

# Navigating Complexity: How Classroom Engagement And Environmental Contexts Shape Children's Cognitive Abilities And Behavioral Evolution

T.Sathyaseelan<sup>1</sup>, S.Brindha<sup>2</sup>, K.Sakthi Balamurugan<sup>3</sup>, M. Ramesh<sup>4</sup>, D. Sarulatha<sup>5</sup>, M. Kalaiarasan<sup>6</sup>

<sup>1</sup>Assistant Professor of English, Department of English, KPR Institute of Engineering and Technology, Coimbatore, India.

<sup>2</sup>Assistant Professor of English, Department of Languages, Gopalan College of Commerce, Bangalore, India.

<sup>3</sup>Research Scholar, Department of English, PSG College of Arts and Science, Coimbatore, India.

<sup>4</sup>Assistant Professor of English, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Chennai, India.

<sup>5</sup>Associate Professor of English, St.Joseph University, School of Science and Humanities, Palanchur, Chennai, India.

<sup>6</sup>Assistant Professor of English, Science & Humanities, KIT-Kalaingar karunanithi Institute of Technology, Coimbatore, India.

---

## Abstract

*This study investigates the impact of classroom education on the development of children's cognitive skills. Based on this aim, specific objectives and research questions have been formulated. Children with strong cognitive skills can better navigate complex situations by critically engaging with learning materials. These skills foster a creative and innovative mindset in young learners. Additionally, children's cognitive development is also influenced by their environmental surroundings, including ecological systems and socio-behavioral structures, which reflect interdisciplinary concerns of environmental science, ecology, and behavioral systematics. Classroom engagement follows a structured approach, beginning with simpler tasks and gradually advancing to more complex processes, which enhances cognitive abilities. To examine the parameters of this research, a primary method was chosen: a questionnaire comprising 10 topic-based questions and 3 demographic questions, administered to 55 participants. The data collected were analyzed using SPSS software, generating statistical and numerical insights that informed the strength of the relationships between variables and validated the study's hypotheses. Various classroom activities have been shown to enhance student engagement in the learning process, thereby improving their cognitive skills. This enhancement contributes not only to academic success but also to the ability to tackle real-world challenges effectively. The correlations identified among the variables suggest that children's cognitive skill development can be significantly fostered through effective classroom interactions. The data collection process was successful in yielding pertinent information, and the analysis further strengthened the research by providing valuable insights.*

**Keywords:** *Cognitive development, Classroom engagement, Ecology, Behavior, Environmental science, Evolution, Geology, Systematics*

---

## 1. INTRODUCTION

Cognitive skills are highly important to provide the foundation of growth among children which can help them acquire success in future events. In the development of cognitive skills among children, classroom activities and engagement processes help in an effective way (Pedler et al., 2020). It can be seen that; the academic development of a child and their cognitive development are interconnected and one influences the other in an effective way. Thus, engagement in classrooms is paramount for children which can help them develop knowledge and skills from in-person interaction and real-world experiences.

Engagement in the classroom can relieve students from social isolation which improves their mood, and motivation to learn new things every day and perform well in every aspect of life. Cognitive skill helps children think uniquely and improve their innovation ability (Wang & Hofkens, 2020). In this process, classroom engagement helps immensely as the interaction between teachers and students, as well as peer interconnections help to develop the ability of critical thinking. Besides that, the classroom proved to be the best place to get adequate resources for the growth of mind and skills that not only increase academic performances but also improve the all-round development of children.



**Figure 1: Needs of children during cognitive development**

Classrooms provide the required tools and support in developing the cognitive ability of children; however, few issues can be observed that demotivate young learners to engage in a classroom in a better way. According to, Wong & Liem (2022), students face challenges in classrooms from peers as a form of bully that reduces their free will to interact with everyone positively. This hinders their ability to develop new skill sets, learn mindfully, deliver the best result to teachers and increase academic performance. This has become a problem due to a lack of cultural understanding of students and differences in perception (Bowden et al., 2021). This can be managed through the teacher-student interaction to deliver the knowledge of differences in cultures, races, languages and other matters that can trigger the bullying mentality of students. Teachers are primarily responsible for the social, personal and educational well-being of young learners and proper classroom interaction is highly effective for them to increase their satisfaction and motivate them to achieve all the mentioned benefits (Kim et al., 2020). The development of cognitive skills in educational environments can be seen through the lens of environmental science. Classroom spaces act as structured ecosystems where interactions, resource availability, and behavioral patterns evolve—paralleling ecological models. Geographical location and geological environments further influence access to education and engagement, especially in rural or disaster-prone regions, making environmental context a critical factor.

### 1.1 Aim

The aim of this study is to evaluate the role of classroom education in the cognitive skill development of children. The aim here helped in setting objectives and questions for this research that can help in collecting evidence effectively.

### 1.2 Objectives

**RO 1:** To understand the importance of increasing cognitive skills in children

**RO 2:** To evaluate the way of increasing cognitive skills in children through classroom engagement

**RO 3:** To discuss the challenging areas faced by children in classrooms that can hamper cognitive skill development

**RO 4:** To identify the processes to improve the classroom learning session by mitigating challenges and ensuring a better learning experience for the development of cognitive skills of children

### 1.3 Research Question

**RQ 1:** Why cognitive skill is so important for children at an early age?

**RQ 2:** How can classroom engagements help children in developing cognitive skills?

**RQ 3:** What are the challenges children face in classroom settings that hamper their positive cognitive development?

**RQ 4:** How to mitigate the challenges in classrooms for better learning experiences for the development of cognitive skills of children?

