

# Coding Manual for the Hong Kong Study of Child-Nature Interaction Patterns: Dominating and Relational Behaviors

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## ABSTRACT

This technical report provides our coding manual – our systematic method to code the qualitative data – for coding the observational data of a study of children playing in a Hong Kong nature program. In this study, we used an Interaction Pattern Approach to model child-nature interaction, and then used the model to test two hypotheses that bear on differential affordances of landscape. Interaction patterns refer to structural characterizations of ontogenetically and phylogenetically meaningful human-nature interaction. Fifty-four children participated in the study. Observational data were collected using a random time sampling methodology to record (in 5-minute segments) videos of children (mean age 4.8 years) during play in nature. This method yielded approximately 37 hours of video data which were formally coded for children’s interaction patterns. In addition, where each interaction occurred, the landscape was coded as either relatively wild or relatively domestic. A total of 708 interactions were coded, and categorized based on 37 distinct interaction patterns, such as *gathering forest items* and *immersing one’s body in water*. Based on this modeling, we then tested two hypotheses: (1) that in the more domesticated nature areas, children would engage in more domination interaction patterns (e.g., *killing insects*, *catching wild animals*), and (2) in the more wild nature areas, children would engage in more relational interaction patterns (e.g., *cohabitating with wild animals*, *using water to find respite in nature*). Both hypotheses were supported statistically. The modeling results extend interaction pattern theory, showing its applicability in a cross-cultural setting.

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## I. List of Keystone Interaction Patterns and Higher-Order Categories

### Interacting with Animals:

- *Catching wild animals*
- *Cohabiting with a wild animal*
- *Exploration of animals*
- *Imitating animals*
- *Killing insects*
- *Looking at wild animals*

### Interacting with Forest:

- *Balancing on forest features*
- *Being in solitude in the forest*
- *Clambering on forest features*
- *Climbing high in small tree*
- *Digging in earth*
- *Falling on ground in forest*
- *Gathering forest items*
- *Imaging nature to be something other than it is*
- *Leaning and hanging from supple tree limbs*
- *Manipulating forest items*
- *Pushing to the edges of social boundaries*
- *Recovering from a potential fall in forest*
- *Striking wood on wood*
- *Using one's body vigorously in nature*

### Interacting with Water:

- *Balancing on natural features in water*
- *Being in solitude in water*
- *Clambering on nature features in water*
- *Falling in water*
- *Gathering nature items in water*
- *Imaging nature to be something other than it is in water*
- *Immersing one's body in water*
- *Manipulating the flow of water*
- *Manipulating nature items in water*
- *Rafting in water with the aid of vessels*
- *Recovering from a potential fall in water*
- *Splashing in a mud puddle*
- *Throwing rocks in water*
- *Using nature features to navigate water*
- *Using water to find respite in nature*

### Interacting with Weather:

- *Being outside in inclement weather*
- *Embracing the elements*

## II. Definitions for Keystone Interaction Patterns

### **Interacting with Animals**

#### ***Catching wild animals***

This interaction pattern includes but is not limited to hunting, catching, or capturing wild animals. To capture or attempt to capture wild animals, the child may use tools such as nets, boxes, or their bare hands. The animals may include grasshoppers, snails, fish, frogs, toads, caterpillars, worms, and other fauna encountered by children in this area. Importantly, even if a child ultimately fails to successfully capture the organism, if the child's attempt is accompanied by a recorded audible verbal expression or otherwise clear intention of the child to capture the wild animal then this observed behavior shall still be coded. Often, these behaviors revealing intent to capture a wild animal are demonstrated through a child's kneeling, crouching, and active searching in the service of catching a wild animal.

#### ***Cohabiting with a wild animal***

This interaction pattern relies fundamentally upon a child's awareness and respect of the presence of a wild animal or insect. This pattern may involve the relocation of the involved organism to a new area to preserve its wellbeing as a step to mitigate any potential harm to the insect or animal as a result of the child's or others' actions. This act of preservation often involves scaffolding by a teacher. Cohabiting is different from simply looking at a wild animal in that it requires a deeper understanding or consideration of the organism's life by the child. This keystone interaction pattern also often involves the child touching or holding the organism.

#### ***Exploration of animals***

This interaction pattern occurs when the child exhibits intention and action to explore organisms in the outdoor environment. These coupled cues can include verbal confirmation of intent, or simply clear physical expression of exploration. Often, this can include when the child looks, pokes, prods, holds, or even verbally poses inquiries to or about the insect or animal.

