

June 2, 2003



AM: for the shoot we can use that big rope over there
LE: not for that, that for that
AM: yeah

In this situation, “that” cannot be understood on its own, even if we look at the drawing that the indexical gesture (finger pointing) refers to at the moment. The “meaning” of “that” does not lie in the drawing or part of the drawing indexed. Rather, both index an entire conversation that the three had participated in the past, and the (different) traces this conversation has left in the different subjectivities.

The diagram is a historical document, associated with the work of designing, and not merely representing the design, the product. If anything, it is a metonymic representation of the shared history. At this particular moment, the participants are already aligned, and the language is used to articulate articulations already shared.

LE: that’s for the shoot, that’s for the incline plane and
these have. Now, you know we have to build this I
have wood over there to build it, so

The image and the indexical gestures refer to the envisioned outcome of their actions, the vision of the final artifact. This vision, they take as shared even though it may turn out in the future that in fact these visions had been different and their subjectivities had not been aligned.

Even so, they will then continue under the assumption that once identified and repaired, they now work with a shared vision. In the process, they forget any prior misalignment. They worked with different visions but under the impression that the vision was shared, that others had the same vision as they had individually. They view their individual vision as *the* collective one, though it turns out at time that the vision was individual rather than collective.

There is a dialectical tension between the individual and the collective vision. The individual vision is always a concrete realization of generalized possible visions, and, from the perspective of the individual subjectivity, this concrete (real) vision is also the one that others have realized. There are always more concrete real visions, depending on

the number of individuals in the collective (with their own histories), the generalized possible visions constitute a universe of visions.

The history of the individual will be formative for his or her way of seeing, perceiving; this history is itself mediated by the socio-cultural context of the individual. A priori, the coparticipants in a group are not aligned, though they may take alignment as the default situation. The practically realized individual perception of the world is taken to be the one all other individuals are realizing.

When there is a common history, such as when a group works for a period of time, there are particular consequences. Now interpretations and actions are framed by a common horizon, the horizon of the commonly experienced situations.

Assertion: there is an important issue of shared history and history that has not been shared, and the relationship between those histories not shared but framed by common or similar socio-cultural contexts.

Question: What is the relationship between common history and the level of alignment in subjectivities and their visions?

Assertion: In collective practical action directed toward a common (collective) goal, cognition (subjectivities) become aligned. Any conversation they have can only be understood under the consideration of the shared history rather than from a (falsely) presumed relationship between word signs and their referents. In the process of collective practical actions, visions are transformed but in such a way that they become aligned. The driving forces are any perceived contradictions between individual visions and the desired collective vision, which is the one ultimately realized in the artifact.

Trace/s

“Memory” is a trace that practical action leaves the subject, including “experience”; traces of past practical actions can be found across the activity system, for example, in the form of artifacts, diagrams, and also in changed ways of doing things.

Traces are resources in practical activity, whatever their nature and wherever the participants find them.

Explicit traces, and traces not salient to the actors but embodied in their actions.

Learning

Learning, as commonly understood, relates to the situation where the physical body (idem-identity) moves from one activity system to another and produces, in situation that have family resemblance for someone (teacher, psychologist), actions that themselves have family resemblance with previous actions, that is, actions are reproduced in “structurally similar” situations.

Intersubjectivity

A number of things go on in this brief episode. First, Bella had her hands at the drawing, thereby aligning her peers to the fact that she was talking about not just some aspect but the particular one that her finger was indexing. Second, there are pauses that at least also have the function to allow Bella to engage in some physical action (moving the hand to the diagram, moving seat). Third, the gestures are integral part of the communication, constitute communication and ideas at the very moment that they are produced. Fourth, in order to understand this episode, the participants draw on the traces that their conversation on the previous day has left, that is, the vision (image) of the design that has taken shape. Intersubjectivity refers to the fact that this is already shared, it is a trace that they take to be common and therefore does no longer have to be articulated. If at all, it is the researcher/author that has to provide for the sense in which these students have to be heard.

01 B: * Or
02 (0.40)

03 * my brother (0.22)
04 A: Hhhm.

