

**Title:** Theory, principles and key content of the Reach Up Curriculum

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## **Introduction**

There is substantial research from high income countries and more recently from low- and middle-income countries (LMIC) showing that deficits in cognition and/or language are evident in poor children as early as the first year of life (1-3) and increase to school age, when the deficits are large (often over one standard deviation) and likely to affect children's progress in school and subsequent life success. It has also been shown that compared with more affluent mothers, those living in poverty use fewer words with their children and offer less mediation of the environment by showing and describing objects and actions. These differences are related to poor language development in children (4). Poverty is also associated with changes in brain structure and function (5). It is estimated that poverty and associated risks lead to at least 43% of children under age 5 years in LMIC not attaining their developmental potential (1).

The Reach Up: Early Childhood Parenting Programme is based on the curriculum developed for the Jamaica Home Visiting (JHV) intervention and is designed primarily for disadvantaged children up to 4 years of age in LMIC. The JHV curriculum was initially developed in the late 1960s, in response to observations that many children exposed to extreme poverty in Kingston, Jamaica were not reaching their developmental potential. The children lived in unstimulating environments with no toys or books and their mothers had little understanding of the importance of play and responsive interactions. The Reach Up programme was developed to facilitate implementation in more countries by producing a web-based package of resources for adapting and planning for new contexts and for training and supervision, to accompany the curriculum which was updated and illustrated.

The JHV/Reach Up has now been implemented in many countries and has an extensive evidence base e.g. from Jamaica, Bangladesh, India, Peru, China and Colombia (6-12). It is unique as the only ECD intervention in LMIC with evidence from a randomized trial showing benefits of early intervention for adult outcomes (13, 14) including benefits to IQ, educational attainment, executive function and earnings, increased conscientiousness and grit and reduction in depression and risk taking. A recent review and meta-analysis located 18 published randomized controlled trials, across 8 countries (15). The analyses showed moderate-sized overall benefits (Table 1). The overall effect sizes (standard scores) were highest for cognition, 0.49 SD in the trials measuring cognition separately. All domain scores improved except for gross motor alone.

Home stimulation also improved. Although some studies had benefits to mothers' depression, the overall effect was not significant. Additional RCTs have been published subsequently with similar benefits in Bangladesh (16) and Zimbabwe (17).

**Table 1:** Summary of meta-analyses of 18 randomised trials using the JHV/Reach Up curriculum (21 contrasts)

Scale	Number of studies	Average Effect sizes SD
Cognitive	14	0.49**
Cognitive with language	20	0.39**
Language	15	0.38**
Language with cognitive	21	0.31**
Fine Motor	8	0.29**
Gross Motor	6	0.05
Gross and Fine motor	19	0.27**
Home stimulation	17	0.37**
Maternal depression	12	-0.09

\*\*p<0.001

In this paper, we describe the motivation and principles that informed the design of the intervention, the key methods used and curriculum content. Prior to the design of the JHV curriculum, observations were conducted with disadvantaged Jamaican mothers and middle-class mothers, when asked to teach their 3-year old child a block sorting task similar to that of Hess and Shipman (18). Compared with middle class mothers, the poor mothers tended to give brief commands with no clear explanations, rarely naming concepts, objects, or activities. They gave very little feedback in response to their child's actions, especially little positive feedback and praise, and used very limited vocabulary when talking with their children. They rarely sought confirmation that the child understood the task. The findings contributed to the design of the intervention, which aims to improve these behaviours and build mother's skills when playing and interacting with their child and in everyday activities. The intervention was designed to support mothers to promote their children's development, through play and responsive interactions. We hypothesized that if we could change the mothers' practices, any benefits to the children would be more likely to be sustained and might also spread to siblings.

We initially used home visiting rather than a center-based model because the aim was to improve childrearing practices in the home environment, where very young children spend most of the time. We were inspired by the home visiting programme directed by Susan Gray (19) in Tennessee, USA. That programme targeted very poor families that appeared to be similar to the Jamaican ones. We also hypothesized that it would be easier for the home visitors (HVs) to make close relations with the mothers, who would then be more likely to be influenced by them and change their child-rearing practices. When mothers are not available the main caregiver is the focus, usually a female relative or the father. We use ‘mothers’ in the text to include these other caregivers. If additional caregivers are present in the home at the time of the visit they are welcome to join the session.

