

## **Coding Manual**

### **Required Materials:**

Video recordings  
Coding manual  
Coding sheet  
Computer to view videos  
Headsets (optional)

### **The Present Study:**

In the present study we code collaborative interactions using categories we created based on our review of 72 middle school child pairs who programmed a computer game. Understanding a middle school child's collaboration can help us better understand the socio-cultural processes occurring during pair programming.

### **Procedure Used in This Study:**

In this study, middle school children were invited to participate in an after-school or in-school elective technology course where they used Alice – 3D computer programming environments designed specifically for novices – to program computer games. Child pairs worked together over approximately 20 hours during a semester. In the first half of the semester, pairs worked through a series of self-paced instructional exercises. During the last half of the course, the child pairs freely designed and developed their own games in a visual programming environment (Alice). Partners were chosen by the teachers, using input from each child.

The pairs were videotaped for a 20 minute session toward the end of the semester during which they collaborated while working on their games. Each child had an opportunity to be both driver and navigator (10 minutes in each role). The children switched roles halfway through the activity. The driver role required that the child control the mouse and keyboard. The navigator was instructed to sit next to the driver, using reference materials to address questions, and provide input. We referred to the first child to assume the role of driver as 'child A' and the first child to be the navigator as 'child B.'

### **Instructions:**

View the video once, without any coding. The purpose of this initial viewing is to get a sense for how the pair of children worked together.

During your second viewing begin coding. You might find it helpful to review the video more than once while coding. Rewind the video and view the 10 second segments several times. Initially coding a video may take up to 5 hours or longer.

Our **unit of analysis** for this study is the child pair. Because of this, most codes do not distinguish between the children, if one child performs the action then you can code that collaboration type. There are a few exceptions that specifically focus on the driver or navigator.

**Interval coding** was chosen to code the pair's interactions. In interval coding, the coder checks for interactions that fall under coding categories during each time interval. If one of the interactions occurs during that interval, mark the box for the code with an uppercase "X."

If it carries from one time segment to another, mark both time segments. Be very careful when coding interactions that span across more than one time segment. Reliability can be affected if one is not conscious of the start or end to a segment. If a child started asking a question at 00:01 and the last word ended at 00:11 then code 'question' for both time segments.

Only code interactions that are relevant to our coding manual. Not all interactions will be coded. Sometimes you may even observe an interesting interaction, but we have no code to capture that interaction. In this case, the interaction will not be coded. This is expected, so try not to get stuck on interactions that we do not fit our codes.

Examples include: "Hey can I have a cookie?" "This screen is so dirty." "Hey is that your sister?" (Then points at wall behind camera).

There are only a few codes that capture interactions that may be unrelated to the pair programming activity. These codes include 'nonverbal look', 'screen point' and 'antagonistic actions.' Code actions during pair programming activity for these three codes even if they seem unrelated to pair programming.

### **Taking Notes:**

Take notes that will help you remember the video when we talk about it right after the video. Write down any questions that you would like to discuss. This is especially true for videos that will be used for checking reliability.

If you find a great example for a particular interaction we are coding or interactions you find really interesting make note of it and add it to the google document we created. Feel free to also make note of pairs who worked exceptionally well together or who might be a great example of a dysfunctional pair.

In other words, you can use this note sheet to keep track of anything you find interesting. We can later use these examples to remember interesting interactions between pairs of children.

### **Hypotheses:**

We have decided to keep you blind to our hypothesis in this study. So please help us achieve this goal by reminding us if you think we are about to reveal the hypotheses. We may sometimes ask you to leave the room so we can discuss the hypotheses.

We are interested in gender on an exploratory basis. Because we have no predicted direction for findings related to gender, we can discuss this freely. Please keep an eye out for any interesting gender patterns you notice. You will be un-blinded (told the hypotheses) when coding is finished.

### **Privacy:**

Please avoid coding in public places. If you have to work from outside the home for some reason try to find a place where your video will not be viewed and heard by others. If you have to transfer a video to your computer for coding, please delete it from your computer after you finish coding.

### **Coding Instructions Review**

Code an interaction if it happens during the 10 second segment. The codes are not mutually exclusive, so you may code 2 or more types of interactions per interval. If an interaction with a designated code occurs during that time segment, then you should code it.

The only exception to coding any interactions that occur for any length of time is made for the 'navigator intently involved' code. This code focuses on your overall evaluation of the navigator's involvement during those ten seconds rather than looking for a specific action. If the navigator is involved over half of the segment, then code navigator intently involved.

Interactions should only be coded if the children follow through with the interaction. You would not code, "Where's the..." or "This guy should..." if the child doesn't finish their sentence.

Don't code an interaction between the children and an interrupting person (e.g. another child, a teacher, or a research assistant). If the interrupter is present and the children continue to interact with each other then you may code those interactions between the children.

Only code interactions that are relevant to the pair programming activity and are found in our manual. Not all interactions will be coded. The only codes that include interactions not related to the programming activity are 'nonverbal look', 'screen point' and 'antagonistic actions.' Code actions not related to the pair programming activity for these three codes even if they seem unrelated to their computer work.

