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Factors of developmental red flags affecting the academic achievements of grade 1 learners: Content and Validation of Early Childhood Holistic Development (ECHD)

Samantha A. Arbois¹, Pamela G. Bautista², Nikolai Marikris M. Mallari³, Rachel Anne M. Olaguer, and Fritzie Angelie J. Pastrana

College of Education, Quezon City University, 673 Quirino Hi-way, San Bartolome, Novaliches, Quezon City, PH-1118 Philippines

Corresponding Author: Edward Torrefranca, edward.torrefranca@qcu.edu.ph, College of Education, Quezon City University, 673 Quirino Hi-way, San Bartolome, Novaliches, Quezon City, PH-1118 Philippines

Abstract. Developmental delay occurs when a child fails to meet developmental milestones compared to peers. Parents must be informed about developmental milestones for timely diagnosis and treatment, as these years are critical to a child's growth. This study aims to improve understanding of developmental red flags and develop a tool for early childhood assessment. The researchers created an informal assessment about assessing early childhood holistic development (cognitive, behavioral, physical, communication, social-emotional). After the creation of the assessment tool, it was validated by five experts. After that, the validity was calculated with the use of CVI, probability of chance agreement (Pc), kappa statistics (K), and CVR. The results of the validation show that the assessment tool's items are accepted and retained, while some items (8, 11, 16, 17, 21, 32, 36, 40, and 42) are removed or rejected. Overall, this study recommends that to ensure the reliability and validity of an assessment tool, it must be validated and calculated by statistics. Especially assessment tools like this concerning children's developmental milestones and delays, it's important to ensure the validity of the tool to have legit and factual results from the assessment.

Keywords: *development, developmental delays, developmental milestones, red flags, holistic development, early childhood*

Introduction

A developmental delay occurs when a child fails to develop expected developmental skills in physical, speech, language, cognitive, play, and social areas. It can occur in one or multiple domains and can be caused by genetic conditions, shaken baby syndrome, exposure to hazardous substances, or food or environmental deprivation. While it can be alarming, it has therapeutic choices and does not predict future intelligence (SSM Health, n.d.) In relation to this, Choo et al. (2019) stated that developmental delay occurs when a child fails to meet developmental milestones compared to their peers, affecting children under five. Causes include genetic conditions, shaken baby syndrome, hazardous substances, and environmental deprivation, affecting children before, during, and after birth.



Clinically speaking, there are a few "absolute indicators," often called "red flags," that pinpoint the developmental or behavioral markers indicating the need for further assessment. These "red flags" should act as a signal for a parent to get their child evaluated for developmental delays in order to make sure they are progressing appropriately (Developmental Red Flags - the Children's League, n.d.). Four basic domains are used to evaluate children for developmental delays: languages, fine motor, social, and gross motor. In order to enable timely diagnosis and treatment in the event of a developmental delay, parents must be informed of developmental milestones as these years are critical to a child's growth (Kumar et al., 2024).

As stated by Choo et al., (2019) developmental delays are common in preschool children, occurring in 10%-15% of them. Global delays are less common, occurring in 1%-3%. These delays are identified during routine checks by primary care physicians or when concerns are raised. Assessments for developmental delays in primary care settings include a general examination, hearing and vision assessments, baseline blood tests, referral to a developmental pediatrician, and counseling for parents. Parents should be contacted promptly to activate referrals. For mild developmental delays, advice on appropriate stimulation activities can be provided and a review conducted within three months.

Overall, this study aims to improve understanding of how early developmental red flags impact academic achievement in the first grade and develop a valuable tool for early childhood development assessment, allowing for earlier identification and intervention for children with potential delays.

Theoretical Framework

The researchers chose Jean Piaget's Cognitive Development Theory stages of development in 1936 as the foundation for their study since it claims that intelligence varies as a child grows. It also states that a child's cognitive development requires the child to form a mental concept of the world rather than just acquire knowledge. As stated by Cherry (2023) that child development focuses on explaining how children change and grow over the course of childhood. These developmental theories center on various aspects of growth, including social, emotional, and cognitive development.

Children progress through a succession of phases of cognitive development as a result of the interaction of natural abilities and external circumstances. According to Malik and Marwaha (2020), pediatricians and primary care practitioners are in a prime position to monitor a child's growth and development in children and a child's cognitive development. Jean Piaget proposed his cognitive development theory in 1936 to observe the child's cognitive growth entails more than just gaining knowledge; the child must also create or construct a mental model of the world. These red flags cannot be ignored and must be observed during the development of a child.