05 (1.55)

06 B: he has a parking lot *
07 (0.90)
08 L: uhhm
09 B: um:
10 (1.48)
11 [you can take this part out]
12 [((moves repeatedly up and down along
“elevator”
13 (0.32)



14 then you pull like [this *

15 [((pulling motion along the

16 tower part))

(0.45)

((Because of this ephemeral nature, I often stop while riding the bicycle to note some idea, or even only words, afraid that I may have forgotten it by the time I have returned. There, too, there is a trace, ephemeral, about something I am currently working on, analyzing, which I stabilize by materializing it into notes, by inscribing it in a more permanent form, more retrievable form.))

The three girls in fact are aligned twice both in the sense that they could draw on their personal traces of the conversation from the previous day but also from their (culturally) based understanding of “this part” of a parking garage. This part they could take out of her brother’s garage and put into their own design. There is a conflation in the sense that she already pointed to the diagram and said that they could take this part (in diagram) out of her brother’s garage. That is, this part in their design and the parking garage had a common element, and all three were aligned to the fact that in this case the diagram did not refer to their design but to the parking garage.

((Perhaps thinking in terms of reference is not a good way of proceeding here))

This moment Bella, had aligned her two partners to the parking lot, her hand was on the diagram. The diagram therefore did not represent their design; rather, Bella pointed to it while uttering the parking lot, thereby orienting the situation as being one about parking lots. “This part” is therefore not a part of the design or the drawing but a part in the parking lot. Furthermore, the three are attuned to the fact that Bella’s brother is similar in age and that “his parking lot” is therefore a toy parking lot. It is evident that this part could therefore be taken out. However, by the time she had completed the next utterance (line 13), her gesture that moved from the upward column to the shoot, she had realigned herself with the present design. ((Here the pause allowed for the change over between the two situations that were created and to which speaker and audience were aligned??))

Her repeated gesture up and down along the pulley and vertical column aligned listeners to the particular item that corresponded to “this part”; the gestures therefore aligned not only speech and perception, but also the three subjectivities.

The pauses coincide with major changeover in the situations created with talk, gesture, and diagram. In lines 12 and 14, the pauses coincide with the changeover from the parking lot (this part) to the diagram and the diagram back to the parking lot (batteries). During the pause in line 02, Bella moved her hand from resting on the table to the design. The first pause, too, moves the conversation from the design to her brother.

Bella’s pause from line 03 to line 06 was actually 2.03 s long; Amanda’s “Hhmm” is a confirmation that she was attending to Bella. During this pause, she scratched herself. There is another long pause between completing the word “lot” and the beginning of the next words. During this pause, Leanne indicated attention (line 08) and Bella used a filler (line 09), normally employed by a speaker who indicates wanting to continue to speak.

Here, we have a slow emergence of the idea, publicly constituted, of using a particular existing piece as a component in their prototype.

The first gesture (line 02) oriented the group to the diagram, and more specifically to the tower-part of the diagram. Bella was saying “my brother” but her hand indicated that the diagram (tower part) was the topic. ((Perhaps this double alignment made the subsequent, long pause necessary; in part it also appeared to be the time required for the scratching??)) The second gesture (line 06) again served as alignment between the utterance and the tower part, it was an indexical gesture. The iconic gesture accompanying “this part” served to make the tower figure; this movement actually turns out to be better than simple pointing, which is inherently underspecified in terms of its aim, and could be a general or specific pointing. The moving gesture, however, was taken by coparticipant to be iconic to whatever it is that it is to be salient. In fact, the gesture itself was a representation, pointing to some part of the diagram, but the diagram pointed to the gesture and makes it in turn salient. There was a dialectic of two images. The next gesture was iconic, a pulling motion involving hand and arm, thumb and index close to the “string,” holding and pulling it. It was a dynamic situation, whereby the gesture enacted the movement described, involving the particular objects, and consistent with the geometry displayed. The imagery pertaining to the final gesture is unknown to the analysts.

This situation cannot be understood on the basis of the resources present. Rather, it also draws on the traces in each of them left by the conversation that they have had to get the drawing to where it was. The particular elements, for example, tower, pulley, and shoot arose during the conversation, and their functions had been discussed. When they were now talking about “this part,” they not only meant whatever they could see on the diagram, but in fact to the conversation that they had talked about. In this sense, the diagram as outcome of one day’s activity was a metonymic trace that pointed back to and allowed them to make present again, the situation that had led to its being.