	<b>Code</b>		<b>Description</b>	<b>Example</b>	<b>Notes</b>
1	Nonverbal look	NVL	If a child looks in the direction of their partner, code for nonverbal look. The child must follow through and look in the direction of their partner. Do not code nonverbal look if the child obviously is looking past their partner or if a child		Also code nonverbal looks that may be unrelated to the pair programming activity.

	Code		Description	Example	Notes
			initiates a nonverbal look but does not follow through.		
2	Screen pointing	SCP	<p>Screen points include interactions where either child points at the screen. There are two cases when this will be coded:</p> <p>A. The pointing is visible in the video (meaning you must see that the child is using their finger to point to the screen).</p> <p>B. The pointing is not completely visible: in cases where fingers cannot be seen, screen pointing can be coded if a child raises their hand and says something that suggests a point (i.e. The child raises their arm and says, “click here.”)</p> <p>For pointing to be coded when the whole hand is not visible, one child must both give verbal indication of pointing and the coder should be able to view one arm or parts of the arm being raised.</p>	<p>Child B: (The child raises their arm and says.) “Click here”</p>	<p>Also code screen pointing that may be unrelated to the pair programming activity.</p> <p>Gesturing with their hand or a tool to the screen counts as pointing.</p>
3	Question	QUE	<p>Code for a ‘question’ if a child asks a question. This may be done verbally or nonverbally. Code as a ‘question’ when inflections or tone in a child’s voice indicate a question.</p> <p>This can include colloquial utterances such as “Huh?” or “What?”</p> <p>Saying, “Let me see” without a change in tone or inflection does not count as a question.</p>	<p>Child B: (Pointed at the screen then looked over at the navigator and shrugged their shoulder to indicate confusion.)</p>	<p>Do code for a question regarding control of mouse or keyboard. Keep in mind that questions of this type can contribute to ‘taking control with consent.’</p> <p>Questions aimed at instructors should not be coded.</p> <p>A question can also be in response to another question. In this case, both ‘question’ and ‘respond to question straightforward’ would be coded.</p>
4	Respond to question	RQS	<p>‘Respond to question’ includes interactions where a child responds to a question.</p> <p>Only code ‘respond to question’ for the interval when the response to a question interaction starts.</p>	<p>Child B: “Where’d you put that?” Child A: (Points at the screen.)</p> <p>Child A: “How do we get started?” Child B: “Click here first.”</p>	<p>Laughter doesn’t count as a ‘respond to question.’</p> <p>Interactions coded as ‘respond to question’ might also be double coded with other codes (i.e., ‘controlled direction in the second example.’)</p>
5	Respond to own question	ROQ	<p>Code this type of interaction if a child asks a question and then responds to their own question.</p>	<p>Child A: “Where did you want to put the dog?” (10 seconds later) Child A: “Oh, by the car.”</p>	
6	Agreement	AGR	<p>Code for agreement if one child or both children agree with each other. A child may indicate agreement using the following words: Yes, ok, yeah, alright, sounds good, mm hmm, as well as a nod.</p>	<p>Child A: “Should we make the elephant smaller?” Child B: “Okay”</p> <p>Child A: “But should we start the method?”</p>	<p>Consider the context when evaluating whether it was an agreement or merely a characteristic of a child’s speech.</p>

	Code		Description	Example	Notes
			Evaluate whether it was an agreement or merely a characteristic of a child's speech. If a child says, "Ok, should we make the elephant smaller?" Even though the first word is "Ok" this would not be coded as an agreement. But the other child might respond, "Yeah let's make it really small." This would be an agreement.	Child B: (nods in response)  Child B: "Let's do a bird house!" Child A: " Yeah!!!"	
7	Disagreement	DIS	<p>This code refers to a disagreement between the partners about the project. Use this code if the children disagree on the direction of their project.</p> <p>Cases of disagreement include disagreement on the next step to take in their project, and on which roles they each should play in creating their project. Also, code if one child shakes their head to signal, "no."</p>	<p>Child A: "Let's make it a camel!" Child B: "I don't want a camel in our game"</p> <p>Child B: "Did you want to put it over here?" Child A: "No."</p>	Don't code for disagreement in examples that are vague, implied, or subtle such as the example.
8	Controlled direction	CTD	<p>Controlled direction includes commands where a child directs their partner (when in the driver or navigator role) with or without an explanation. Controlled direction is characterized by controlling the direction of the partnership.</p> <p>The child is not asking for their partner's feedback in the immediate interaction, but telling them "We're doing it this way."</p> <p>Controlled direction has to come clearly from the driver to the navigator or from navigator to driver.</p> <p>We're not focusing on the direction of the project or the partnership, but how they command their partner. (Madelyn, "They are not directing the project, they are directing the person.")</p>		<p>This code occurs mostly verbally. If it occurs nonverbally, it would look like one child pointing at parts of the screen (as if instructing the child, ok click here, now here, ok now click this).</p> <p>If "Let's" and "should" occur alone without hedging to soften the direction it's a controlled direction.</p> <p>'Controlled direction' usually comes from the navigator but it's not exclusive to the navigator.</p>
9	Suggested direction	SGD	<p>'Suggested direction' includes suggestions of the project direction (or next step) that is inclusive of their partner. The suggestion seems to be inclusive of the partner and sometimes seeks the partner's feedback.</p> <p>Use the context to evaluate whether the direction should be coded as 'suggested direction' or 'controlled direction'</p> <p>A suggested direction may be marked by tentativeness.</p> <p>The following words may sometimes precede a suggestion, but</p>	<p>Child A: "I think we should make the cow dance, then say 'hi.'"</p> <p>Suggested direction does not always sound like a question.</p> <p>Child A: "If we do that, the project might work better."</p>	A 'suggested direction' will sometimes be phrased as a question to be inclusive of their partner. In these cases code both 'suggested direction' and 'question.'