These theories will tell if the child's age is appropriate for the child's actions. Parents should encourage their child's cognitive growth from the moment they are born since it lays the groundwork for a child's success in school and later in life. For example, studies show that children who can distinguish sounds at six months of age are more likely to learn to read between four and five years of age.



Methodology

Research Instrument (Assessment Tool)

Before the researchers made the assessment tool, they utilized the The Early Childhood Care and Development Checklist (ECCD) as the basis for this assessment tool. Additionally, to assess their kid's growth and development, mothers, midwives, child health development specialists, and childcare professionals can utilize the ECCD Checklist. Two Child's Records— one for children ages 0 to 3 and the other for those ages 3 years and 1 month to 5 years and 11 months—make up the Checklist. Seven domains are used to assess children's development: cognitive, socioemotional, expressive, receptive, fine motor, self-help, and gross motor.

After that, the researchers created an informal checklist focusing on five developmental domains, namely, physical, cognitive, behavioral, social-emotional, and communication development. In each developmental domain, the researchers prepared a set of 10 statements that portray the milestones or abilities of the child. Overall, the checklist has 50 statements. The numbering of the items of this assessment tool is 1-10 = cognitive development, 11-20 = behavioral development, 21-30 = communication development, 31-40 = physical development and for numbers 41-50 = social-emotional development. For better and easier identification, light red for cognitive, light orange for behavioral, light yellow for communication, light green for physical and light blue for social-emotional development.

COGNITIVE DEVELOPMENT	MARK
1. The child can recognize and name basic shapes (e.g., circle, square, triangle)	
2. The child can understand simple cause-and-effect relationships (e.g., pressing a button makes a toy light up)	
3. The child can count from 1 to 10	
4. The child can understand the concept of counting objects (e.g., counting blocks or toys)	
5. The child can identify and name basic colors (e.g., red, blue, yellow)	
6. The child can recognize and understand simple patterns (e.g., blue-red-blue-red or red-red-blue-blue)	
7. The child can sort objects by shape, color, or size	
8. The child can understand spatial concepts like up, down, inside, and outside	
9. The child can complete simple puzzles with a few large pieces	
10. The child can understand and follow simple two-step instructions (e.g., "Pick up the ball and put it in the box")	

BEHAVIORAL DEVELOPMENT	MARK
11. The child demonstrates cooperation during group activities.	
12. The child follows simple instructions independently.	
13. The child waits for their turn during games or activities.	
14. The child shares toys or objects with peers willingly.	
15. The child expresses empathy towards others who are upset.	
16. The child shows interest in helping with simple tasks.	
17. The child displays frustration when unable to achieve a goal.	
18. The child demonstrates self-control when faced with tempting situations.	
19. The child exhibits curiosity about new people or situations.	
20. The child engages in pretend play with toys or objects.	



Table 1. Assessment tool made by the researchers.

COMMUNICATION DEVELOPMENT	MARK
21. The child uses single words to express basic needs (e.g., "more," "drink").	
22. The child uses two-word phrases to communicate (e.g., "want toy," "mommy help").	
23. The child points to objects when named.	
24. The child follows simple instructions (e.g., "come here," "pick up the ball").	
25. The child imitates simple sounds or words.	
26. The child responds appropriately to simple questions (e.g., "Where is your nose?").	
27. The child uses gestures to communicate needs or desires.	
28. The child engages in turn-taking during simple conversations.	
29. The child identifies and labels common objects (e.g., "cat," "dog," "apple").	
30. The child uses pronouns correctly (e.g., "I," "you," "me").	

PHYSICAL DEVELOPMENT	MARK
31. The child can crawl on hands and knees.	
32. The child can pull themselves up to stand using furniture or support.	
33. The child can walk independently without assistance.	
34. The child can climb up and down stairs with minimal support.	
35. The child can kick a ball forward.	
36. The child can throw a ball with some accuracy.	
37. The child can jump with both feet leaving the ground.	
38. The child can balance on one foot for a few seconds.	
39. The child can run without falling frequently.	
40. The child can pedal a tricycle or bicycle with training wheels.	