Other considerations were that individual play sessions should facilitate matching the activities to the specific developmental level of the child and thus improve learning. The play activities could also be more readily linked to the mother’s everyday activities and thus be more likely to be continued. Furthermore, the most disadvantaged women often have difficulty attending centers regularly.

Subsequently, with the aim of reducing the costs, the intervention has been adapted for delivery in small groups, with group size varying from 2-4 in Bangladesh (20, 21), 8 in India (7) and up to 11 in Colombia (22). Significant benefits to children’s development were found in all the evaluations with the largest benefits in Bangladesh. In the Indian study (7), mothers and children were randomized to group sessions in the community or home visits and both delivery methods benefited the children’s development with no significant difference between them in impact. Group delivery was lower cost, and this opens up the possibility of reaching more children at lower cost.

## Principles underlying the curriculum

### Aims:

The programme has aims for mothers, children and home visitors (Box 1). The overall goal is for the mothers to understand that they can improve their child's development and ultimately their life successes by the way they interact, talk and play with their child. Maternal behaviours that are encouraged include:

1. Showing consistent love, giving positive and specific feedback to the child, celebrating the child's achievements and efforts.
2. Observing and being responsive to their child's vocalizations, actions, mood, and interests.
3. Mediating the environment for the child (drawing attention to, describing, labeling) and introducing new objects, sounds, words, activities and concepts.
4. Using play with objects/toys, everyday activities, and looking at books with the child to introduce new concepts and language.

### Box 1 Reach Up Programme Aims

Mothers	<ol style="list-style-type: none"> <li>1. To gain knowledge about how children develop.</li> <li>2. To improve the way they talk, play, teach and interact with their child.</li> <li>3. To be able to integrate play in daily activities and use household objects to play with their child.</li> <li>4. To improve self-confidence and enjoyment in bringing up their child.</li> </ol>
Children	<ol style="list-style-type: none"> <li>1. To improve their cognitive, language and motor development.</li> <li>2. To improve their socio-emotional development (including secure attachment, attention, persistence, task motivation and self-confidence).</li> </ol>
Home Visitors	<ol style="list-style-type: none"> <li>1. To improve their ability to conduct home visits or run group sessions by:               <ol style="list-style-type: none"> <li>a) Improving their knowledge and skills in child development and in teaching techniques with children and mothers,</li> <li>b) Improving their ability to form good relationships with mothers and children,</li> <li>c) Improve their ability to motivate and organize mothers and children in groups.</li> </ol> </li> <li>2. To improve their self-esteem through respectful relationships with supervisors/mentors and with families.</li> </ol>

**Feasibility:**

One of the main considerations when designing the curriculum was to make the programme feasible to conduct with relatively low funding and limited availability of highly trained staff. It was therefore designed to be delivered by non-professionals, with limited educational backgrounds (a minimum of complete primary education) and using homemade play materials.

Non-professionals may often lack the experience and knowledge to be able to develop their own activities appropriate for the number and variety of children they visit. Therefore, to facilitate delivery we developed a structured curriculum with specific guidelines for materials and activities for every visit/session. While the text is specific and simple, so it can be easily followed by visitors with limited literacy, it is not intended to be read to the mother. It is intended to provide the visitor with suggestions on what to cover and how, with reminders of key concepts. Simple illustrations of the activities are also provided. Visitors are encouraged to modify activities based on the child's interest and to adjust activities to be more, or less difficult depending on the ability of the child. Feedback from the visitors indicates that they generally find the structure very helpful.

**Relationships:**

Relationships between all levels are critical to the success of the programme, with the quality of relations affecting success and influencing relationships in both directions.

Programme coordinators ↔ Supervisors ↔ Visitors ↔ Mothers ↔ Children

Supervisors are trained to provide supportive supervision or mentoring rather than authoritarian or administrative supervision of the visitors. This improves the visitors' self-confidence and motivation and hopefully the quality of their relationship with the mothers. Motivating the mothers depends on the visitors having a warm and respectful relationship with them. Training of home visitors therefore includes how to listen to mothers, find out what they know, ask their opinions and suggestions, respond to their comments and give positive feedback. The supervisors model these aspects in their interactions with visitors, so that visitors internalise them and adopt them in their interactions with mothers. In some more hierarchical cultures, extra time may have to be devoted to building relationships between supervisors and HVs, and between HVs and mothers.