### Hypothesis

**H 1:** Teaching method in classrooms has a positive correlation with the cognitive skill development of children

**H 2:** There is a positive and strong linkage between the curriculum content formation in classrooms and the cognitive skill development of children

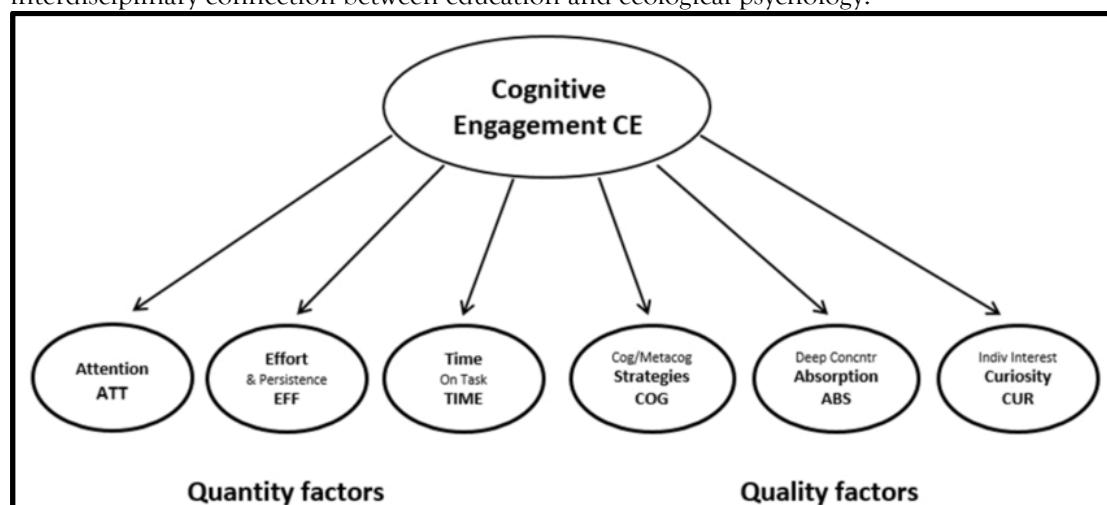
**H 3:** Teacher-student interaction forms a correlation with the cognitive skill development of students in a positive way.

Understanding the impact of classroom engagement in the development of cognitive skills of children is important for individuals such as parents, teachers and children themselves. The young learner is basically vulnerable and prioritising their feelings, emotional condition and ability to learn in a classroom setting is vital to ensure their proper cognitive skill development (Nepal & Rogerson, 2020). This study, thus, can help fellow researchers in developing knowledge in future regarding the similar matters. It is also able to inform those who seek knowledge regarding the best of improve cognitive skills among children. These versatile roles prove the importance of this research and the purpose of this study can be justified properly.

## 2. LITERATURE REVIEW

### 2.1. Importance of increasing cognitive skills in children

Cognitive skill development holds a paramount value as it helps children think critically and solve problems voluntarily. As per the comment of, Liu et al., (2023), it can be seen that analysing information and making informed decisions through proper evaluation of different available options is possible for children through the development of cognitive skills. These abilities are not only helpful in the academic section but also effective in real-life situations where they are able to navigate challenges, make choices during crises and adapt to new situations effectively. According to, Peng & Kievit (2020), children with strong cognitive abilities are able to comprehend difficult situations by engaging critically with materials that help them in performing well in different aspects. It can also be seen that the development of cognitive skills among children helps them interact socially and develop communication abilities. Through the development of cognitive skills, children are better equipped to understand emotional regulation that helps them realise viewpoints of others, show empathy, and express their ideas properly to navigate social relationships. These social interactions also reflect behavioral systematics, where patterns of behavior evolve over time due to environmental pressures and peer influence, reinforcing the interdisciplinary connection between education and ecological psychology.



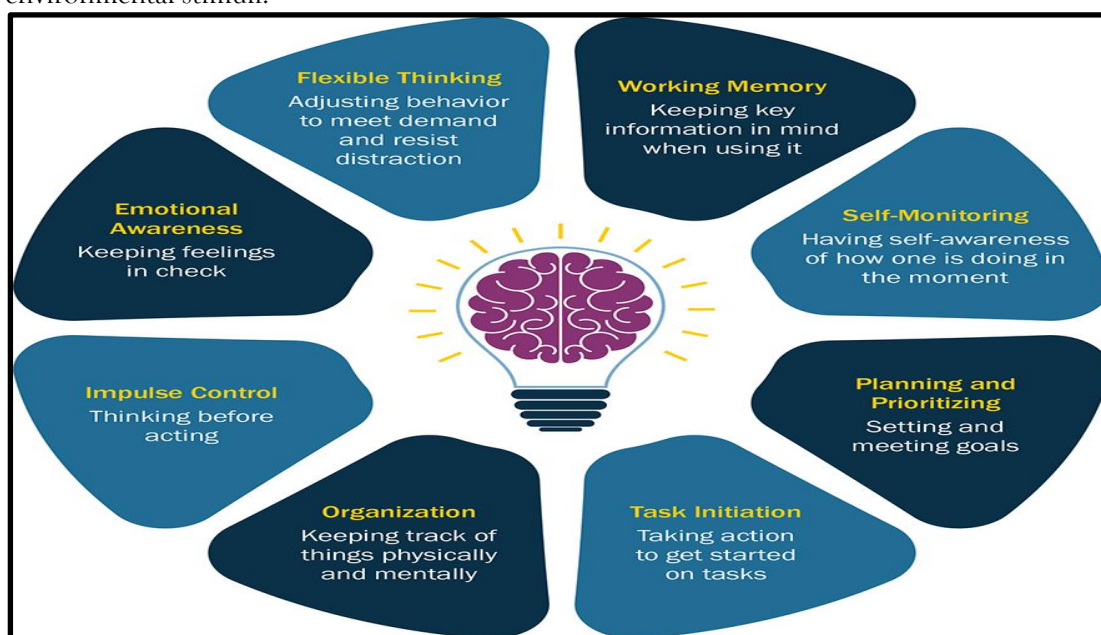
**Figure 2: Types of engagement during cognitive development of children**