SOCIAL-EMOTIONAL DEVELOPMENT	MARK
41. The child shows interest in playing with other children.	
42. The child shares toys and takes turns during play.	
43. The child displays empathy towards others (e.g., comforting a crying friend).	
44. The child shows affection towards caregivers and peers.	
45. The child seeks attention from familiar adults when needed.	
46. The child expresses emotions verbally (e.g., saying "I'm happy," "I'm sad").	
47. The child shows frustration or disappointment when things don't go as expected.	
48. The child demonstrates self-regulation by controlling impulses (e.g., waiting for a turn).	
49. The child engages in imaginative play and role-playing activities.	
50. The child expresses curiosity about others and their experiences.	



By conducting this assessment, the observer or teacher must observe the child’s ability and put a check mark in each statement on the checklist that the child can do. If the child cannot make some of the statements, then the observer must leave them blank. For the scoring, the observer must tally the number of check marks in each domain and record all this in the section labeled “Total Score.” The check marks that were tallied in each domain are the raw scores. After knowing the scores to each domain and overall score, below is the basis for interpretation.

Table 2. The scoring for the assessment tool

SCORE IN EACH DOMAIN	INTERPRETATION
1-2	Suggest significant delay in overall development
3-4	Suggest slight delay in overall development
5-6	Average development
7-8	Suggest slightly advanced development
9-10	Suggest highly advanced development

On the other hand, the researchers created this assessment tool to help educators and parents determine their child’s developmental milestones and developmental delays, also known as “red flags.”. By having this knowledge, intervention can be provided for the child.

Validation of Instrument

After creating the assessment tool, the researchers will test its relevance and validity by making it validated by five experts that’s related and a professional in the field of teaching early childhood, psychologist, or a pediatrician. After the validation, next, in order to ascertain if the parts in the instrument should be kept, revised, or eliminated, the researchers computed the content validity index (I-CVI), probability of chance agreement (Pc), kappa statistic coefficient (K), and content validity ratio (CVR).



Results and Discussions

Table 3. Content validity index (I-CVI)

ITEMS	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	I-CVI	INTERPRETATION
1	4	3	4	4	4	1	ACCEPTED
2	3	4	4	4	3	1	ACCEPTED
3	4	3	4	3	3	1	ACCEPTED
4	4	3	3	3	4	1	ACCEPTED
5	4	3	4	4	4	1	ACCEPTED
6	4	3	3	4	3	1	ACCEPTED
7	3	3	4	3	3	1	ACCEPTED
8	2	3	3	3	4	0.8	REJECTED
9	4	3	3	4	3	1	ACCEPTED
10	4	4	3	4	3	1	ACCEPTED
11	3	2	4	3	4	0.8	REJECTED
12	4	4	3	3	4	1	ACCEPTED
13	4	4	3	4	3	1	ACCEPTED
14	4	4	4	4	3	1	ACCEPTED
15	3	3	4	3	3	1	ACCEPTED
16	4	2	4	4	4	0.8	REJECTED
17	2	4	3	4	3	0.8	REJECTED
18	4	4	4	3	4	1	ACCEPTED
19	3	3	4	3	3	1	ACCEPTED
20	4	3	3	3	4	1	ACCEPTED
21	2	3	3	4	3	0.8	REJECTED
22	4	3	3	3	4	1	ACCEPTED
23	3	3	3	4	3	1	ACCEPTED
24	3	4	4	4	3	1	ACCEPTED
25	4	3	4	3	4	1	ACCEPTED
26	3	3	4	4	4	1	ACCEPTED
27	3	3	3	3	4	1	ACCEPTED
28	3	3	3	3	3	1	ACCEPTED
29	4	3	3	4	4	1	ACCEPTED
30	4	4	3	3	3	1	ACCEPTED
31	4	3	4	4	3	1	ACCEPTED
32	3	4	3	3	2	0.8	REJECTED
33	3	4	3	4	4	1	ACCEPTED
34	4	3	3	3	4	1	ACCEPTED
35	3	3	3	4	3	1	ACCEPTED
36	3	4	2	4	4	0.8	REJECTED
37	3	4	3	4	4	1	ACCEPTED
38	3	4	3	4	4	1	ACCEPTED
39	4	3	4	3	3	1	ACCEPTED
40	4	2	3	4	3	0.8	REJECTED
41	4	3	3	3	4	1	ACCEPTED
42	3	2	4	4	3	0.8	REJECTED
43	4	3	4	4	3	1	ACCEPTED
44	4	4	3	3	4	1	ACCEPTED
45	4	4	3	3	4	1	ACCEPTED
46	4	4	4	4	3	1	ACCEPTED
47	3	3	4	3	4	1	ACCEPTED
48	4	4	4	3	4	1	ACCEPTED
49	3	3	3	4	3	1	ACCEPTED
50	3	4	3	3	3	1	ACCEPTED

The Content Validity Index (I-CVI) for individual items is calculated by dividing the number of experts who rated the item as either a 3 or a 4 (Nr) by the total number of experts



(N). For the content validity index of the assessment tool created, it concluded that all items are relevant except for numbers 8, 11, 16, 17, 21, 32, 36, 40 and 42, these items are rejected and need to be revised or totally changed.