The diagram did not just refer to the day before, or the vision that each may have had for the ultimate design that was to emerge from their construction work, but also for something completely different, that had never been present itself. Bella managed to shift the conversational context in such a way that at least the tower part aligned those present with her brother’s parking lot, or at least with a particular aspect of it.

In this situation, we have several dialectics—including the one between image and image, image and speech, and between subjectivities. Coparticipants in a situation indicate alignment, through gaze, nodding, or sounds (hmm, um).

Signaling alignment

While Bella was developing the alternative design, or rather, the particular implementation of the “elevator” part, Amanda and Leanne provided her with evidence that they were attuned with the unfolding design. In fact, when there appeared to be evidence that Bella did not continue while attention appeared to be focused elsewhere,

alignment was signaled. After uttering “brother” (line 03), Amanda had turned her gaze from the previous speaker Leanne to face Bella; Leanne was still looking down toward the drawing. Her gaze moved up to meet that of Bella only 0.97 seconds after Bella had completed; the pause may also have had the function to wait until alignment was signaled. By the time Bella had uttered “lot,” Leanne was gazing at the diagram as if following the pointing finger, but Amanda was still gazing at Bella. The latter’s continuation fell precisely together with the point in time when Amanda, too, had directed her gaze at the diagram. At “this part” both listeners were looking at the diagram until Bella had finished the explanation of what to do with the part from her brother’s garage. Both simultaneously moved their gaze to look Bella squarely into the face. Amanda continued to gaze at Bella, whereas Leanne nodded repeatedly. As soon as Bella had completed her utterance, Leanne, still facing Bella, began to talk and Amanda shifted her gaze to the next speaker after having briefly dropped it downward in the direction of the design.

In both the first and second pause, Amanda (line 04) and Leanne (line 08) provided verbal indications of alignment. The intonation of Amanda’s “Hhm” was downward in pitch, indicating agreement rather than question. Similar situation existed in Leanne’s case.

That is, by the time the students are in sixth or seventh grade, they already engage in practices that make conversation possible. These practices are not salient to the consciousness of most people, but they appear to attend to them nevertheless as part of normal, everyday conversation, making them in fact work.

Dialectics

In this situation, the object of the activity is the design. During the conversation, participants are aligned to the production of the design. In the present situation, however, Bella brought in a design element that is not immediately available as resource. In this contribution, speaker and audience needed to shift their attention repeatedly. These shifts required work to guarantee that the team continued to be aligned. These shifts were managed with pauses, gestures, and gaze directions.

In this situation, the traces both of the previous conversation and whatever the parking lot may be were aligned, at least to the extent necessary for moving on. As long as there is no evidence contrary, coparticipants work based on the assumption that they are in fact aligned.

ANTHROPOMORPHISM: Reasoning from the first person perspective and in the present tense, even for the analyst.

Learning

Leanne, Bella, and Amanda had already changed in the course of the previous day, for they created, through their actions, a(n) ephemeral trace that became a resource on the

subsequent day. Inscribed in their body, as a change in their body, they now had an experience that they could refer to. This experience, their traces, they take as shared, even though it might turn out that they differ on this. Or it could be that the trace changes differently so that they, even though they might initially agree to have had the same experience, heard the same words, the same meanings, they subsequently will differ on this.

Each practical action both produces and reproduces the person, reproduces the learner and produces change. These changes may be slow, unnoticeable, certainly unnoticeable on the tests that teachers and psychologists might give to students, but they are noticeable in the conversations.

Engineering requires a large knowledge base to make choices and those choices are not made by chance, but logical reason based on previous experience... A building cannot be designed or constructed in real life without logical reasoning using basic engineering principles (Aerospace engineer, personal communication, June 12, 1994).

This is the typical stance taken by those in engineering education who want to teach the basics first and then have students begin to design. Some presumed knowledge of facts and principles is presupposed. It has to be learned and then students are thought to apply facts and principles in practice. But this approach begs the question about the relationship between some formal knowledge, manipulation of text, images, design elements and the practice of designing.

Children too design based on previous experience, though their experiences are different.