#### ***Imitating animals***

This interaction pattern occurs when the child pretends or acts as though they are another organism. For this environment, this keystone interaction pattern is demonstrated by children imitating vertebrate animals within the phyla of mammals, birds, and fish.

#### ***Killing insects***

This interaction patterns occurs when the child kills or show intention to kill insects. Insects abundant in this particular outdoor environment were ants, mosquitoes, grasshoppers, beetles, ladybugs, and butterflies. To code this interaction pattern, the

child must give verbal expression of intention to kill or show clear physical expression of killing. This interaction pattern is perhaps best demonstrated when the child squishes, hits, claps, presses, or steps on insects.

### ***Looking at wild animals***

This interaction pattern describes any account of a child observing wild animals or insects attentively. To code for this keystone interaction pattern, children may look at the wild insect or animal from a close perspective or from a distance.

### **Interacting with Forest:**

#### ***Balancing on forest features***

This keystone interaction pattern does not involve the use of one's hands in the act, but does involve some degree of lack of stability that requires a child to attempt to maintain equilibrium in movement across nature feature (stump, log) or in a stationary position for at least two seconds. This pattern is often characterized by the careful act of standing, kneeling, walking, or lying on precarious features, while attempting to stabilize the body from falling over. In this interaction, the coder may see a child extend their arm out to maintain balance.

#### ***Being in solitude in the forest***

This interaction pattern occurs when the child chooses to be alone in nature. It manifests when a participant is not accompanied by anyone (teachers included) within a 20-30 ft radius for at least 20 seconds -AND- the child is secluded, concealed, or isolated in some way by natural or artificial features. The coder shall also add the sub-code of being 'active in solitude' or being 'passive in solitude'.

#### ***Clambering on forest features***

This interaction pattern involves the child climbing on branches, trees, tree limbs, stumps, logs, or other natural features of the forest. There must be at least three points of contact (using hands and feet), and active movement on the nature features. In order to code for this interaction pattern, the participants should be clambering actively for at least two seconds. If the participant clambers on multiple nature features, once they shift and disengage with their previous central nature feature, automatically code for another instance of clambering. Difficult or strenuous physical activity often accompanies this keystone interaction pattern.

#### ***Climbing high in small tree***

This interaction pattern requires a child to climb up and onto the limbs of a small tree, and in accordance with *climbing high* - requires the child's entire body to be above ground level *and/or* above the tree's base. This keystone interaction pattern frequently

encompasses acts of balancing, lifting oneself up with arms, and testing the limits of tree limbs. It also includes the intentional placement of feet. This interaction pattern can include vigorous or moderate physical activity. A tree is coded as a *small tree* when the trunk's diameter is smaller than the child. To distinguish from *clambering on nature features*, and *balancing on nature features*, this pattern is exclusively coded for small trees. One count of behavior is coded for *each* individual focal child observed in the video. For consecutive videos of same focal child/same behavior/same zone the pattern *shall not* be recounted.

### ***Digging in earth***

This interaction pattern often involves the use of artifacts or tools (such as a stick, rock, or hand) to attempt or successfully remove or move earth from the ground. This occurs when the child exerts energy to complete the action, often relocating dirt, mud, or sand from the ground into an artifact (such as a wheelbarrow or bucket), or to another part of the classroom. This interaction pattern should only be coded if the child digs for at least two seconds.

### ***Falling on ground in forest***

This interaction pattern involves any instance of a child tripping or falling in forest, with point of contact ranging from one limb to full body contact. Often this interaction pattern takes place when a child loses their balance causing them to fall on either a mediating natural feature or the ground. This interaction pattern constitutes an act without intent or an aspect of accidental occurrence of losing control. This pattern should only be coded there is the risk of the child not landing on their feet.

### ***Gathering forest items***

This keystone interaction pattern is demonstrated by the act of moving or removing nature items (sticks, leaves, branches, rocks, earth) from one place to another – collecting is a subset of this interaction pattern. A participant who performs this interaction pattern should 1) collect the same type of nature items, 2) move the gathered nature items to the same location. This interaction pattern will only be coded if the participant performs this interaction pattern for at least two seconds continuously or recognizes that the gathered quantities are larger than five.

### ***Imagining the forest to be something other than it is***

This interaction pattern occurs when the child imagines or pretends an object in the forest (i.e., rocks in the forest, sticks, or tree branches) is a different object than what it truly is. This interaction pattern often is accompanied by children's pretend play scenarios. Evidence of the occurrence of this keystone interaction pattern can be both in the form of

audible verbal expression or visual confirmation of the child's imagination being enacted upon the water objects.