On the other hand, the job of strong cognitive skills is to implement a creative and innovative mindset in children. In this context, Bamicha & Drigas (2022), mentioned that the cognitive development of a child nurtures its ability in exploring new ideas, experimenting with diversified approaches and use self-developed knowledge in various fields. Original expression to solve problems of flexibility and navigating challenging situations can be highly influenced by cognitive development in children. As opined by, Andreoni et al., (2020), cognitive skill empowers individuals with tools that can help them in learning new things and adapt with changing situations in life long. In the age of rapid changes globally, it is highly important to have the strengths to acquire knowledge faster and in a proper way to achieve new skills and adapt to different circumstances. Where the development of cognitive skills helps children by encouraging them to get involved in imaginative thinking it also empowers executive function skills (Kokol et al., 2020). Children are able to plan different things and manage time effectively by incorporating self-control processes and organising skills effectively. Educational development, therefore, is not isolated but

intertwined with broader ecological and evolutionary systems where behavior is both an outcome and a driver of change.

## 2.2. Evaluating the ways of increasing cognitive skills in children through classroom engagement

Classroom engagement has a paramount role in improving the cognitive skills of children as it provides proper structure and environment for meaningful experiences of young learners. Activities and engagement processes in classrooms mostly involve hands-on activities interactive exercises as well as group discussion facilities that encourage each child to participate actively and explore different areas to increase knowledge (Stadsleiv, 2020). It can be seen that direct interaction and involvement of children in learning tasks help them applying their cognitive understanding, improve attention, memory power and the ability of solving problems in real-world contexts. It can be seen that classroom engagement has a particular structure that engages children to start with similar tasks and move forward with complex processes (Cabrera et al., 2020). This process of gradually moving towards the complex task-solving system through proper guidance of teachers helps them breaking down concepts properly and understand the way to manage it step adequately. This structured advancement is conceptually similar to developmental stages observed in evolutionary biology, where learning systems evolve in complexity based on external environmental stimuli.



**Figure 3: Benefit of improved cognitive skills of children**

In classroom settings, teachers offer scaffolding techniques for students that include building knowledge through questioning and prompting properly. This has a paramount benefit to indulge children and make them use cognitive understandings properly (Hutton et al., 2020). In classrooms, children are able to understand the development procedure of others which has them analysing their position in the academic section. This provokes a mindset of healthy competition which ultimately results in positive academic success (Critten et al., 2022). Children are able to develop their cognitive skills by learning the ways of analysing information critically, assessing supporting evidences, and formulating well-reasoned arguments through debates, role-playing exercises, and inquiry-based projects.

## 2.3. Challenging areas faced by children in classrooms that can hamper cognitive skill development

Cognitive skill development in children can be hampered due to various challenges, that they face in classrooms. As per the comment of, Wen (2021), it can be seen that children have their individual ability to learn and adapt skills at their own pace however a particular curriculum for all can impose challenges for students to learn at the same place which demotivate them and reduce the interest to engage in classroom activities. Children with the need of personalised learning approaches for better development of their cognitive skills often face difficulties due to the instructional approach of teachers in classrooms. On the other hand, Woods et al., (2021), mentioned that the activities at materials used in classrooms are sometimes unable to fit the interests and abilities of a child which leads to the engagement rate of students in classrooms. These factors interest children to get engaged with group discussion and other learning activities which result in poor performance in the academic section as well as cognitive skill

development part. A multifaceted strategy that places an emphasis on individualised instruction, active engagement, and meaningful assessment practices is needed to address these difficult areas.

Classrooms often impose a standardise way of detecting the progress of children such as exams and providing grades which can increase pressure and force students to memorise complex learning materials which hinder their critical thinking ability. In this content, Goldstone et al., (2020), mentioned that the importance of memorising study materials over a deeper understanding of subjects and facts can undermine motivation level as well as curiosity and creativity which can negatively impact the development of cognitive skills. It can be seen that some classrooms failed to acquire hand-on exploration of subject matters and enquiry-based learning systems. This posits a thread on the smooth development of cognitive skills as children are unable to make precise decisions through critical thinking and innovative approaches (Alam et al., 2020). Thus, acknowledging the challenges is important for teachers and school authorities to provide a learning environment that can support the cognitive development of children through classroom engagement.

### 3. METHODOLOGY

Classroom engagement has a positive benefit on the development of cognitive skills of children and understanding the factors influence the engagement in classroom is highly required. In order to understand all the parameters in this research to evaluate the key elements effectively, collecting proper evidence is highly important for which primary method has been selected. The role of the primary data collection method is to provide real-time information (Tzagkarakis & Kritas, 2023). On the other hand, the primary data has been collected by following the quantitative method in which the survey has conducted in this study. A questionnaire has been prepared that consists 10 topics-based and 3 demographic questions for participants [Referred to Appendix 1]. The close-ended questions in the survey have helped in collecting the views of participants in an effective way that required minimal time for the completion of the overall process. In order to collect the data, the study has selected 55 participants randomly. The collected data have analysed later through the use of SPSS software that helped in generating statistical and numerical information for the study.