“Designing in the head”: When I have some ephemeral trace about what some designing entity will look like, it is neither highly specified (perhaps bodily limitations) nor elaborate or fixed. The design is truly taking shape when it is materialized into diagrams and prototype. At the same time, because of its ephemeral nature, the “mental” design can be changed, reconfigured, discussed, argued more easily than when students begin to “commit” themselves on paper, in material form. Material traces appear to have greater stability, more resistance—perhaps they even form the character of engineers, as SungWon says, engineers are honest, perhaps because they have to deal with the resistance of the artifacts on a continuous basis.

The ephemeral nature of the trace also gives a virtual character to the design, which could be like this or like that. But with the commitment to a pencil stroke on paper, the design begins to materialize, loose its ephemeral and virtual character. For the children, the design is also of a more general nature, they design—though there are changes in this—elements in general and then look for raw materials for a sedimentation of the ephemeral design into matter. The children are therefore **very flexible** when it comes the nature of the materials to be used. (**Interpretive flexibility of the design elements in terms of the materials to be taken**) They not only choose but also negotiate the material elements of the design.

This changes, such as in the situation where Don and Dan design, taking into account tools and raw materials. No longer do they design in general but with specific materials and tools “in mind”—just as the engineer said in my quote above. Students have to have design experience to enter this stage where existing tools and materials mediate the designing activity, and the more experience you have the more the design will be shaped by it, to the point that your design becomes perhaps overly constraint by the existing traces, especially when these are cultural.

Cultural traces (customs) provide both affordances and constraints, opportunities and limitations, because each idea once it has taken material form becomes normative for subsequent design moves. Radical re-design is perhaps less probable, so designers move on, always build on what they have already thought, and then make adjustments when they encounter resistance. Designing integrates over its own history, like a mathematical convolution, continuously feeding itself and its accomplishment in subsequent design process and design product.

((There is a dialectical tension between ideas, which are of similar nature as “visions”, and material form.))

There are constraints and resistances that do not come to a fore until the moment when the artifact is actually being built. That is, the material constraints and resistances often cannot be foreseen until there is a material trace that we can then use to think with. Designing becomes distributed across the setting, and first contradictions and constrain might emerge. As the designer builds up the diagram or prototype, more contradictions and constraints continuously emerge. In each act, the designer also changes; it is a design act that changes the designer, who thereby learns to design.

Vision as “internalized” practical action

At the outside, all action is practical, interaction with the material and social world. We interact or transact with our environment, and doing so repeatedly, we come to the point that we can replay the action in the absence of the worldly aspects, the material or social situation. For example, we learn to speak with and in the presence of others. Later, we come to have internal monologue.

How does this happen?

From a neural perspective, the same or related neurons are active in the two situations. But the second one, the internal monologue, the internal designing is (more) independent of the actual situation in which it was initially born. So there is an increasing independence of the action from the practical situation until the point that the subject runs through the action but now independent of the situation.

A similar thing must be at the origin of “**transfer**,” where something you are doing in one situation will be done in another situation, another activity system. That is, a

particular practical action shares similarities across activity systems, and therefore, despite the differences in the situations because of the differences in the mediating elements.

“**Transfer**” does not normally occur because there is a change in context, activity or rather **action** system, so that the mediating elements change the practical action. It is through experience that different action systems come to be perceived as similar, and it is at this point that we begin to transfer an action from one setting to another, or recognize that in both action systems the “same” action is appropriate.

Designing **in the head** becomes possible when the subject has had sufficient experience to know what a particular design element will do once it has materialized. This cannot occur without experience, without the experience of having gone through the process of materializing ideas into diagrams and prototypes.

The **body** is the crucial element, it embodies action and perception, orients us with respect to and in the material and social world. It is the entity that moves across, and we rally traces to reproduce ourselves in different situations. We are not constant but continuously have to reproduce ourselves within situations and across situations.

June 3, 2003

Addendum

“Or”: Leanne had said, “You know we have to build this,” while pointing to and tapping on the vertical tower part of the drawing. She continued, “I have wood over there to build it.”

((Images begin with 008.jpeg))

01 L: You know, we have to build this *. I have wood over there to build this. () So



Bella’s “Or” came right after this statement, in which Leanne proposed to build the tower part with some wood that she had (brought). It set up a contrast, a difference, and therefore a dialectical tension, which the following conversation had to resolve. It is the “or” that orients the listeners to the contradiction that will unfold, a contradiction that even Bella may not have fully envisioned in its impact or shape.