## **Programme Methods:**

The programme methods are based on Vygotsky's theory of learning (23). Children's learning is considered a shared experience with help from a more competent person—in this case, the mother.

*Proximal Zone of Development (PZD):* The child learns most when the task is within their Proximal Zone of Development (23), that is when the task is a little challenging for the child to do alone, but with a little help the child will be able to do it. The methods include observing what the child does with the play materials on their own and encouraging the child to explore them, then demonstrating and describing a new activity, then helping the child to do it by using 'scaffolding' and giving positive feedback when the child completes or attempts the task. The demonstration is important because children will imitate the action as part of learning. Scaffolding includes helping the child to do the task by describing what they are doing and labeling concepts, breaking tasks down into easy steps, giving positive feedback and finally, gradually withdrawing help as the child learns to do it alone (23). Examples of other "tools" (24) used in the curriculum to help children learn include: linking new words to actions, such as "bang-bang" when the child bangs or "up, up" when lifting the child so that the child first links the action to the words and later learns to say them. Other tools are linking shapes and colours to analogies e.g. "red like a tomato, round like a ball", and showing children how to scan systematically when searching for a matching picture or searching pictures for hidden objects.

To facilitate identifying the PZD, curriculum activities are arranged in approximate developmental order and children usually move on to the next set of activities with each visit. The children begin at the developmental level according to their age and move along in order at each visit. Small adjustments to the difficulty level of an activity (easier or harder) are suggested in the curriculum. If activities are consistently too easy or too difficult, the visitors and supervisors are trained to adjust the child's position on the curriculum by moving forwards or backwards around 4 weeks. Visitors may find assessing the PZD difficult, and an important role of the supervisors is to check that the children are at the correct level when observing the visits or when reviewing the child's progress during meetings with the visitors. While visitors may often notice an activity is too difficult, they often may not move children ahead when activities are too easy.



When introducing an activity, the visitor first finds out whether the mother is already familiar with the activity and acknowledges this by encouraging her to demonstrate what she already does and giving positive feedback. New activities are then demonstrated with the child and described to the mothers, including explaining what the child can learn. Mothers are then encouraged to practice the activity with the child when their performance is praised and encouraged, and if necessary, suggestions made in a positive way to modify what she does. The mother is encouraged to continue the activities and expand on them with her child until the next session. Play materials are left with the family and exchanged at the next visit. It is an essential part of the intervention that materials are left in the home (or distributed at group sessions) so that the mother and child can continue the activities. Achieving change in the mothers' practices so that she continues playing, chatting and interacting with her child during the week is the most important component of the intervention. The longer-term aim is for the mothers' role in the visits to change as she introduces and suggests new activities.

*Positive feedback:* An essential part of the methods is giving positive feedback both to mother and child, and celebrating any success of the child, as well as their efforts and attempts. This motivates the child to learn and the mother to participate, and promotes their self-confidence and self-esteem, which are both aims of the programme. It is important for feedback to be specific and reinforce achievements by briefly saying what was done e.g. "well done, you built a high tower with the blocks". Specific feedback can also focus on the child's behavior, for example how well they concentrate or persevere at an activity (e.g. I love the way he enjoys working out how to do the puzzle).

*Repetition:* Repetition is built into the curriculum, usually children like to repeat activities and consolidate their learning, but the difficulty level can be increased if they complete it easily. All play materials are repeated, usually about 3 times, and some of the more versatile toys such as blocks are repeated more often. The same toy is not repeated for at least 4 to 5 weeks so that some novelty remains for the child. Analogously, the same concepts are deliberately repeated with different materials and activities to consolidate children's understanding of them, whilst retaining an element of novelty. Another goal of repetition is to promote a sense of accomplishment and motivation particularly in the mother - my child is learning; my child has mastered this.

*Culturally appropriate:* The curriculum should be adapted to ensure it is appropriate for each country or culture, and the Reach Up package includes a manual describing how this can be done. Pictures are adapted to reflect the local context as children learn more easily and enjoy books and pictures that reflect familiar people, things, and environments. Local activities (e.g. looking after animals, weaving, carpentry) are incorporated in pretend games, for example when playing father/mother role, and local songs and games are used. This may also help to improve both the mothers' and children's self-concept and strength of identity.