	Code		Description	Example	Notes
			do not always lead to suggestions:  What if..., I think..., What do you think about..., Maybe we should..., Why don't we..., etc... but are not limited to these words.		
10	Explanation	EXP	The 'explanation' code refers to interactions where one child explains something to their partner. This may include an aspect of Alice, the direction of their project, or why they are suggesting or executing the next steps.	Child A: "Let's make the fire truck say 'hello' <u>just to make sure we're doing it right.</u> "  Child B: "You want to click on create new method" (points at the computer screen) "... <u>because that helps you tell the character what we want them to do.</u> "	
11	Taking control with consent	TCC	This type of interaction is characterized by explicit agreement between the partners to exchange control. Code an interaction for taking control with consent if one of the children asks to use the keyboard, mouse, or ige manual, or if a child motions to their partner to take control.	Child A: "Can I try?" (Motioning to the keyboard.) Child B: (Retracts their hands from keyboard and leans back).  Child B: "I don't know how to do that. You just do it." Child A: "Driver pushes mouse to navigator."	
12	Taking control without consent	TCW	In this type of interaction one child takes the mouse or keyboard away from the other child without receiving consent. This interaction may occur forcefully or in a sneaky way. This type of exchange can happen even when no one asks. In some instances a child asks for access, but takes the mouse without waiting for a response from their partner.		Only code 'taking control with consent' if the child follows through with the action. A child may attempt to take control, but is unable to because their partner swats their hand away. Simply laying their hand or a finger on the mouse does not count as 'taking control without consent.'
13	Antagonistic actions	ANT	Antagonistic actions include actions that cause tension in the partnership that affect how the pair interacts and collaborates. Antagonistic actions also includes hitting, name-calling, or teasing that is not part of the children's rough play. This includes hurtful verbal comments, instigating fights, prodding, putting down their partner's work and ideas, minimizing their contributions, and showing annoyance with their partner.	Child B: (Imitating a radio voice into the microphone.) "I see Alex not doing anything right, he's ruining the project. No, no, don't do that Alex. Don't you know what you're doing! Oh no, he's messed up the game folks."  Child A: "I don't know why you tried that. I know it wasn't going to work."	Also code interactions that may be unrelated to the pair programming activity.
14	Switch	SWT	A switch occurs when the driver and navigator switch spots. This includes exchanges in roles that were built into the study (a timer will go off, the children may have kept track of the time, or one of the adults may ask them to switch).		Any time the child in-front of the computer switches this should be coded.

	Code		Description	Example	Notes
15	Interruption	INT	<p>Code any interruption that occurs throughout the students' collaboration. This includes interactions where an adult or child outside the pair begins speaking or interacting with the partners.</p> <p>An interruption to the partner's interactions.</p> <p>Code an 'interruption' even if an adult interrupted to give instructions or to troubleshoot a computer problem.</p> <p>Do not code as an interruption if the participants themselves distract each other.</p>		<p>Also code for interruption when the seated child talks to a child who is not his designated partner.</p> <p>Code whether the interaction is relevant to the pair programming or not.</p> <p>Make sure to code off-screen interactions.</p>
16	Away from workstation	AWY	<p>If one child moves away from the workstation for more than half of the time segment (even if they are seeking help) code as away from keyboard. Examples include, but are not limited to, leaving to go get help, to get a snack, because they are bored, or frustrated.</p>		
17	Navigator Intently Involved	NVI	<p>This code is unique because it only focuses on the overall involvement of the <b>navigator</b> for the 10 second time interval (the navigator needs to be intently involved for at least half of the interval). In this type of interaction the navigator shows involvement in the coding by looking at the screen, looking at or talking to their partner, or looking through the iGame manual. Only code 'navigator intently involved' if the navigator is focused on the computer activity. Look for other actions that indicate that the navigator is involved in a way that shows purposeful contribution to the game during that segment.</p> <p>Do not code the navigator as intently involved if the navigator is not on camera, unless verbal cues give indication of involvement.</p>		<p>The 'navigator intently involved' code requires that you assess the overall involvement of the navigator per segment.</p> <p>Do not code an interaction as navigator intently involved if they are discussing being video taped.</p>