At the outset, it is not clear what the contrast is, and possibly not even in its detail to Bella. It could, for example, be a contrast to “building” in “we have to build this.” “Or” would then set up a contrast unfolding in the utterances, “we do not have to build it. I already have a part that is ready to be installed.”

When Leanne points or rather taps on the image, she says, “we have to build this.” But whatever she points to is not the only or true referent of “this.” “This” and the tower she points to reference the conversation that they had when they originally decided upon the diagram, but these also refer to the traces that they have of the artifact that will be. There are several dialectical tensions because “this” and the finger are different and the same, indices to something, and the something itself is dual in nature.

But the listeners do not take what Leanne said as a representation that they had to interpret; they were immediately attuned to what she was orienting them to. It is only when this attunement doesn’t exist, when the different participants in a situation are not aligned that more work is required, that it appears as if the words have a referent, that we begin to wonder what the talk is *about*.

Bella’s proposal

There is also something dialectic about the proposal, for it is both different and the same. It is the same in the sense that she has a different embodiment of the “elevator” part, a prefabricated element, taken from her brother’s parking lot. This prefabricated part fulfills a function, the *same* function that the pulley and string are to fulfill. But the

proposal is also different in the sense that the prefabricated part is different than the one Leanne envisioned to be built from wood and the pulley, for which Bella had been designated as responsible during the previous day.

The “or” sets up the difference rather than the sameness between the two. This also becomes clear in the unfolding episode, when Bella refers to the drawing and shows what you do with the part from the parking lot but she was pointing to the diagram, which they had previously settled on to mean a piece of wood and the pulley. Thus the diagram can be understood as a functional drawing rather than one that specifies in advance the raw materials, and therefore it allows for some flexibility about how it will ultimately materializing from the children’s activity.

The dialectic is also one of the general and the specific, the diagram stands in a dialectical relationship with the artifact that unfolds, for the prototype that emerges is but one materialization of the generalized possibility inherent in the diagram. Other materializations are thinkable and discussed by the students. Some of their material realizations (materializations) turn out to provide resistance, so other avenues have to be taken. But the essence remains that throughout the process, the material artifact stands in a dialectical relation to the diagram, because the former is a concrete realization whereas the latter embodied generalized possibilities. In different takes, or different participants, the design would materialize in different ways although each of the projects may be said to have the (same) diagram as its starting point.

Project, is also projecting, a project has an intended outcome, or an intension that is an integral and defining part of it.

((On the **dialectic of the general and specific**, see Il’enkov, 1977))

There may be a similar relationship between the “mental” trace built in the process of talking about a design, and its first realization (materialization) through the inscription on paper.

((All these dialectics seem to be involved: The **ideal** and the **real**, the **general** and the **specific**, the **abstract** and the **concrete**..))

In a sense, before the design comes to be inscribed for a first time (later inscribed in materials) on paper, it has the character of the **ideal**, which comes face to face with the constraints of the **real** in the process of materializing. Parallel, there is a transformation from the more **general** to the more **specific**, and from the **abstract** (the literally removed) to the **concrete**.

Assertion: Designing involves a movement from the general to the specific, the abstract to the concrete, the ideal to the real.

The general is like the parent in evolution, copresent with the daughter generation, an ever-proliferating concrete realization of the possibilities embodied in the parent

generation (of ideas). If there were different artifacts built based on the same diagram, these would all constitute filiations of the same “idea,” the same parent nucleus; they would all constitute concrete realizations (materializations) that all stand in a dialectical relation to the parent, both embodying something that is the same and something that is different. That which is the same, we call the “same idea,” whereas that which is different are the concrete particulars.

Idea

[a. late L. *idea* (in Platonic sense), a. Gr. {ἰδέα} look, semblance, form, configuration, species, kind, class, sort, nature, (in Platonic philosophy) a general or ideal form, type, model, f. root {ἰδ-}, {ἰδεῖν}, to see: the word being thus analogous in derivation and original sense to L. *species* from *spec-*{ē}re to see, behold. So It., Sp., Pg. *idea*; F. *idée*. (Oxford English Dictionary Online, June 3, 2003)

To *idea*, v. a. trans. To give a particular form or character to (cf. prec. 7b). b. intr. To form ideas or notions.