Some developmental domains may be given more emphasis, for example gross motor activities may be added where poor motor development is a concern, and the timing of introduction of some activities may be modified.

*Family Members:* Any household adult member who often looks after the child, especially the father and grandparents, are invited to join the session if they are present during the visit. They are also asked to help the mother find time for playing or looking at books with the child during the week, and to play and talk with the child themselves. It is very helpful if the father and the grandmother, if living with them, are also persuaded that intervention is important for the child's development. In many cultures they may affect what happens in the home and influence caregiving practices and the mother.

Other children in the home under 4 years should be included in the visit and the training provides guidance on ways to do this. If older children are present, we suggest that some play materials, such as crayons and paper, are given to them so they can draw during the visit. All children in the household are encouraged to participate in the singing of action songs or local songs allowing the home visit to end with all family members having fun.

*Enjoyment:* It is particularly important that the sessions are enjoyable for both mother and child. This will not only ensure motivation and good participation, but children in this age range learn through exploring, playing and having fun.

## **Curriculum content**

Emphasis is placed on the mother interacting with the child, responding to the child's vocalizations and interests, playing, chatting, looking at books, singing and using everyday childcare and household chores to add games, new words and concepts. Some basic principles of maternal-child interactions were adapted from a WHO Mental Health Programme (25).

### **Domains of development:**

In the training of home visitors or group facilitators, we introduce the developmental domains and discuss how the various activities support them. In the curriculum, we deliberately do not identify which domains of development are being promoted by each activity. Most activities promote several domains and activities to promote all developmental domains are included. Special emphasis is placed on cognitive ability and language because these are the areas where disadvantaged children's development is most affected. If the target population has poor gross motor development (as may happen with undernourished populations) then more of these activities may be added.

Socio-emotional development is important and is covered mainly through the methodology of the visits. Sharing consistent play time and looking at books with mother in joint engagement with loving, responsive maternal-child interactions should promote secure attachments. Furthermore, having their own toys with a special place to keep them, experiencing success with play activities such as building a tower or completing a puzzle, and receiving frequent positive feedback should increase children's self-esteem. Understanding emotions and theory of the mind is taught through play with dolls and soft toys, and books. There is also a book specifically on emotions, helping the child to recognize emotions. The methods and activities also build early executive function skills such as sustaining attention, working memory, cognitive flexibility and self-regulation.

### **Play materials:**

Many of the play materials were designed from recycled materials. Toys include a series of puzzles, sorting and matching games (classification activities) and picture books, arranged in order of difficulty. Some more traditional toys such as dolls, blocks, crayons and paper are also

included. Simple, fun activity books are introduced for children aged over 3.5 years to help them develop early pre-literacy and numeracy skills, through games. The parents are generally very keen for their child to start learning skills that would help them in school and these books were initially developed in response to their requests. The activity books help to link the programme to preschool and can be motivating for the parents.

The toys are simple and quick to make and should be robust and safe. A detailed toy manual is part of the Reach Up package. Bought toys can be used but should be carefully chosen to fit with the aims of the activities in the curriculum as well as being robust and safe. When going to scale, books, puzzles, sorting and matching games and blocks are often manufactured.

### **Books and Pictures to Talk About:**

Studies have shown that interventions of mothers reading books with young children using participatory methods leads to improvements in children's language development and sustained attention, and the mothers improve in facilitatory techniques (26, 27). There is also evidence that regular reading to young children is associated with secure attachment (28). However, books require considerable adaptation to be culturally appropriate therefore we present the theory behind the books in the programme.

In general, the pictures are deliberately uncluttered with very clear outlines. The first books comprise simple pictures of familiar objects and people which infants are likely to see in their homes. For slightly older children, books with pictures of things likely to be seen outside the home are added. Then very simple stories are added with a beginning and expected ending, then the stories gradually become more complex. The usual family structure and common activities are also reflected in books such as extended families and farming.

*Maternal literacy:* Many of the disadvantaged mothers the programme originally targeted had limited reading skills. We wanted mothers to enjoy the books and talk about them freely with the child and observed that they were often more relaxed chatting about the pictures, rather than trying to read words. Therefore, to ensure the books can be used by mothers with varying literacy there are no words in most of the books except for the titles with only a few words introduced in some of the stories. This can also help to engage mothers and stimulate creativity and responsive

interaction with the child. More words could be added in populations with better maternal literacy.