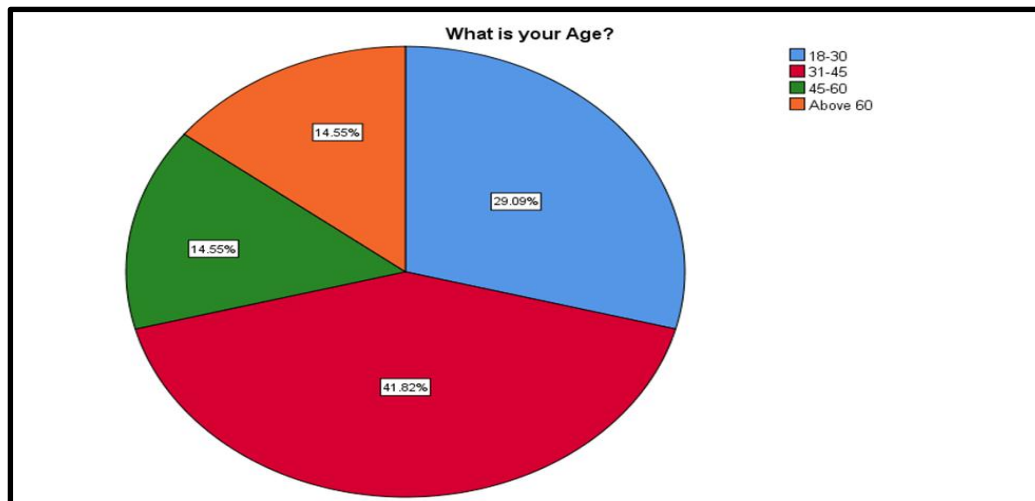
### 4. Findings and Analysis

#### 4.1. Demographic analysis

		What is your Age?			Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	18-30	16	29.1	29.1	29.1
	31-45	23	41.8	41.8	70.9
	45-60	8	14.5	14.5	85.5
	Above 60	8	14.5	14.5	100.0
	Total	55	100.0	100.0	

**Table 1: Distribution of age**

The age distribution of people who took part in the survey can be analysed through the “What is your age?” of demographic analysis. Table 1 reflects numeric values of the age distribution of population took part in the survey. Among all 55 participants, the highest number of people, 23, belonged to the age group of 31-45. 16 people out of all have belonged to the age group of 18-30. In both the age groups of 45-60 and above 60, the number of participations was the same which was only 8.



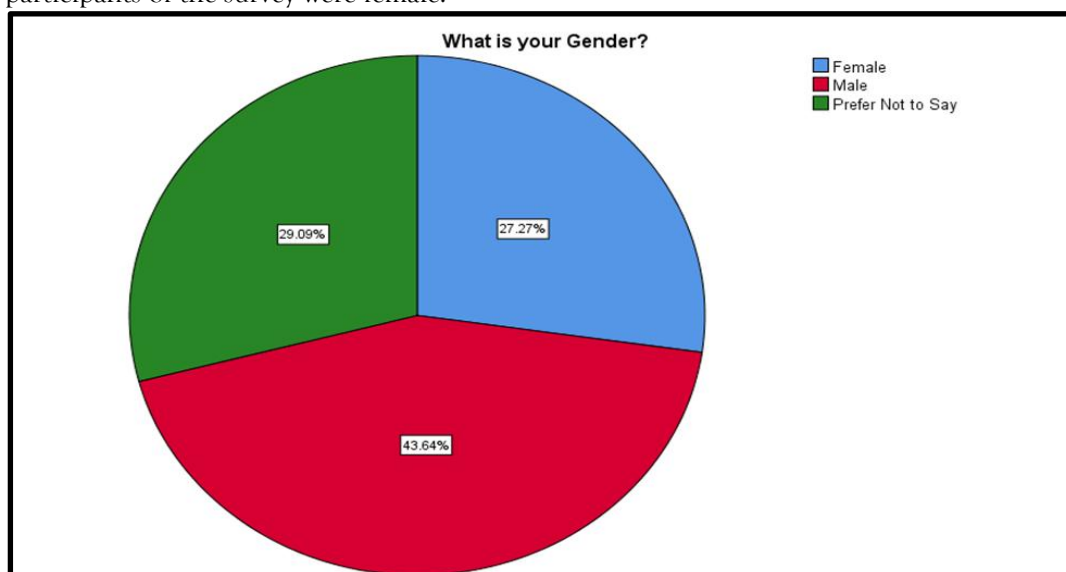
**Figure 4: Distribution of age**

Figure 4 is reflecting numeric values of the age distribution of population who took part in the survey. In 100% participation, the highest number of people, 41.82%, belonged to the age group of 31-45. 29.09% of people out of all were belonged to the age group of 18-30. In both the age groups of 45-60 and above 60, the number of participations was the same which was only 14.55%.

What is your Gender?				
		Frequency	Percent	Cumulative Percent
Valid	Female	15	27.3	27.3
	Male	24	43.6	70.9
	Prefer Not to Say	16	29.1	100.0
	Total	55	100.0	100.0

**Table 2: Distribution of Gender**

The gender distribution of people took part in the survey can be analysed through “What is your gender?” of demographic analysis. Table 2 is reflecting numeric values of gender distribution of the population took part in the survey. Among all 55 participants, the highest number of people, 24, belonged to the gender group of Male. 15 people out of all, preferred not to disclose their gender identity and 16 participants of the survey were female.



**Figure 5: Distribution of Gender**



Figure 5 is reflecting numeric values of gender distribution of population took part in the survey. In 100% participation, the highest number of people, 43.64%, belonged to the gender group of Male. 29.09% of people out of all, preferred not to disclose their gender identity and 27.27% of participants of the survey were female.

#### 4.2. Professions of participants

What is your Profession?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Corporate worker	8	14.5	14.5	14.5
	Professor	22	40.0	40.0	54.5
	School Teacher	8	14.5	14.5	69.1
	Student	17	30.9	30.9	100.0
	Total	55	100.0	100.0	

Table 3: Professions of participants

The profession of people who took part in the survey can be analysed through the demographic analysis of “What is your profession?” Table 3 highlights the professions of all 55 participants in which the maximum number of people, 22, were professors. 17 people were students and 8 people took part from both the professional group of corporate workers and School teachers.