Video: Part 3

Continuation of the transcription, opposition to Bella's proposal

- 01 L: Although ((shakes head)) we can't do it.
 02 (0.90) ((L continues to shake her head))
 03 A: Why *no:t*?
 04 L: =We wouldn't be doing it by ourselves.
 05 (0.76)
 06 B: Okay.
 07 (1.50)
 08 A: No, but we are allowed to use a battery or something.
 09 (0.86)
 10 B: But we don't make it.
 11 L: Yeah, but we have to make it ourselves.
 12 A: =Uhhh.
 13 L: =Let's just start making this part, did you bring any
 pulleys?
 14 [(1.40)
 15 B: [((shakes head))
 16 L: D'you have any?
 17 B Didn't find [one.
 18 L: [What about from your last machine?
 19 (1.14)
 20 B: I don't know where it went.

Leanne began the episode, shaking her head in reaction to the proposal that Bella had just developed before them. Leanne suggested that they could not do it, which is inherently

ambiguous because it can mean not being able to do something or not being allowed to do something. Bella was not attuned to the situation in the same way as Leanne, and this alignment of the two occurred subsequently. Nor was Amanda aligned, for she followed Leanne's comment that they couldn't do it with a "Why not." Amanda indicated that she was not aligned, she did not understand the previous contribution as it was presumed to be relevant to the present situation. There was a contradiction between her way of perceiving the current design situation and the way Leanne did. That is, this contradiction drives the next several turns. It functions like a repair. The design can only continue once the repair has been completed. In a sense, this part is also design, it is both repair and a rejection of a particular design proposal.

Still gazing at Bella, Leanne said, "We wouldn't be doing it by ourselves" does not refer to the fact that they do not construct the part by themselves but that they would be using an electrical motor rather than a hand-operated machine. It is not clear whether Bella was attuned to the first or second possibility, or yet another altogether. But although Amanda asked the question "why not," the recipient of Leanne's response clearly was Bella, who then responded, "Okay." It was as if the question, "Why not?" had in fact be posed by Bella, as the subsequent exchange (lines 04–05) between Leanne and Bella showed.

Although Bella appeared to accept Leanne's explanation, Amanda continued, "No, but..." Just prior, her eyes had moved away from Leanne, who had been the previous speaker, to somewhere between the other two. Then, just before beginning her utterance, Amanda lifted her eyes, looked at Bella, and then returned her gaze to Leanne. Her "No, but" was designed in response and contradiction to what Leanne had said and explained. But the short eye contact with Bella appeared to signal agreement with what the latter had proposed earlier. She did not begin the "no" until after having begun to shift her gaze back to Leanne. The contradiction signaled was not with respect to what Bella had said, but with respect to the situation as Leanne apparently wanted to develop it.

Rather than responding, Leanne noticeably shifted her gaze (head) in the direction of Bella, who then responded as if speaking for Leanne, "But we don't make it." Amanda's gaze had followed Leanne's.

Following a brief pause, Amanda raised the issue in terms of "being allowed to," suggesting that they were in fact allowed to use batteries, which has the possible implication of an electric motor.

Bella's next utterance "But we don't make it" appeared to be in line with a situation in which the artifact had to be entirely constructed by them, a description that resonates with the subsequent one that Leanne contributed. Leanne then proposed to "just start doing this part." This is not just an invitation to begin the construction, but also an invitation to begin the construction without drawing on the part from the parking lot. She asked whether Bella had brought "any pulleys," to which Bella responded by shaking her head. Leanne followed up whether Bella in fact had any; the latter responded that she didn't find any. Leanne asked about the pulley(s) Bella had built into her previous machine, but Bella indicated that she did not know where it went.

In this situation, we first observe a rejection of the proposal, the redesign of the machine in terms of the parking lot part. The discussion establishes that using this part would constitute a contradiction, though it is not quite clear whether the contradiction would be in terms of the construction or in the hand-powered nature. Bella and Leanne's utterances allow the interpretation that it is because of some rule that they had to "make it," but the teacher had never provided such a constraint. There had been the constraint for previous designs that the machines had to be hand-powered. The design instructions (rfp) for this part of the course did not specify that the entire machine had to be hand-powered, but rather that a minimum of two of four parts were to be based on the simple machines that students had studied and designed previously.

