2

Reproduction and Transformation of Affect in Activity

In the preceding chapter we suggest that in the Vygotsky-Leont'ev-Holzkamp version of cultural-historical activity theory articulated here, cognition cannot be understood independently of emotion. This is so because the latter constitutes an holistic expression of the subject's current state with respect to the object/motive and the subject's sense of the likelihood of success in realizing the object/motives it has subscribed to. That is, the activity, stimulated by the object/motive, continually transforms the situation at hand, including, as we show here, the emotion expressed and thereby made available to others. Affect is not a static, trait-like characteristic of the subject. Rather, emotion, the sensual valuational reflection of activity in the acting subject, is continuously reproduced and transformed together with the cognitive and material results that emerge from the hands and minds of the subjects. Affect is in movement together with the activity as a whole, of which it is one of the manifestations. That is, in this chapter, then, we show that affect is an irreducible moment of activity, which, like the activity itself, is in and brings about the (self-) movement. The category of activity was created precisely to capture movement; the analysis focuses on inherent change (becoming) rather than on how things are in and for themselves.

In the following sample episode featuring Aurélie, Mario, and Thérèse, we exhibit and theorize this continual production of cognition and emotion, both of which are thought to be reflections/refractions of the living activity. In the process, the subjects make thematic and available to each other and to themselves expressions of the emotional and cognitive reflection of activity. These expressions are resources that are employed in and therefore mediate the movement of the activity itself.

Since the beginning of the study in September 2007, regular meetings have been held involving the teacher, the researchers, and the research assistants at one school in Ontario, Canada. The meetings have taken place either at the school or at the university to discuss the mathematical content of the tasks, the design of the

Problème 4 :

Pour son anniversaire, Marianne reçoit une tirelire contenant 6$.
Elle décide d'épargner 3 $ par semaine. À la fin de la première
semaine elle se dit : « J'ai 9 $! ».
Questions :
a) Modélise le problème à l'aide des boîtes et des jetons jusqu'à la
6ᵉ semaine
b) Remplis la table de valeurs suivante :

Numéro de la semaine	1	2	3	4	5	6
Montant épargé ($)	3+6	3+3 +6	3+3+6 3+3+3+6	3+3+3+3+6	3+r3+3+3+3+6	
Ou	3x6	2x3 +6	3x3 +6	4x3 + 6	5x3 +6	6x3 + a3

Fig. 2.1. Problem 4 was to be solved by the fourth-grade students. Presented is the copy of
Mario's worksheet at the end of the lesson.

tasks and forms of interaction to be promoted in the classroom. Though experimen-
tal, the tasks were designed to meet the requirements of the provincial curriculum.[1]
Among the curricular topics, one that has gained prominence is modeling. In the
following, we focus on one of the lessons in a fourth-grade class (9–10 years) re-
volving around the topic of modeling situations by means of algebraic concepts.
More specifically, at the heart of the present and subsequent chapters is Problem 4
(Fig. 2.1)[2], from which the fragments that we present below are drawn. Problem 4
includes two main tasks about the modeling of a saving process. The students have
been provided with clear plastic goblets and chips to accomplish the first of the
two tasks.

This first fragment – constituting the first 21 lines of the raw transcript, 46 turns
in augmented transcript presented here – may be glossed in a summarizing way by
saying that Mario moves from having an idea about what they have to do, through
its articulation, to the eventual halt in the activity and the statement that he does
not understand. In the course of this fragment, he moves from expressing confi-
dence to frustration. Aurélie tells her peers that she does not understand, and, even
though her worksheet comes to be filled, expresses frustration. Thérèse both com-
pletes the task and exhibits confidence throughout. How can we understand this
changeover, which itself is the result of the students' activity? We suggest that the
engagement in the activity produces a negative emotional response and a recogni-
tion that they do not understand so that an initially available positive emotional

---

[1] The provincial curriculum can be downloaded from the website of the Ontario Ministry of Education
(2005): http://www.edu.gov.on.ca/eng/curriculum/elementary/math18curr.pdf.
[2] The task translates as:
Problem 4:
For her birthday, Marianne receives a piggybank containing $6. She decides to save $3 each week. At
the end of the first week she says to herself, 'I have $9!'
Questions:
a. Model the problem until the sixth week using goblets and chips
b. Fill the following table of values

stance turns into a negative one. Affect here is a reflection, from the perspective of the subject of activity, of the distance between the current state and the anticipated – even if not articulated – object/motive of the activity.