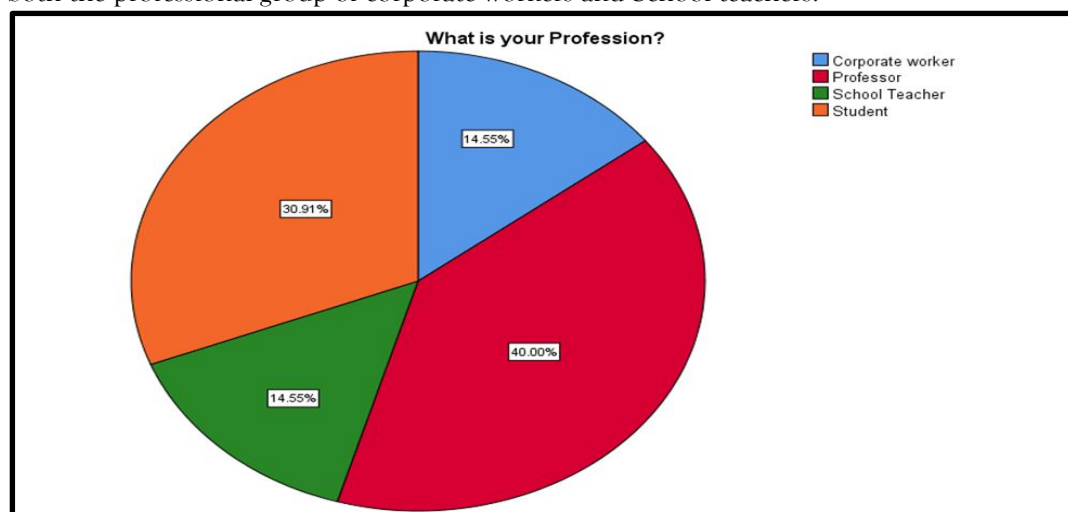


Figure 6: Professions of participants

Figure 6 highlights the professions of all 55 participants in which the maximum number of people, 40%, were professors. 30.91% of people were students and 14.55% of people took part from both the professional group of corporate workers and School teachers.

Descriptive Statistics											
	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error	
cognitive skill development in children (DV)	55	1	5	3.45	1.412	1.993	-.539	.322	-1.014	.634	
Teaching method in classroom (IV 1)	55	1	5	3.40	1.435	2.059	-.435	.322	-1.188	.634	
Curriculum content (IV 2)	55	1	5	3.45	1.412	1.993	-.539	.322	-1.014	.634	
Teacher student interaction (IV 3)	55	1	5	3.44	1.424	2.028	-.505	.322	-1.094	.634	

Table 4: Descriptive analysis

Descriptive analysis needs to be performed to deduct numeric and statistical information in a summarised way. The description of gathered data can be indicated through the use of “mean” “median” “sum”, “kurtosis” and “skewness” values. The median value in the analysis ranged between 4 to 5 indicating that the maximum people chose strongly agree and agree against each survey question. The positive and negative values of skewness intercept that the dataset in this research has not so long or short, but rather medium-sized tail. The value of kurtosis also belonged to both negative and positive as seen in table 4 which depicts that the dataset has a neither so thin nor nor so thick tail.

#### 4.3 Regression analysis

Model Summary <sup>a</sup>										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change	Durbin-Watson
						F Change	df1	df2		
1	.841 <sup>a</sup>	.707	.702	.771	.707	127.980	1	53	.000	2.148

a. Predictors: (Constant), Teaching method in classroom (IV 1)  
b. Dependent Variable: cognitive skill development in children (DV)

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	76.115	1	76.115	127.980	.000 <sup>b</sup>
	Residual	31.521	53	.595		
	Total	107.636	54			

a. Dependent Variable: cognitive skill development in children (DV)  
b. Predictors: (Constant), Teaching method in classroom (IV 1)

Coefficients <sup>a</sup>					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.642	.270		.2381
	Teaching method in classroom (IV 1)	.827	.073	.841	.000

a. Dependent Variable: cognitive skill development in children (DV)

Table 5: Linear regression of hypothesis 1

Table 5 depicts the relation between the DV “cognitive skill development of children” and the IV 1 “Teaching method in classrooms”. The values of R, R Square, and Adjusted R Square are presented in the graphical representation in Table 5 which are 0.841, 0.707 and 0.701 respectively. The value of R helps in detecting the strength of the chosen variables in this hypothesis. The positive value of R reveals that the relation formed between the chosen IV and the DV is strong. The value of Durbin-Watson is 2.148 which is near to the value of 2 and indicates that there is no autocorrelation formed between variables in hypothesis 1 (Joshi et al., 2023). The significant value also holds importance and the value here is .000 which is less than 0.005. This helps in reflecting that hypothesis 1 is accepted in this study.

Model Summary <sup>a</sup>										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change	Durbin-Watson
						F Change	df1	df2		
1	1.000 <sup>a</sup>	1.000	1.000	.000	1.000	.	1	53	.	<sup>b</sup>

a. Predictors: (Constant), Curriculum content (IV 2)  
b. Not computed because there is no residual variance.  
c. Dependent Variable: cognitive skill development in children (DV)

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	107.636	1	107.636	.	<sup>b</sup>
	Residual	.000	53	.000		
	Total	107.636	54			

a. Dependent Variable: cognitive skill development in children (DV)  
b. Predictors: (Constant), Curriculum content (IV 2)

Coefficients <sup>a</sup>					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.000	.000		.
	Curriculum content (IV 2)	1.000	.000	1.000	.

a. Dependent Variable: cognitive skill development in children (DV)

Table 6: Linear regression of Hypothesis 2



Table 6 depicts the relation between the DV “cognitive skill development of children” and the IV 2 “Curriculum content”. The values of R, R Square, and Adjusted R Square are presented on the graphical representation in Table 6 which is 1 in every case. The value of R helps in detecting the strength of the chosen variables in this hypothesis. The positive value of R reveals that the relation formed between the chosen IV and the DV is strong. The value of Durbin-Watson is not generated after analysis which reveals that a correlation is not possible between the chosen variables in hypothesis 2. The significant value also holds importance and the value here is not generated here. This helps in reflecting that hypothesis 2 is not positively accepted in this study.

not positively accepted in this study.