In this situation, the idea of a teacher-instituted constraint mediated the interaction. At least two students (Bella, Leanne) described the situation as one in which they would not "make it" themselves, which, presumably, contrasts something else to which they were attuned. Whatever it is (real, that is, actually said by the teacher or not), Bella and Leanne were in agreement about it, that is, some constraint in the way they understood it. The constraint was based on a trace, and in this situation, both agree—their traces are not only common but also mediate their actions in the same way. Amanda indicated alignment when she responded "Uhhh" to Leanne's final comment concerning the parking lot addition and before turning to the next issue.

Without pause or further discussion, Leanne moved to ask about the pulley. Neither Bella nor Amanda stop the actions to request reconsiderations of the issue and thereby contribute to making the events unfold in the way they did at this point.

Leanne and Bella were raising the specter of a contradiction, perhaps one with far-reaching consequences. That is, when a course of action has been proposed such that it might lead to a contradiction, so that someone perceives a contradiction looming in the distance as the causal consequences of the actions, the trace becomes a resource in the "negotiations."

Bella's comment, "Didn't find one" led to a contradiction in the way Leanne was oriented to the situation. She remembered (trace) one (or more) pulley(s) in Bella's previous machine. "I didn't find one" raises a contradiction between the earlier possession of a pulley and the description of not having found one. Leanne's return brought this trace explicitly into focus. But Bella responded that she did not know where it was. That is, Bella was also aligned to the previous presence and existence of a pulley—which they could have reused in the way that Dan and Don reused a pulley from an earlier design.

This, too, is an alignment of their respective situations. Fundamentally, coparticipants assume that their respective situations are the same. If there is evidence that this is not the case, then members engage in a repair of the situation. In some instances, it may be that something salient to one person was not so to another. The repair then works to bring this entity into salience. The differences between the two constitute a contradiction, and

“repair” is the process by means of which the contradiction is removed. More so, the contradiction is the engine of the repair actions, motivates these actions and does so until the contradiction has been removed.

At the end, it was clear that Bella did not have the agreed-upon pulley (a commitment that had been inscribed in the planning sheet) and that she did not know where the one she had previously used, making it impossible to use it in the present design, unless there was some change in the situation.

Amanda began her utterance with a “No, but...,” which, much like Bella’s “Or” set up a contrast, perhaps a contradiction of what was to be developed and what existed up to that point.

The situation embodies its own history, as situation changes into situation, and never abruptly changes; there is a continuity of the agents’ presence.

Video: Part 1

((Begins with 090.jpeg))

In the following episode, we have two overlaps, Amanda and Leanne competing for the speaking floor. The contradiction there is that both are speaking at the same time, and, for conversation to proceed normally, one of them has to stop. There is also an issue of conversing by drawing on the visual elements as part of the communicating, and the verbal and gestural deixis providing a link, the glue between different communicative layers.

- 01 L: Bella, where is that thing that piece of wood that
you just showed me?
- 02 (1.16)
- 03 A: Whh hh.
- 04 (1.44)
- 05 L: * [1That can be the shoot]
- 06 [1((Gestures back and forth along the shoot
- 07 (1.63)
- 08 [2and I have wood over there [for that]] [so]
- 09 [2((Gesture along vertical column
- 10 A: [Well for] the
sho[ot] we can use that big ro– that big road [over
there
- 11 L: [3No,
no, for that– that– [that’]s for that]



[3((Gestures

- up and down the tube))**
- 12 A: O[h Yeah]
- 13 (0.40)
- 14 Yeah.
- 15 (0.53)
- 16 L: [4that's for the shoot, [5n'this for the inclined
plane we use the other [(?)].
[4((Moves along "pipe"
[5((Gestures along plane
A: [°Mmh]
- 17 (0.47)
- 18 No, you know we have to build [6this I have
wood over there to build this.
- [6((points to
the vertical column**
- 19 (0.80)
- 20 So:::

Narrative

In this episode, the three begin their day's work. Leanne began asking for a piece of wood, which she subsequently attributed to the "shoot" while pointing to the inclined plane. She said she had a piece of wood for the vertical post in the design. At this point, Amanda signaled an opposition, "Well" and then developed an alternative for the shoot, a piece of "road" available somewhere in the classroom, "over there." ((Dialectic of here and there?)) Leanne overlapped, in turn indicating disagreement and developed description in which "that" was used for "that," in the second instance pointing to the tube. Amanda agreed while Leanne continued, or rather, reiterated that "that" was for the shoot, whereas for the inclined plane she intended the "other piece." Amanda signaled agreement for a second time, and Leanne continued suggesting that they had to build the vertical column and that for this she already had some wood. Amanda signaled agreement a third time.

