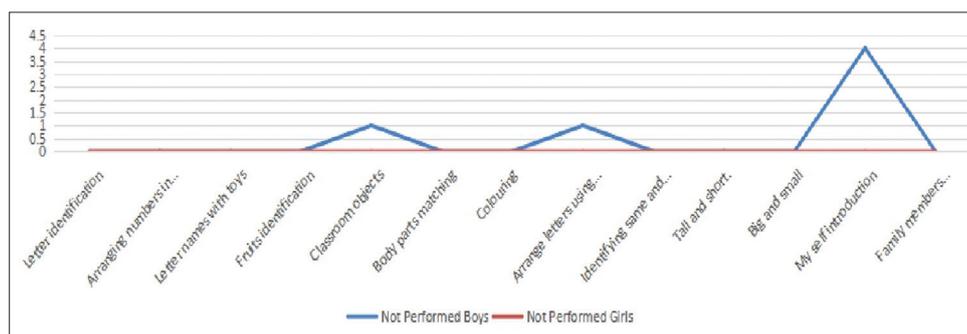


Fig. 10: Results of curriculum-based activity among boys and girls who not performed the activities

earlier while boys get matured in later stage. This study also proves that preschool children develop more target-oriented behavior, when they had a good opportunity to learn through activity-based teaching module rather than the conventional black board teaching.

According to National Institution for Transforming India (NITI AAYOG), 2016–2017 report by Government of India, Tamil Nadu state education index 73.35, ranking second position in India [31,32]. North Chennai, Tamil Nadu, is majorly occupied by middle class people and economically weaker section people. The students enrolled in our school are mostly belongs to economically weaker people, in spite of their financial constraints, they made their children study at a private institution like us, where they develop their education basement at this nursery education. We provided our students with complete skill based activities to all the childrenes irrespective of their background, they found to be successful in early academic skill achievement through our skill based activity.

CONCLUSION

This study was aimed to understand the achievement of students through activity-based teaching methodology, which improves children in both cognitive and motor skill development. We estimate that activity-based learning gives the advantage of long-term memory retention through experimentation of regular hand-on activities. It also develops the curiosity and ability of analytical thinking and understanding of each student. Further they attain social skill required for life which gives them a real life connection and encourage between others and themselves irrespective of their socio-economical background [33].