Model Summary <sup>b</sup>										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change	Durbin-Watson
						F Change	df1	df2		
1	.857 <sup>a</sup>	.735	.730	.734	.735	147.059	1	53	.000	2.101

a. Predictors: (Constant), Teacher student interaction (IV 3)

b. Dependent Variable: cognitive skill development in children (DV)

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79.121	1	79.121	147.059	.000 <sup>b</sup>
	Residual	28.515	53	.538		
	Total	107.636	54			

a. Dependent Variable: cognitive skill development in children (DV)

b. Predictors: (Constant), Teacher student interaction (IV 3)

Coefficients <sup>a</sup>									
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	.534	.260		2.050	.045			
	Teacher student interaction (IV 3)	.850	.070	.857	12.127	.000	.857	.857	.857

a. Dependent Variable: cognitive skill development in children (DV)

Table 7: Linear regression of hypothesis 3

Table 7 depicts the relation between the DV “cognitive skill development of children” and the IV 3 “Teacher-student interaction”. The values of R, R Square, and Adjusted R Square are presented in the graphical representation in Table 7 which are 0.857, 0.735 and 0.734 respectively. The value of R helps in detecting the strength of the chosen variables in this hypothesis. The positive value of R reveals that the relation formed between the chosen IV and the DV is strong (Kamel & Abonazel, 2023). The value of Durbin-Watson is 2.101 which is near to the value of 2 and indicates that there is no autocorrelation formed between variables in hypothesis 3. “R-Square “shown in Table 7 is 73.5% which indicates that the way teacher-student interactions in classrooms can influence the development of cognitive skills of children. The significant value also holds importance and the value here is .000 which is less than 0.005. This helps in reflecting that hypothesis 3 is accepted in this study.

Correlations					
		cognitive skill development in children (DV)	Teaching method in classroom (IV 1)	Curriculum content (IV 2)	Teacher student interaction (IV 3)
cognitive skill development in children (DV)	Pearson Correlation	1	.841**	1.000**	.857**
	Sig. (1-tailed)		.000	.000	.000
	N	55	55	55	55
Teaching method in classroom (IV 1)	Pearson Correlation	.841**	1	.841**	.982**
	Sig. (1-tailed)	.000		.000	.000
	N	55	55	55	55
Curriculum content (IV 2)	Pearson Correlation	1.000**	.841**	1	.857**
	Sig. (1-tailed)	.000	.000		.000
	N	55	55	55	55
Teacher student interaction (IV 3)	Pearson Correlation	.857**	.982**	.857**	1
	Sig. (1-tailed)	.000	.000	.000	
	N	55	55	55	55

\*\* . Correlation is significant at the 0.01 level (1-tailed).

Table 8: Correlation Test

The coefficient in the correlation analysis helps to analyse the strength between independent variables and dependable variables in this study. Table 5 shows the result generated from correlation analysis through the primary analysis method. The value of Pearson nears the value +1 indicates the positive correlation formed between dependable and all independent variables. The values here are 0.841, 1, and 0.857 for IV 1, IV 2 and IV 3 depicting that the IVs are able to build a strong positive correlation with the DV in this study.

#### 4.4. DISCUSSION

Different activities in classrooms increase the engagement of students with learning process that increase their engagement rate. This helps in boosting cognitive skills effectively that help in not only succeeding on academic front, but also helps to increase the strength of handling real-world problems effectively (Stengelin et al., 2023). The analysis of this study accepted the hypotheses that prove that the formation of curriculum in the classroom, teacher-student interaction and teaching methods are able to positively influence the cognitive development of children. The formed correlation between variables posits that cognitive skill development of children are indeed possible through effective classroom interaction where teachers are responsible to provide proper resources, educational support and monitor progress rate of individuals. Furthermore, classroom engagement can be mapped to ecological principles such as feedback loops and system adaptability, where each learner's input contributes to the dynamic equilibrium of the classroom environment. Understanding these interactions can offer a systematic perspective on educational behavior.

It is also important to maintain harmony in classroom that can motivate pupils in engaging in group discussion and team-based projects without dealing with negative factors like bullying or ragging by others. Despite having strength, classroom interaction sometimes imposes challenges in children to develop cognitive skills (Ondog & Kilag, 2023). A particular structure of learning for all failed to analyse different ability of gathering knowledge by individual pupils. The lack of support from teachers with adequate resources and study materials can also impose challenges to develop knowledges (Cabrera et al., 2020). Biassed attitude of teachers can also demotivate students to engage in classroom activities willingly. These situations need to be handled by teachers and school authorities by understanding diversified needs in classroom. Different learning pace and ability is needed to understand before making curriculum. Incorporating most of the learning material with easy to moderate level materials and incorporate some of the complex educational content for fast earners can help in satisfying everyone's need (Kim et al., 2020). Through this process the approach of improving the ability of improving cognitive school from classroom engagement of children can be ensured.

#### 5. CONCLUSION

This study has evaluated the basic of cognitive skill development procedure among children through the proper engagement in classroom settings. The data collection process proven to be effective to generate relevant information for this study and analysis process has also helps in boosting the value of this research by generating valuable insights. The formation of the hypotheses are accepted in this study as seen in findings section that proves that the cognitive skill, of student are able to improve through the influence of proper teacher-student interaction, proper formation of classroom curriculum, and teaching method followed by teachers in classes. It can be seen that, cognitive skill of children has a high value in their mental development that help in increasing the ability of thinking critically, solving problems voluntarily and stay calm in challenging situation. This study also elaborated the way different challenges faced by students in the cognitive skull development and learning in classroom settings as well as described the process of mitigating them effectively. Positioning classroom learning within an ecological and environmental science framework reveals the interdependence between learner behavior and environmental structure. These findings align with ecological system theory and behavioral evolution in structured learning ecosystems.