The intent of the task is for students to begin by placing the number of chips into their goblets that correspond to the amount of money Marianne has in her piggybank at the end of each week. But rather than transferring the total number of chips in each goblet to the table of values, students are to note the repeated additions of $3 to the piggybank (see table in Fig. 2.1). To achieve this, the table of value specifies for the first cell +6, inviting the students to add a 3 to achieve the representation 3 + 6 corresponding to the $9 in goblet #1. Similarly, the +6 in the second cell is intended to encourage students to represent the repeated addition 3 + 3 + 6 rather than note the '12' corresponding to the 12 chips in goblet #2. The intent of the third row in the table is to have students write a shorthand representation for the contents of the cell above, which means that they might move from the repeated addition 3 + 3 + 6 to the more efficient multiplicative/additive structure 2 x 3 + 6. By filling the table, fewer terms are embedded in each cell, which embodies the curricular intent to allow the emergence of the pattern (# of weeks) x 3 + 6. To provoke this emergence, the worksheet shades the number of weeks in yellow in the entire first row and for weeks 2 to 5 in row 3. Subsequent tasks on the same worksheet are designed to lead the students to the generalization as they go from calculating the amount of money in the piggybank for weeks 10, 15, 25, and finally, an arbitrary number of weeks above 100. The table therefore constitutes an artifact that embeds a cultural-historical form of thinking about the saving process (Radford 2000). It highlights the theoretical content of the algebraic generalization, where repeated additions are conceptualized as a multiplication – a crucial step towards the *conscious awareness* of the algebraic structure of the sought-after model.

In the terminology of activity theory, the *object* of the classroom activity is learning to reflect algebraically about patterns. In the course of the activity, the object appears in its ideal (abstract) and material (concrete) form. In the material or concrete plane, its ideality is exhibited through particular instances. Yet, the particular instances do not exhaust the object to which they refer. This is why the object of the activity cannot be the production of the algebraic expression 6 + 3n or any other linear expression, like 1 + 2n, etc. In turn, the particular instances appear under the form of a *goal* to be reached – the production of a model featuring an algebraic structure of the saving process. Objectifications, that is to say, the collective processes through which individuals seek to attain the goal and the object of activity are entailed by cognitive and emotional transformations that arise as efforts to deal with the inherent contradictions of activity. These transformations are marked by the *motive* of the activity that is materialized in the form of affective orientation of the individuals as they produce understandings and non-understandings with clear emotional valences. In the next section we explore the question of emotional valences in light of the production of non-understandings.

How Activity Produces Negative Emotional Valence and Expressions of Not Understanding

For cultural-historical activity theorists, activity, rather than the individual subject, constitutes the smallest useful unit of analysis: Without other manifestations such as tools, division of labor, rules, and community, we cannot understand and theorize the events that we see on the videotapes. Emotions, therefore, need to be analyzed at the level of activity rather than at the level of the individual. Emotion, like consciousness, is an inner reflection of the material activity as a whole rather than a mere biological and physiological state of the human subjects involved. It is therefore as part of the unfolding activity that emotions are both reproduced and transformed. Over the course of the following three sub-sections, we exhibit the events in the course of which the nature of the emotions expressed changes from positive to negative, and from negative, to positive. Emotions are an assessment of the current state of the activity in respect to the outcome to be achieved.

'Now I Understand. You got it Wrong'

The three students begin by counting out the number of chips that they place into each of the five goblets. They count out 6 blue and 18 red chips for a pile that ends up next to the fifth goblet and corresponds to the final cell in their table of values (Week 6). At this point, Mario asks, 'What now?' Thérèse points to the table of values on Aurélie's work sheet and they begin the task to fill it. But there is a debate, because the latter points out that they do not have the same as he does. Aurélie and Mario repeatedly ask Thérèse what she is doing. Aurélie has already repeatedly expressed frustration and has rebuffed a student from another table who wanted to help: 'But we don't have the same thing that you have'. She continues, 'but look', we already have done this', while pointing at the table of values on her sheet. Mario tells her, 'Ali, just add on the side'. She asks Thérèse about the numbers highlighted in yellow on the worksheet and then announces all they had to do was 'add three and three'.

   Fragment 2.1 takes up the last of these questions that Mario directs to Thérèse (turn 001). There is a long 15.11-second pause that follows during which Mario gets back to his sheet. We can see Mario moving his fingers up and down between two consecutive rows of the table of values. Aurélie pounds the desk with her fist, then throws herself backward against the backrest (Fig. 2.2), throws her hands up in the air, and then lets them drop into her lap (turn 002). Thérèse, who has been filling her table of values leans back and breaks the silence, utters a very long, drawn-out 'okay' (turn 003) continuing to gaze at her worksheet (turn 003). There is a pause, and then Mario produces an interjection of surprise, 'Oh, oo' and then says, 'Now I understand' (turn 005).