### ***Leaning on or hanging from tree limbs***

This interaction pattern requires a child to grasp supple tree limbs with either one or two hands, while counterbalancing their body weight through shifting movements. This interaction pattern includes actions such as swaying, swinging, or leaning. Tree limbs may be any size from large or small trees but are primarily mainly low-hanging branches. This interaction pattern often involves active movement. To distinguish this behavior from *leaning against tree*, this interaction pattern requires more vigorous movement that *does not* include the child leaning their back against the tree. To also distinguish the coding of this behavior from *climbing high in a small tree*, this keystone interaction pattern *only* encompasses the child at ground level. For consecutive videos of the same focal child/same behavior/same filming zone, the interaction pattern *shall not* be recounted. The coded interaction pattern is recounted as one additional instance when a focal child moves away from tree limbs and returns over a 30 sec interval.

### ***Manipulating forest items***

This interaction pattern involves the exploration of natural objects such as, sticks, branches, leaves, and other nature items in the forest. This includes, bending, twisting, rolling, pushing, scratching, or in some other way transforming or manipulating the nature item. After a participant manipulates the nature item while in the forest area, that nature item should transform insofar as its shape is changed, or perhaps part of the nature item has become dislodged. The child should exhibit a degree of control over the nature item.

### ***Pushing to the edge of social boundaries***

This interaction pattern occurs when a child breaches or almost breaches the social boundaries of the nature classroom with some part of their body. This occurs when the child either is trying to achieve a goal (i.e. reaching over a classroom boundary line to retrieve some leaves for gathering), or is simply attempting to cross the boundary. Social boundaries are defined by the demarcation of certain areas of the nature classroom, usually marked by tape, long branches on the ground, or large logs positioned around the periphery. A child who is interacting with the social boundary (such as touching the classroom tape) is automatically coded for this interaction pattern.

### ***Recovering from a potential fall in forest***

This interaction pattern often involves a child tripping or showing some instance of saving themselves from a potential fall. Often this interaction pattern takes place when a child loses their balance while climbing and playing on different nature feature. It often observed with *balancing on nature features*. When looking at this interaction, the coder

may see the child flail their arms in attempts to save themselves from a fall reminiscent of an infant's moro reflex.

### ***Striking wood on wood***

This interaction pattern requires a child to strike any piece of natural wood with their hands upon another piece of natural wood. Natural wood includes sticks, branches, and bark. The natural wood struck upon can be larger or smaller than the other piece of wood. Examples of these include logs, stumps, trees, or low-hanging branches, and excludes domestic tools like shovels, pans, or toys. This pattern includes vigorous to moderate physical activity. To distinguish from *destroying nature*, this pattern *does not* include acts of striking to remove a piece of nature, i. e. bark off a tree, or verbal expression of harm to nature items. This pattern requires a duration of 3 seconds to be coded. One count of behavior is coded for *each* individual focal child observed in video. For consecutive videos of same focal child/same behavior/same zone the pattern *would not* be recounted. The pattern is recounted as one count, in instances when focal child stops behavior and returns again over 30 seconds.

### ***Using one's body vigorously in nature***

This interaction pattern describes instances in which children exert above-average energy while moving throughout the space. This pattern includes motions such as running, jumping, crawling, rolling, skipping, sliding, and hopping. This interaction pattern should only be coded when the physical activity captured in a recording is not properly covered by any of the other physical keystone interaction patterns. The duration required for this interaction pattern should last for at least two seconds of continuous action or three consecutive instances of an action occurring with no more than two seconds apart between each instance. Any instance of running will be coded, with no minimum second limit. In the case of jumping, a child jumping off of something knee-height will automatically be coded once.

## **Interacting with Water**

### ***Balancing on nature features in water***

This interaction pattern is characterized by the careful act of standing, kneeling, walking, or lying on various features, while attempting to stabilize the body from falling over. This pattern requires the child to maintain equilibrium in movement across nature feature(s) or in a stationary position for at least two seconds. In this interaction, the coder may see a child extend his/her arm out to maintain their balance.

### ***Being in solitude in water***

This interaction pattern occurs when the child is visibly alone in water. This is coded when the child actively chooses to be alone and away from the group in the water.