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REFERENCES

- Mickle KJ, Munro BJ, Steele JR. Gender and age affect balance performance in primary school-aged children. *J Sci Med Sport* 2011;14:243-8.
- Venetsanou F, Kamba A. The effects of age and gender on balance skills in preschool children. *Phys Educ Sport* 2011;9:81-90.
- Gallahue D, Donnely F. *Developmental Physical Education for All Children*. Champaign: Human Kinetics; 2003.
- Miyahara J, Meyers C. Early learning and development standards in East Asia and the Pacific: Experiences from eight countries. *Int J Early Child* 2008;40:17-31.
- National Council of Education Research and Training (NCERT). *National Focus Group on Early Childhood Education. Position Paper*. New Delhi: National Council of Education Research and Training; 2006.
- Chopra N. A focus on early childhood care and education to ensure fulfilment of right to education-2009. *Innov J Educ* 2015;3:7-9.
- Bharthu R, Thajudeen A. Efficacy of grip strength and hand coordination training in improvement of handwriting in school children. *Innov J Educ* 2017;5:1-5.
- Kumar NS, Fathima MP, Mohan S. Impact of neurocognition on teaching competency. *Innov J Educ* 2013;1:7-9.
- Babu A, Maiwal J. Role of an Importance of activities in school environment. *Innov J Educ* 2014;2:1-2.
- Mahar J. Study of role of the guardians in the management of primary schools. *Innov J Educ* 2014;2:3-5.
- Kaul V, Ramchandran C, Upadhaya GC. *Impact of Early Childhood Education on Retention in Primary Grades: A Longitudinal Study*. New Delhi: National Council of Educational Research and Training; 1993.
- M.S. Swaminathan Research Foundation. *Quality Matters! Understanding the Relationship between Quality of Early Childhood Education and Learning Competencies of Children: An Exploratory Study in Tamil Nadu*. Chennai: M.S. Swaminathan Research Foundation; 2000.
- Willems TM, Witvrouw E, Delbaere K, Philippaerts R, De Bourdeaudhuij I, De Clercq D. Intrinsic risk factors for inversion ankle sprains in females--a prospective study. *Scand J Med Sci Sport* 2005;15:336-45.
- Houghton Mifflin Company. *The American Heritage Medical Dictionary*. Boston: Houghton Mifflin Company; 2004. Available from: <http://www.medical-dictionary.thefreedictionary.com/motor>.
- Oswalt A. *Early Childhood Physical Development: Gross and Fine Motor Development*. Medwin Publishers; 2008.
- Benelli C, Yongue B. Supporting young children's motor development. *Child Educ* 1995;71:217-20.
- Franjoine MR, Darr N, Held SL, Kott K, Young BL. The performance of children developing typically on the pediatric balance scale. *Pediatr Phys Ther* 2010;22:350-9.
- Habib Z, Westcott S. Assessment of anthropometric factors on balance tests in children. *Pediatr Phys Ther* 1998;10:101-9.
- Bressel E, Yonker JC, Kras J, Heath EM. Comparison of static and dynamic balance in female collegiate soccer, basketball, and gymnastics athletes. *J Athl Train* 2007;42:42-6.
- Wrotniak BH, Epstein LH, Dorn JM, Jones KE, Kondilis VA. The relationship between motor proficiency and physical activity in children. *Pediatrics* 2006;118:e1758-65.
- Milanese C, Bortolami O, Bertucco M, Verlato G, Zancanaro C. Anthropometry and motor fitness in children aged 6-12 years. *J Hum Sport Exerc* 2010;5:265-79.
- Ozman JC, Gallahue DL. Motor development. In: Winnick JP, editor. *Adapted Physical Education and Sport*. Champaign, IL: Human Kinetics; 2005. p. 343-57.
- Kalaja S, Jaakkola T, Liukkonen J, Watt A. The role of gender, enjoyment, perceived physical activity competence, and fundamental movement skills as correlates of the physical activity engagement of Finnish physical education students. *Scand Sport Stud Forum* 2010;1:69-87.
- Tripathi R, Joshua AM, Kotian MS, Tedla JS. Normal motor development of Indian children on Peabody developmental motor scales-2 (PDMS-2). *Pediatr Phys Ther* 2008;20:167-72.
- Folio MR, Frewell RR. *Peabody Developmental Motor Scales*. 2nd ed. Austin, TX: Pro-Ed; 2000.
- Van Hartingsveldt MJ, Cup EH, Oostendorp RA. Reliability and validity of the fine motor scale of the Peabody developmental motor scales-2. *Occup Ther Int* 2005;12:1-13.
- Franjoine MR, Gunther JS, Taylor MJ. Pediatric balance scale: A modified version of the berg balance scale for the school-age child with mild to moderate motor impairment. *Pediatr Phys Ther* 2003;15:114-28.
- D Hont E, Deforeche B, Bourdeaudhuij ID, Lenoir M. Relationship between motor skill and body mass index in 5- to 10-year-old children. *Adapt Phys Activ Q* 2009;6:21-37.
- Goulding A, Jones IE, Taylor RW, Piggot JM, Taylor D. Dynamic and static tests of balance and postural sway in boys: Effects of previous wrist bone fractures and high adiposity. *Gait Posture* 2003;17:136-41.
- Dwyer DC, Ringstaff C, Sandholtz JH. Changes in teachers' beliefs and practices in technology-rich classrooms. *Educ Leadersh* 1991;48:45-52.
- Zhu C, Valcke M, Schellens T. A cross-cultural study of teacher perspectives on teacher roles and adoption of online collaborative learning in higher education. *Eur J Teach Educ* 2010;33:147-65.
- Kundu A. A study on Indian teachers' roles and willingness to accept educational technology. *Int J Innov Stud Sociol Humanit* 2018;3:42-52.
- Available from: <http://www.social.niti.gov.in/edu-new-ranking>.