Fig. 2.2. Aurélie (left) has disengaged after pounding on the table (turn 001).

```
Fragment 2.1
001  M:  <<all>resa> what are you DOing? ((Aurélie leans
         backward, Fig. 2.2, Thérèse writes on the oriented
         toward her; English in the original))
002      (15.11) ((Mario orients to his sheet, Finger moves up
         and down between rows, pounds on table, throws herself
         back))
003  T:  okay::::::
004      (1.40)
005  M:  <<f>oh oo> now i understand. you did it wrong! (1.49)
         .hh the first wEEK (0.78) she has how much; (0.21)
         ((He points to the goblet of Week 1)) n:IN:E. (0.89)
         we write n:IN:E (1.19) the second week (0.43) she has
         how much? we write it (0.24)
                   th[ird (0.35) how much           ] ((A
         still leans back))
006  A:  <<plaintive> [we havent even finished the fir]st
007  T:  no no no ((She laughs))
008      (0.74)
009  A:  <<plaintive> [we havent even finished] the first
         [And like it doesnt make sense]>
010  M   [look tresa, (0.58) look the  ] first s: (0.44) the
         first week, (.) she has nine. ((points to Week 1, Fig.
         2.3)) (1.10) second wEEK, she has:: (2.00) elEVen
         (0.63) wait no. (1.09) ((he points towards week 2))
         twELve. (0.74) third wEEK, she has (2.18) FIFteen
         (0.75) ((physically establishes relation between
         goblets and cell in table of values [Fig. 2.3]))
         (.)                  [we write (0.32) that.  ]
011 A:   <<plaintive> what [are you doing thérèse .] ((hits
         table, rests head on table, Fig. 2.4)) ((3:01))
```

Mario further suggests to Thérèse that she has done something wrong and then articulates what needs to be done all the while doing it (turn 005). Placing his left arm and hand such that his index finger comes close to the goblet marked '1', he says, 'the first week . . . she has how much?' He continues, 'Nine'. He orients to

Fig. 2.3. Aurélie continues to be disengaged, Thérèse (center) writes, and Mario explains to her his understanding of the task (turn 010).

his worksheet, points to the first cell with the index finger of the left hand and then writes (right hand) while saying, 'we write nine'. There is a pause, during which he orients to the second cell in the table, and says, 'the second week he has how many, and you write it'. He continues, 'the third week, how many' and then moves his hand pointing to two more cells in the table exhibiting its sequential nature from left to right. In a plaintive intonation (high, strongly falling to the end), Aurélie suggests in a plaintive voice, 'We haven't finished the first, and further, that doesn't make sense' (turn 006).

Thérèse, who up to this point has apparently been listening but stared into the air, turns to Mario who rises from his worksheet to turn and gaze at her, when she says 'no' three times (turn 07). In a plaintive voice, Aurélie repeats what she has said before, 'We haven't even finished the first' and then continues, 'then, like this doesn't make sense' (turn 009). Neither Mario nor Thérèse appear to react to what Aurélie has said or how she has said it. Instead, simultaneous with the second part of Aurélie's utterance, Mario begins his explanation again. 'Look Thérèse, look, the first week, she has of it nine. Second week, she has . . . eleven . . . wait no . . . twelve. . .' (Fig. 2.3). He moves his sheet onto Thérèse's table, close to her. He continues, 'Third week she has of it . . . fifteen . . . and we write that' (turn 010). Aurélie rises from her lounging position, pounds the desk, then asks, 'What are you doing Thérèse?' (turn 011) with apparent frustration in her voice, then places her head on the folded arms on her desk (Fig. 2.4). At this point, Thérèse has completed four cells of the first row of the table of values and the entire second row (see statement of Problem 4). Mario, although he has verbally articulated how to fill the cells of the second table row, has not yet begun filling it in. Aurélie has just begun with the first cell.

Fig. 2.4. Aurélie, head on table, has disengaged from seeking a solution to the problem (turn 011).