### ***Clambering on nature features in water***

This interaction pattern involves the child climbing on big rocks, or other natural features in water. There must be at least three points of contact (using hands and feet), and active movement on the nature features. To code for this interaction pattern, the participant should be clambering actively for at least two seconds. If the participant clambers on multiple nature features, and once they shift and disengage with their previous central nature feature, automatically code for another instance of clambering. Children often engage in difficult or strenuous physical activity in the performance of this interaction pattern.

### ***Falling in water***

This interaction pattern involves any instance of a child tripping or falling in Water, with point of contact ranging from one limb to full body contact. Often the coding of this keystone interaction pattern takes place when a child loses their balance causing them to fall on either a mediating natural feature or the ground. This interaction pattern constitutes an act without intent or an aspect of accidental occurrence of losing control. This pattern should only be coded there is the risk of the child not landing on their feet.

### ***Gathering nature items in water***

This keystone interaction pattern includes any act of removing, moving, or collecting nature objects in water (i.e.: rocks, water, leaves). A child whose behavior is coded for this interaction pattern should 1) collect the same type of nature items, and 2) move the gathered nature items to the same location. This interaction pattern shall only be coded if the participant performs this interaction pattern for at least two seconds continuously and if the coder can estimate from the recorded data that the gathered quantity sums to five or more.

### ***Imagining water object is taking a different form***

This interaction pattern occurs when the child imagines or pretends a water object (i.e., rocks in water, water) is a different object than what it truly is. This interaction pattern often is accompanied by children's pretend play scenarios. Evidence of the occurrence of this keystone interaction pattern can be both in the form of audible verbal expression or visual confirmation of the child's imagination being enacted upon the water objects.

### ***Immersing one's body in water***

This interaction pattern occurs when child places at least half of their body (to the waist) underwater. Immersing includes the action of swimming, sitting, crouching, or standing in water.

### ***Manipulating the flow of water***

This interaction pattern occurs when the child intentionally changes the path of flow of water. This can include using one's arm, hand, foot, or leg to change the flow of water in some way. This may also include using non-bodily implements like plastic buckets and shovels.

### ***Manipulating nature items in water***

This interaction pattern involves the exploration of natural objects such as, sticks, branches, leaves, and other nature items in water. This includes, bending, twisting, rolling, pushing, scratching, or in some other way transforming or manipulating the nature item. After a participant manipulates the nature item, that nature item should transform insofar as its shape is changed, or perhaps part of the nature item has become dislodged. The child should exhibit a degree of control over the nature item.

### ***Rafting in water with aid of vessels***

This interaction pattern involves traversing bodies of water with the aid of vessels such as small boats and tires. It includes actions such as kayaking and lying on floaties. This interaction pattern requires 1) the use of a vessel and, 2) movement of the vessel, by children or teachers, that results in floating, and 3) clear indication that the child is not in physical contact with the riverbed. To distinguish from *immersing one's body in water*, the video data must show that the child is not touching the riverbed with any part of their body. If there is clear no indication of floating while also satisfying the requirement of immersing self in water, then that behavior would be more accurately coded as the keystone interaction pattern *immersing one's body in water*.

### ***Recovering from a potential fall in water***

This interaction pattern often involves a child tripping or showing some instance of saving themselves from a potential fall in water. Often this interaction pattern takes place when a child loses their balance while climbing and playing on different nature features in water. It often observed with *balancing on nature features*. When looking at this interaction, the coder may see the child flail their arms in attempts to save themselves from a fall similar to an infant's moro reflex.

### ***Splashing in a mud puddle***

This interaction pattern is illustrated by a child using their gross motor skills such as jumping, kicking, leaping or stomping in a small pool of water during or after a rainstorm. This interaction pattern requires 1) a clear display of a mud or water puddle in the video, 2) one or both feet leaving the ground, and 3) landing of feet which causes splattering of mud or water.

### ***Throwing rocks in water***

This interaction pattern involves throwing, skipping, tossing rocks into water or onto the surface of water through the movement of the child's arms. This interaction pattern is often observed alongside *gathering nature objects*, but shall be coded as its own distinct keystone interaction pattern.

***Using nature features to navigate water***

This interaction pattern occurs when a child uses a nature object to prevent themselves from falling. This interaction pattern requires a child to use a nature feature as an anchor to support their weight while walking or traveling upstream. The child must be using both hands to actively travel across water. To distinguish from *clambering on nature features* and *balancing on nature features*, this interaction pattern shall only coded if a child is actively moving across water.

***Using water to find respite in nature***

This interaction pattern references how children adapt to challenges and respond by using water. This includes relieving pain after mosquito bites and cooling oneself down from hot weather.