*Concepts:* Books are designed to make it easy to introduce concepts from the curriculum as well as new vocabulary and to follow the story. Examples are the book, “Dirty Shirt” which illustrates wet/dry; dirty/clean; full/empty; and the emotions angry/not angry, sad/happy. The book, “Where is puppy?” shows many position concepts.

Some books introduce specific behaviors, for example a book for 3-year-old children “Going to school” illustrates sharing and taking turns. We also use books to develop theory of the mind (29) and encourage the mother to ask the child questions like “how do you think they feel?” and “what do you think they will do next” when looking at stories. To introduce a more exciting story for three-year-olds, a book on flooding was developed for Bangladesh, where it is a common experience. By the time they reach the last books, the children should be able to retell the stories in their own words.

*Method of looking at books:* Mothers are encouraged to put the child on her lap or beside her when looking at books to help focus their attention and to observe what picture the child is interested in and talk about that first. She is encouraged to use interactive techniques similar to the dialogic method (27) (helping the child to turn pages, manipulate the book, point and name pictures, ask open questions, etc.). Mothers and children are also encouraged to act out the pictures making animal noises/car noises, etc.

Looking at books is a good time to improve not only the child’s language ability and their ability to follow a story; it may also help to develop a secure attachment between mother and child through sharing an interest and having fun.

### **Activities from birth to 15 months:**

In infants under 6 months, the main focus of activities is on responsive interactions, comprising warm, loving interactions between mother and infant. The mothers are helped to recognize signals from the infant and respond to their needs and mood, and to develop sensitive and responsive interactions. Mothers are encouraged to maintain eye contact, respond to the child’s vocalizations, introduce new sounds, and participate in “back and forth” (Serve and Return) verbal interaction. They are encouraged to talk, sing and smile with their child while caring for

them and to elicit responses such as vocalization, movement and smiles from the child. They are encouraged to talk softly to the child and to describe what they are doing and mediate the environment by showing them things in and around the home, allowing time for the infant to respond. Several activities for children under 6 months were adapted from a programme in the USA - The Outcome Curriculum (30).

From 6 to 15 months, mothers are encouraged to continue using the responsive interactions described above and to help the child explore their environment, by providing interesting objects to handle and look at. The activities follow the path of normal development first described by Piaget in the sensorimotor period and developed into 6 ordinal scales of psychological development by Uzgiris and Hunt (31). We chose 5 of the scales as listed below with some examples:

1. *Visual pursuit and Object permanence*

Follows moving line/arc --- finds object half hidden --- fully hidden --- hidden under one of two covers.

2. *Means for obtaining desired event (causation)*

Bangs suspended toy to move it --- reaches for toy --- grasps it --- drops one object to pick up third.

Pulls cloth to get toy --- creeps after toy --- pulls string horizontally to get toy --- pulls string vertically to get toy --- uses stick to get toy.

3. *Imitation*

a) Vocal Imitation: Coos --- responds to familiar sounds --- repeats familiar sounds --- repeats familiar sound patterns --- repeats unfamiliar sounds --- repeats words

b) Imitation of familiar and unfamiliar gestures: Imitates familiar gestures (e.g. shaking, banging, waving bye-bye, clapping hands) --- imitates unfamiliar gestures (e.g. banging blocks together, making faces, closing eyes,)

4. *Objects in space (exploration)*

Reach --- touch --- grasp, looks for dropped object, puts objects in and out of container, stacking

5. *Schemes relating to objects (exploration)*

Mouth --- inspect --- hit, shake, drop, throw, show, recognise use of objects (brush hair, spoon feed)

*Language:* This is promoted by encouraging the mother to respond to the child’s vocalizations, participate in verbal interactions such as describing and pointing out things in the child’s environment and describing what the child and mother are doing, introducing action words and adjectives, and expanding the child’s early verbalizations.