Analysis

While Leanne was still talking, Amanda signaled disagreement "Well" and vied for the floor by beginning to speak before Leanne was finished. Amanda was speaking, when Leanne uttered another "so" before abandoning the floor. She suggested that for the just mentioned "shoot," they could use a specific piece of raw material, which she called "road." But even before she could complete, Leanne began by indicating opposition, now uttering that "that" was for the part that the diagram depicted as a tube. Amanda immediately agreed. From her perspective, this is just what she had proposed. Whereas Leanne had initially named the inclined plane the "shoot," she subsequently pointed to the pipe this time naming it the shoot. The contradiction existed in the varied use that Leanne had made of the word shoot, using it first for the inclined plane and subsequently for the pipe. In the latter case, she was in agreement with Amanda, who rapidly

acknowledged agreement and thereby signaled intersubjectivity, alignment as to the intended use for the piece of material in the envisioned prototype.

These moments of overlap constitute contradictions that have to be resolved; the ability for competent resolution of such moments already exists, or develops as children engage in these kinds of tasks. These contradictions cannot be maintained for any length of time, so usually one person abandons the floor. The contradiction being that when they talk, they cannot also listen to the other. If they are to design in a collective manner, then there is a need for a give and take.

The ambiguity but also efficiency of using the same word in the same sentence but for different entities is resolved by coparticipants without problems. There is a seeming contradiction that the same word “that” was uttered four times, but *shifted* what it was standing for. In the first and last instance (line 11), the index appeared together with “for” while the index finger was resting on the diagram and therefore made salient the intended use of the raw material Amanda had talked about, twice invoked by “that.” The index is used to orient the interlocutor, to a different situation or aspect of a situation. The first and fourth occurrence, together with the index finger, reorients the listeners to the diagram before them and therefore to the envisioned design. The piece of wood is being projected as a raw material to take a particular place in the final artifact; it is the concretion of the “idea,” the image inscribed in the paper, and the even more ephemeral image it may have for the designer.

In the pause (line 07), Amanda shifted her gaze to Bella, as if asking “do you agree with Leanne.” Amanda visibly prepared to talk, breathing in deeply and bringing her upper body upward, then overlapping with Leanne. It looked as if she expected something to be said which wasn’t, then began to address the issue (of the attribution of the object to the shoot), but was so late that she overlapped not in the beginning but later in Leanne’s utterance. She did not agree with the attribution of the piece of wood to the shoot, and seemed to orient to Bella and get her opinion on this.

Bella didn’t react, neither did she in response to Leanne’s statements, so that the latter repeatedly shifted gaze from the diagram to face Bella, who gave no visible sign (utterance, head, body). In these situation, she clearly designated the recipient for her utterances and also in search for an indication of the extent to which Bella agreed (or disagreed) with the statements.

Amanda’s eyes had shifted from Bella to something some distance in front of her (but not visible to the camera), and her hand moved forward pointing in the distance. She shifted gaze from the material toward Leanne after having uttered “that” (line 10). In the first part of her utterance, Amanda aligned the audience to the material she wanted to bring into the design consideration, and in the second instance, her gaze move to establish the recipient of the utterance, which is really an objection.

Leanne said, “I have wood over there for that” while the index finger moved up and down the vertical column. In this case, she established a tension between here and there,

the wood that is over there, that is, away from them, somewhere else in the room, and the “that,” which the index finger pointed to at the same time. Here, there is a dialectic between the material, found somewhere away from the group, and the diagram, embodying the idea, the first level of materialization of their vision. The dialectic of place embodied the dialectic at the conceptual level, an inscription that had more the quality of idea and the projected realization in material form. The wood over there in fact constituted the realization of the idea of the pillar. It is also the dialectic of what is present and what will be in the future, the present idea and the future artifact. All these dialectical oppositions are present in this very instance.

Reading Il'enkov: Dialectical logic

“any concrete, developing system includes contradictions as the principle of its self-movement and as the form in which the development is cast” (Chapter 10)