**Interacting with Weather:**

***Being outside in inclement weather***

This interaction pattern occurs when the child experiences dynamic or challenging weather conditions such as extreme temperature, wind, rain, and thunderstorms. Weather must impact behavior of the child, or the behavior must manifest within the context of challenging weather conditions. The following characteristics are evidence of inclement weather conditions: temperature, wind speed, and precipitation levels. The challenging weather conditions should reach an audible or visual threshold during the video.

***Embracing the elements***

The child fully experiences outside weather and atmosphere. Child is aware of weather phenomena or outside elements including the sky, clouds, sun, rain or wind. This keystone interaction pattern differs from *being outside in inclement weather* because *embracing the elements* includes all outside elements and excludes observations of children exhibiting reactive behavior to challenging weather conditions. Child must show acknowledgment of elements through verbal communication and/or physical cues, such as outstretched arms in the presence of rainfall.

**III. Definitions of Relational and Domination Child-Nature Interactions**

**Relational Interaction:**

Relational interactions refer to behaviors that show respectful awareness and/or mindfulness of our environment, including the ability to cohabitate with other life forms

and/or preserve and promote the well-being of and a bond with nature.

### **Dominating Interaction:**

Dominating interactions refer to behaviors that show aggression toward and/or seek to control the environment, including gratuitous or unjust harmful consequences enacted upon nature.

## **IV. Coding Decision Rules**

### **1. Focal Child Rule**

Keystone interaction patterns are only coded if the child-nature interaction is occurring with or to the designated focal child in the video.

Example: If two children are using bug nets to catch butterflies in the nature environment, only one child shall be coded. The research design was such that each video follows the actions from solely one child: the focal child. If one video contains more than one child/person, only the child of focus (in the middle of the screen for more than half of the video time) shall be coded.

### **2. One Second Rule**

If the focal child is in the scene for under one second, their behavior occurring during that fraction of time shall not be taken into consideration for the possible coding of keystone interaction patterns. This rule allows for a frequency distribution of keystone interaction patterns to be determined by reducing the ambiguity of child behavior that occurs for a relatively negligible amount of time.

### **3. Two Second Rule**

All keystone interaction patterns in the Interacting with Water and Interacting with Forest category must last for a minimum of two seconds in order to be coded. To acquire a precise measurement of the frequency distribution of these interaction patterns, there must be a duration of two seconds in order for the keystone in the “Interacting with Water” and “Interacting with Forest” category to be coded.

### **4. No Minimum Time Rule**

All keystone interaction patterns in the Interacting with Weather and Interacting with Animals higher-order classification categories shall be coded with no minimum time requirement. In other words, once the coder observes a child’s recorded behavior exhibiting criteria that fulfills any keystone interaction pattern contained within the Weather and Water categories, the coder shall mark that occurrence. These interaction patterns are distinct from the physical keystone interaction patterns because *being outside in inclement weather, embracing the elements, cohabiting with wild animal, killing insects, exploration of animals, and imitating animals* do not necessarily require sustained duration in order for the observed behavior to fulfill the coding criteria stipulated herein.

Thus, keystone interaction patterns nested within the Interacting with Weather and Interacting with Animals categories are exempt from the Two Second Rule.

#### 5. Ten Second Rule

Once the enactment of a keystone interaction pattern has terminated, the coder begins a timer for ten seconds. When the timer has reached ten seconds, only then can the same keystone interaction pattern be coded for a second instance. This coding decision rule only applies when the interaction is unbroken. The purpose of this rule is to prevent 'under-coding' any keystone interaction patterns in the dataset.

Example: if a child is *gathering forest items* for 15 sec continuously, then two instances of *gathering forest items* shall be coded.

#### 6. Higher-Order Categorical Specificity Rule

To prevent the possibility of 'double-coding' a child-nature interaction, the keystone interaction pattern that is most specific from each higher-order classification category (Interacting with Animals, Interacting with Forest, Interacting with Water, and Interacting with Weather) shall be coded for a child's observed behavior.

For example, if a child is observed climbing fairly high in a small tree, then the keystone *climbing high in small tree* from the "Interacting with Forest" category should be coded. Although technically the observed behavior of the child climbing the tree could also be considered Using one's body vigorously in nature, since this keystone interaction pattern resides within the same higher-order classification category as the more specific keystone IP noted above, only the more particular shall be coded. This rule will allow for more accurate estimation of which keystones occur across the dataset.