**Activities from 15 to 48 months:**

*Concepts:* Understanding concepts begins at earlier ages but becomes more important as the children get older. As part of the curriculum mothers are encouraged to name concepts in the activities (e.g. under, beside, the same as). We used concepts from Francis Palmer’s Concept Curriculum (32), (Box 2) but did not follow the methods used to teach them as the US programme was center-based program with highly trained staff. The activities and materials used to teach the concepts were specially designed for the JHV programme.

Box 2

<b>Concept</b>	<b>Examples</b>
Size	Big/little
Colour	Starting with primary colours
Shape	Circle, square (using a series of puzzles)
Position	On top, in front, next to
Touch/State	Wet/Dry
Sound	Noisy/quiet
Quantity	More, all. Simple counting
Same/different	Matching objects
Classification by sequence	Sorting by increasing size. Repeated colour patterns (e.g. with threading beads)

*Executive Function:* For children under 36 months, several aspects of executive function are promoted through the curriculum's activities. For example:

*Persistence of effort:* Activities are included to promote the development of persistence of effort and attention, components of task-orientation. The problems include simple actions such as finding a toy under a cover, stacking objects, puzzles, construction with blocks, and threading beads. The joy of accomplishing a task or solving a problem is emphasized with praise and celebration. Efforts (attempts) are also recognised and praised.

*Sustained Attention:* This is encouraged by looking at picture books and as they grow older following the story, and by persevering to complete tasks such as puzzles and sorting and matching games.

More recently we added activities that promote executive function for children over 36 months. These include:

*Selective attention:* This is promoted with a series of pictures with hidden objects to be found.

*Working memory:* This is promoted by memory games, for example identifying a missing item from a series of items just seen.

*Cognitive flexibility and inhibition:* This is promoted in games of sorting the same objects in more than one way for example sorting animals by mother and offspring and then by large and small animals; matching mother to large spoon and baby to small spoon and then reversing it.

*Language:* As the child's vocabulary increases, mothers are encouraged to expand what the child says, ask open questions and frequently chat with their child holding two-way conversations. They are also encouraged to look at picture books often, introduce new words, and sing action songs together.

*General information about the world:* Pretend games, picture books, pictures-to-talk-about and walks outside introduce animals, nature, local institutions (e.g. schools and hospitals), time of day, and social roles.



*Imagination:* Mothers are encouraged to participate in imaginary games with their child. Symbolic play begins first with object substitution such as using a block or other object to pretend to brush hair or use as a telephone. Later make-believe or pretend play is encouraged, such as play at being an animal by crawling on all fours and making animal noises, doll play such as washing, feeding and putting the doll to bed. Three-year olds are encouraged to act out different roles such as mother, father, teacher, shop keeper or other familiar roles, and to see how long they can stay in a role, which encourages behaviour regulation.

*Prosocial behaviours:* Behaviours such as sharing, taking turns and helping are shown in the later picture books and introduced through pretend games such as playing with ‘tea set’.

*Theory of mind:* Helping the child to understand what others are thinking (29), is introduced mainly through books and doll play.

*Introduction to pre-literacy and numeracy skill:* The curriculum gradually develops number concept and introduces counting objects. For children aged 3.5 years and over, we introduce play activities that involve matching the same number of different objects and matching written numerals to the appropriate number of objects. Pre-literacy skills are introduced through handling books, naming pictures and story comprehension. A series of sequencing games of putting cards in order of occurrence (e.g. planting seeds, the plant growing, tomatoes appear and then are finally picked) teach moving from left to right and following a story. Matching letters to sounds at the beginning of words, using the 5 easiest letters, are introduced.

## **Summary**

The Reach Up programme is designed to improve the development of disadvantaged children in LMIC through building the capacity of mothers and other caregivers to promote development through responsive interactions and play. The curriculum is based on key developmental principles and methods and was designed so that it can be delivered by staff with a minimum of complete primary level education. The emphasis on the quality of the relationship between home visitors and mothers, the motivation and relationships of supervisors and visitors, and the general enjoyment of the visits are important factors in the programme’s success. Impact has been evaluated in over 20 RCTs in LMIC as well as in implementation studies examining staff and parent perspectives on appropriateness, feasibility, and acceptability. The curriculum, together

with the other resources and materials in the Reach Up programme: the adaptation manual, toy manual, training manual and films, supervisors training manual and handbook, provide a comprehensive package to support adaptation for context, training and ongoing support for staff delivering the program through home visits or small groups.

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