Table 4. Probability of chance agreement (Pc) and Kappa statistics (K)

ITEMS	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	Pc	KAPPA	INTERPRETATION
1	4	3	4	4	4	0.031	1	EXCELLENT
2	3	4	4	4	3	0.031	1	EXCELLENT
3	4	3	4	3	3	0.031	1	EXCELLENT
4	4	3	3	3	4	0.031	1	EXCELLENT
5	4	3	4	4	4	0.031	1	EXCELLENT
6	4	3	3	4	3	0.031	1	EXCELLENT
7	3	3	4	3	3	0.031	1	EXCELLENT
8	2	3	3	3	4	0.156	0.76	EXCELLENT
9	4	3	3	4	3	0.031	1	EXCELLENT
10	4	4	3	4	3	0.031	1	EXCELLENT
11	3	2	4	3	4	0.156	0.76	EXCELLENT
12	4	4	3	3	4	0.031	1	EXCELLENT
13	4	4	3	4	3	0.031	1	EXCELLENT
14	4	4	4	4	3	0.031	1	EXCELLENT
15	3	3	4	3	3	0.031	1	EXCELLENT
16	4	2	4	4	4	0.156	0.76	EXCELLENT
17	2	4	3	4	3	0.156	0.76	EXCELLENT
18	4	4	4	3	4	0.031	1	EXCELLENT
19	3	3	4	3	3	0.031	1	EXCELLENT
20	4	3	3	3	4	0.031	1	EXCELLENT
21	2	3	3	4	3	0.156	0.76	EXCELLENT
22	4	3	3	3	4	0.031	1	EXCELLENT
23	3	3	3	4	3	0.031	1	EXCELLENT
24	3	4	4	4	3	0.031	1	EXCELLENT
25	4	3	4	3	4	0.031	1	EXCELLENT
26	3	3	4	4	4	0.031	1	EXCELLENT
27	3	3	3	3	4	0.031	1	EXCELLENT
28	3	3	3	3	3	0.031	1	EXCELLENT
29	4	3	3	4	4	0.031	1	EXCELLENT
30	4	4	3	3	3	0.031	1	EXCELLENT
31	4	3	4	4	3	0.031	1	EXCELLENT
32	3	4	3	3	2	0.156	0.76	EXCELLENT
33	3	4	3	4	4	0.031	1	EXCELLENT
34	4	3	3	3	4	0.031	1	EXCELLENT
35	3	3	3	4	3	0.031	1	EXCELLENT
36	3	4	2	4	4	0.156	0.76	EXCELLENT
37	3	4	3	4	4	0.031	1	EXCELLENT
38	3	4	3	4	4	0.031	1	EXCELLENT
39	4	3	4	3	3	0.031	1	EXCELLENT
40	4	2	3	4	3	0.156	0.76	EXCELLENT
41	4	3	3	3	4	0.031	1	EXCELLENT
42	3	2	4	4	3	0.156	0.76	EXCELLENT
43	4	3	4	4	3	0.031	1	EXCELLENT
44	4	4	3	3	4	0.031	1	EXCELLENT
45	4	4	3	3	4	0.031	1	EXCELLENT
46	4	4	4	4	3	0.031	1	EXCELLENT
47	3	3	4	3	4	0.031	1	EXCELLENT
48	4	4	4	3	4	0.031	1	EXCELLENT
49	3	3	3	4	3	0.031	1	EXCELLENT
50	3	4	3	3	3	0.031	1	EXCELLENT

To compute the modified kappa statistic, the probability of chance agreement (Pc) for each item was initially determined using the formula below:



$$P_c = \left(\frac{N!}{A!(N-A)!} \right) * 0.5^N$$

In this equation, N represents the total number of experts in a panel, and A denotes the count of panelists who agree that the item is relevant. After calculating for the Pc, the researchers then computed the Kappa statistics using this formula:

$$K = \left(\frac{1 - CVI - P_c}{1 - P_c} \right)$$

Moreover, the evaluation criteria for kappa is if it's above 0.74 = excellent, if between 0.60 and 0.74 = good, and if between 0.40 and 0.59 = fair. For the assessment tool's result based on Kappa statistics, all items are excellent and accepted.