## REFERENCES

1. Alam, M. A., Richard, S. A., Fahim, S. M., Mahfuz, M., Nahar, B., Das, S., ... & Ahmed, T. (2020). Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study. *PloS one*, 15(1), e0227839. <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0227839&type=printable>
2. Andreoni, J., Di Girolamo, A., List, J. A., Mackevicius, C., & Samek, A. (2020). Risk preferences of children and adolescents in relation to gender, cognitive skills, soft skills, and executive functions. *Journal of economic behavior & organization*, 179, 729-742. [https://www.nber.org/system/files/working\\_papers/w25723/w25723.pdf](https://www.nber.org/system/files/working_papers/w25723/w25723.pdf)
3. Bamicha, V., & Drigas, A. (2022). ToM & ASD: The interconnection of Theory of Mind with the social-emotional, cognitive development of children with Autism Spectrum Disorder. The use of ICTs as an alternative form of intervention in ASD. *Technium Social Sciences Journal*, 33, 42-72. <https://www.techniumscience.com/index.php/socialsciences/article/download/6845/2426>
4. Bowden, J. L. H., Tickle, L., & Naumann, K. (2021). The four pillars of tertiary student engagement and success: a holistic measurement approach. *Studies in Higher Education*, 46(6), 1207-1224. <https://www.tandfonline.com/doi/pdf/10.1080/03075079.2019.1672647>
5. Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In *Handbook of Child Psychology* (Vol. 1, pp. 793-828). Wiley. <https://doi.org/10.1002/9780470147658.chpsy0114>
6. Cabrera, N. J., Jeong Moon, U., Fagan, J., West, J., & Aldoney, D. (2020). Cognitive stimulation at home and in child care and children's preacademic skills in two-parent families. *Child Development*, 91(5), 1709-1717. [https://www.researchgate.net/profile/Natasha-Cabrera-2/publication/343220106\\_Cognitive\\_Stimulation\\_at\\_Home\\_and\\_in\\_Child\\_Care\\_and\\_Children%27s\\_Preacademic\\_Skills\\_in\\_Two-Parent\\_Families/links/5f26d529a6fdcccc43a47683/Cognitive-Stimulation-at-Home-and-in-Child-Care-and-Childrens-Preacademic-Skills-in-Two-Parent-Families.pdf](https://www.researchgate.net/profile/Natasha-Cabrera-2/publication/343220106_Cognitive_Stimulation_at_Home_and_in_Child_Care_and_Children%27s_Preacademic_Skills_in_Two-Parent_Families/links/5f26d529a6fdcccc43a47683/Cognitive-Stimulation-at-Home-and-in-Child-Care-and-Childrens-Preacademic-Skills-in-Two-Parent-Families.pdf)
7. Chawla, L. (2015). Benefits of nature contact for children. *Journal of Planning Literature*, 30(4), 433-452. <https://doi.org/10.1177/0885412215595441>
8. Critten, V., Hagon, H., & Messer, D. (2022). Can pre-school children learn programming and coding through guided play activities? A case study in computational thinking. *Early Childhood Education Journal*, 50(6), 969-981. <https://link.springer.com/content/pdf/10.1007/s10643-021-01236-8.pdf>
9. Goldstone, A., Javitz, H. S., Claudatos, S. A., Buysse, D. J., Hasler, B. P., de Zambotti, M., ... & Baker, F. C. (2020). Sleep disturbance predicts depression symptoms in early adolescence: initial findings from the adolescent brain cognitive development study. *Journal of Adolescent Health*, 66(5), 567-574. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7183901/>
10. Hutton, J. S., Dudley, J., Horowitz-Kraus, T., DeWitt, T., & Holland, S. K. (2020). Associations between home literacy environment, brain white matter integrity and cognitive abilities in preschool-age children. *Acta Paediatrica*, 109(7), 1376-1386. <https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/apa.15124>
11. Joshi, P., Kalita, A., & Gurusamy, M. (2023). Reliable and Efficient Data Collection in UAV-based IoT Networks. *arXiv preprint arXiv:2311.05303*. <https://www.nature.com/articles/s41598-023-39366-1.pdf>
12. Kamel, A. R., & Abonazel, M. R. (2023). A Simple Introduction to Regression Modeling using R. *Computational Journal of Mathematical and Statistical Sciences*, 2(1), 52-79. [https://cjmss.journals.ekb.eg/article\\_286631\\_a0dd46412c0427de66efe26962e6b549.pdf](https://cjmss.journals.ekb.eg/article_286631_a0dd46412c0427de66efe26962e6b549.pdf)
13. Kim, H. J., Yi, P., & Hong, J. I. (2020). Students' academic use of mobile technology and higher-order thinking skills: The role of active engagement. *Education Sciences*, 10(3), 47. <https://www.mdpi.com/2227-7102/10/3/47/pdf>
14. Kokol, P., Vošner, H. B., Završnik, J., Vermeulen, J., Shohieb, S., & Peinemann, F. (2020). Serious game-based intervention for children with developmental disabilities. *Current pediatric reviews*, 16(1), 26-32. <https://www.academia.edu/download/93227298/157339631566619080811523820221028-1-v6q6fs.pdf>
15. Liu, K., Yao, J., Tao, D., & Yang, T. (2023). Influence of individual-technology-task-environment fit on university student online learning performance: The mediating role of behavioral, emotional, and cognitive engagement. *Education and Information Technologies*, 1-20. <https://link.springer.com/content/pdf/10.1007/s10639-023-11833-2.pdf>
16. Nepal, R., & Rogerson, A. M. (2020). From theory to practice of promoting student engagement in business and law-related disciplines: The case of undergraduate economics education. *Education Sciences*, 10(8), 205. <https://www.mdpi.com/2227-7102/10/8/205/pdf>
17. Ondog, J., & Kilag, O. K. (2023). A Constructivist Framework for Early Grade Numeracy: Drawing on Jean Piaget's Cognitive Development Theory. *Excellencia: International Multi-disciplinary Journal of Education* (2994-9521), 1(4), 308-320. <https://multijournals.org/index.php/excellencia-imje/article/download/67/75>
18. Pedler, M., Hudson, S., & Yeigh, T. (2020). The teachers' role in student engagement: A review. *Australian Journal of Teacher Education* (Online), 45(3), 48-62. <https://files.eric.ed.gov/fulltext/EJ1256902.pdf>
19. Peng, P., & Kievit, R. A. (2020). The development of academic achievement and cognitive abilities: A bidirectional perspective. *Child Development Perspectives*, 14(1), 15-20. <https://srcd.onlinelibrary.wiley.com/doi/pdf/10.1111/cdep.12352>
20. Stadskleiv, K. (2020). Cognitive functioning in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 62(3), 283-289. <https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/dmcn.14463>
21. Stengelin, R., Haun, D. B., & Kanngiesser, P. (2023). Simulating peers: Can puppets simulate peer interactions in studies on children's socio-cognitive development?. *Child Development*, 94(5), 1117-1135. <https://srcd.onlinelibrary.wiley.com/doi/pdf/10.1111/cdev.13913>
22. Tzagarakis, S. I., & Kritas, D. (2023). Mixed research methods in political science and governance: approaches and applications. *Quality & quantity*, 57(Suppl 1), 39-53. <https://link.springer.com/content/pdf/10.1007/s11135-022-01384-y.pdf>
23. Wang, M. T., & Hofkens, T. L. (2020). Beyond classroom academics: A school-wide and multi-contextual perspective on student engagement in school. *Adolescent Research Review*, 5, 419-433. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7732163/>