Table 5. Content validity ratio (CVR)

ITEMS	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	CVR	INTERPRETATION
1	3	3	3	3	3	1	RETAIN
2	3	3	3	3	3	1	RETAIN
3	3	3	3	3	3	1	RETAIN
4	3	3	3	3	3	1	RETAIN
5	3	3	3	3	3	1	RETAIN
6	3	3	3	3	3	1	RETAIN
7	3	3	3	3	3	1	RETAIN
8	3	3	3	3	2	0.6	REMOVE
9	3	3	3	3	3	1	RETAIN
10	3	3	3	3	3	1	RETAIN
11	3	2	3	3	3	0.6	REMOVE
12	3	3	3	3	3	1	RETAIN
13	3	3	3	3	3	1	RETAIN
14	3	3	3	3	3	1	RETAIN
15	3	3	3	3	3	1	RETAIN
16	3	2	3	3	3	0.6	REMOVE
17	3	3	3	3	2	0.6	REMOVE
18	3	3	3	3	3	1	RETAIN
19	3	3	3	3	3	1	RETAIN
20	3	3	3	3	3	1	RETAIN
21	3	3	3	3	2	0.6	REMOVE
22	3	3	3	3	3	1	RETAIN
23	3	3	3	3	3	1	RETAIN
24	3	3	3	3	3	1	RETAIN
25	3	3	2	3	3	1	RETAIN
26	3	3	3	3	3	1	RETAIN
27	3	3	3	3	3	1	RETAIN
28	3	3	3	3	3	1	RETAIN
29	3	3	3	3	3	1	RETAIN
30	3	3	3	3	3	1	RETAIN
31	3	3	3	3	3	1	RETAIN
32	3	3	3	3	2	0.6	REMOVE
33	3	3	3	3	3	1	RETAIN
34	3	3	3	3	3	1	RETAIN
35	3	3	3	3	3	1	RETAIN
36	2	3	3	3	3	0.6	REMOVE
37	3	3	3	3	3	1	RETAIN
38	3	3	3	3	3	1	RETAIN
39	3	3	3	3	3	1	RETAIN
40	3	2	3	3	3	0.6	REMOVE
41	3	3	3	3	3	1	RETAIN
42	3	3	3	2	3	0.6	REMOVE
43	3	3	3	3	3	1	RETAIN
44	3	3	3	3	3	1	RETAIN
45	3	3	3	3	3	1	RETAIN
46	3	3	3	3	3	1	RETAIN
47	3	3	3	3	3	1	RETAIN
48	3	3	3	3	3	1	RETAIN
49	3	3	3	3	3	1	RETAIN
50	3	3	3	3	3	1	RETAIN



In the content validity ratio, experts are asked to assign scores ranging from 1 to 3 to each item, indicating their perception of whether the item is "not necessary," "useful but not essential," or "essential." The formula for calculating the content validity ratio is as follows:

$$CVR = \frac{N_e - \frac{N}{2}}{\frac{N}{2}}$$

Where N_e represents the number of panelists indicating "essential," and N is the total number of panelists involved in the assessment. For the assessment tool's result based on CVR, it stated that all items are retained except for numbers 8, 11, 16, 17, 21, 32, 36, 40 and 42, these items should be removed and need to be revised or totally changed.

Conclusion and Recommendation

The results of the validation show that the assessment tool's items are accepted and retained, while some items (8, 11, 16, 17, 21, 32, 36, 40, and 42) are removed or rejected and need to be changed or revised for a better outcome of the tool. This concludes that the significance of the assessment tool and the validation of the instrument are relevant when it comes to assessing children's development in areas such as cognitive, behavioral, communication, physical, and socioemotional.

Overall, this study recommends that to ensure the reliability and validity of an assessment tool, it must be validated and calculated by statistics. Both reliability and validity are critical for creating assessments that inform educational decisions and support the student growth. Especially with assessment tools like this concerning children's developmental milestones and delays, it's important to ensure the validity of the tool to have legit and factual results from the assessment. Future research may further examine how this assessment tool will be reliable and effective in assessing the children's developmental milestones and delays after being implemented in an early childhood classroom setting.

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