24. Wen, Y. (2021). Augmented reality enhanced cognitive engagement: Designing classroom-based collaborative learning activities for young language learners. *Educational Technology Research and Development*, 69(2), 843-860. [https://www.researchgate.net/profile/Yun-Wen-5/publication/346392943\\_Augmented\\_reality\\_enhanced\\_cognitive\\_engagement\\_designing\\_classroom-based\\_collaborative\\_learning\\_activities\\_for\\_young\\_language\\_learners/links/5fbf7bc792851c933f5d4ac1/Augmented-reality-enhanced-cognitive-engagement-designing-classroom-based-collaborative-learningactivities-for-young-language-learners.pdf](https://www.researchgate.net/profile/Yun-Wen-5/publication/346392943_Augmented_reality_enhanced_cognitive_engagement_designing_classroom-based_collaborative_learning_activities_for_young_language_learners/links/5fbf7bc792851c933f5d4ac1/Augmented-reality-enhanced-cognitive-engagement-designing-classroom-based-collaborative-learningactivities-for-young-language-learners.pdf)
25. Wong, Z. Y., & Liem, G. A. D. (2022). Student engagement: Current state of the construct, conceptual refinement, and future research directions. *Educational Psychology Review*, 34(1), 107-138. [https://www.researchgate.net/profile/Gregory-Arief-Liem/publication/353037023\\_Student\\_Engagement\\_Current\\_State\\_of\\_the\\_Construct\\_Conceptual\\_Refinement\\_and\\_Future\\_Research\\_Directions/links/6315ef1761e4553b956a1559/Student-Engagement-Current-State-of-the-Construct-Conceptual-Refinement-and-Future-Research-Directions.pdf?\\_sg%5B0%5D=started\\_experiment\\_milestone&\\_sg%5B1%5D=started\\_experiment\\_milestone&origin=journalDetail&\\_rtd=e30%3D](https://www.researchgate.net/profile/Gregory-Arief-Liem/publication/353037023_Student_Engagement_Current_State_of_the_Construct_Conceptual_Refinement_and_Future_Research_Directions/links/6315ef1761e4553b956a1559/Student-Engagement-Current-State-of-the-Construct-Conceptual-Refinement-and-Future-Research-Directions.pdf?_sg%5B0%5D=started_experiment_milestone&_sg%5B1%5D=started_experiment_milestone&origin=journalDetail&_rtd=e30%3D)
26. Woods, C. T., Rothwell, M., Rudd, J., Robertson, S., & Davids, K. (2021). Representative co-design: Utilising a source of experiential knowledge for athlete development and performance preparation. *Psychology of Sport and Exercise*, 52, 101804. [https://researchonline.ljmu.ac.uk/id/eprint/13780/1/Woods%20et%20al.%202020\\_Rep%20Co-Design.pdf](https://researchonline.ljmu.ac.uk/id/eprint/13780/1/Woods%20et%20al.%202020_Rep%20Co-Design.pdf)

## Appendices

### Appendix 1

What is your Age?

18-30

31-45

45-60

Above 60

What is your Gender?

Male

Female

Prefer Not to Say

What is your Profession?

Student

School Teacher

Professor

Corporate worker

1. High classroom engagement has a positive prominent impact of the cognitive skill development in children
2. Teaching method in classroom are highly important to increase the problem-solving ability of students
3. Curriculum content is important to engage students with different subject for improving their curiosity and cognitive horizons
4. Teacher student interaction plays an important part in developing the ability of children to scrutinise and analyse different information from diverse sources adequately
5. Structured educational plan can help in providing classroom satisfaction for teachers and students
6. Positive interactions in classroom are vital for the cognitive development of students as it influence self-regulation., control attention process effectively.
7. Classroom education important to acquire foundational knowledge and increase the literacy and numeric skill that promote cognitive flexibility
8. Collaboration between learners in classroom setting is vital for exchanging perspectives and ideas that promote cognitive growth
9. Practical knowledge acquisition through classroom learning process increases the understanding of students regarding real world problems
10. Classroom interaction is a paramount solution for gathering required educational resources, building knowledge and learning through collaboration with peers which help a proper development of cognitive skills