In this first segment from the episode, Mario announces to his peers an insight, declares that Thérèse has done badly, and then explains twice what they have to do. His intonation – based on the correlates between prosody and emotion identified in psychological research (Scherer 1989) – expresses firmness and confidence. During his explanation, his gestures make an embodied link between the goblet-chip model (left hand index finger) and the worksheet in front of him (right hand pencil). While he explains, Aurélie repeatedly makes statements about the status of their work, her intonation expressing complaints, and says that this does not make sense. She pounds the table repeatedly, and throws herself back against the backrest, slouching for a while in disengagement.

As their sympractical activity unfolds, Mario exhibits confidence, and when Thérèse responds negatively to his first explanation, Mario does it over again, this time providing the actual number of chips for goblets 1, 2, and 3. She has finished her table of values and, following Mario's first explication, confidently says 'no' repeatedly, shaking her head sideways in apparent disagreement. Aurélie, on the other hand, increasingly exhibits frustration and disengagement from the activity. In the turn before the present fragment, she has already indicated that she will go on to the next because, and she continues in English, 'I have no clue what she is doing'. Thérèse appears confident. At the end of the fragment, Aurélie asks Thérèse again what she is doing.

There are three aspects to Aurélie's expressions. She makes statements about the status of the task and describes the situation as not making sense. These are cognitive expressions, ways of articulating forms of experience to others using words. They pertain to what she knows (does not know) the task to be, what to do next, and statements about understanding. Second, her intonation and other voice parameters – which tend to be produced unconsciously – express emotional valuations, here, of the negative type. Third, she makes two types of bodily expressions that can be seen and heard as expressions of emotion: she pounds on the table and she throws her body backward against the backrest. In fact, she is not simply producing these expressions sequentially, but the plaintive voice, expression of emo-

tion, simultaneously articulates speech sounds that encode cognitive statements. In this situation, the difference between emotion and cognition is undecidable. The same vocal material expresses both emotion and cognition: it has conscious and non-conscious aspects simultaneously.

Aurélie as a whole becomes an expression of the sensuous-valuational and volitional character of activity. She wants to engage in the task, complete and understand it, but at the same time, the sensuous-valuational aspects are expression of the distance between where she is and where she has to get. Wanting to understand and complete the task and the prospects of getting there are co-expressed reflections of the current state of the activity as Aurélie concretizes it in and with her actions.

'What are You Doing. . . I Don't Understand. And I Will Never Understand'

Following Aurélie's question to Thérèse of what she is doing, there is a pause, then an interjection (turn 013). Mario asks Thérèse what she is doing, and the latter suggests following another interjection, 'just copy me' (turn 015). Overlapping her, Mario indicates the intention to speak, but then stops, as Aurélie, in a plaintive intonation, suggest, 'We have no clue what you are doing, so' (turn 017), but Thérèse produces another series of repetition of interjections (turn 019). There is a pause, during which Thérèse turns her worksheet so that Aurélie can read it, and then she produces another interjection (turn 019). Aurélie has placed her head on her folded arms on the table (Fig. 2.4). As the camera zooms in, Thérèse addresses Aurélie by name, as if calling her and inviting her to participate, and then tells Aurélie that the camera is 'watching' her (turn 023). That is, Thérèse makes apparent to any bystander (including the analyst) that she is aware of Aurélie's disengagement and that this fact can be seen on camera.[3]

Thérèse then begins to fill in the first figures into Aurélie's worksheet and, after a 6.45-second pause, Mario in turn suggests to Thérèse that she, now filling out Aurélie's sheet, is on camera, to which Thérèse responds in a low voice and in a slow and deliberate manner that she knows and that she does not write anything (turn 027). During the pause that follows, Mario turns, leans far back, and looks around the classroom. He raises his hand (Fig. 2.5). His whole body is, following Merleau-Ponty (1945), an expression; teachers understand such expressions as those of students seeking help. There is another pause before Aurélie suggests that she does not understand and that she will never understand (turn 029). Mario has returned his gaze to his worksheet still holding up his right hand, but elbow on his

---

[3] It is evident in situations like this that the participants themselves make available to each other what they are conscious of and what they attend to. The researcher does not have to attempt to get into the head of the participants, who make available anything and everything required to each other for mutual and *participative understanding* of the situation.

Fig. 2.5. Mario raises his hand, turns toward the classroom; the teacher will eventually come and thereby acknowledges the gesture as a call that he has a question (turn 028).

desk. In this second part of the fragment, we observe further expressions that are simultaneously emotional and cognitive reflections of the activity from the perspective of the acting subjects. Aurélie's intonations are plaintive and lamenting while she repeatedly addresses Thérèse, complaining that she does not know what she does.

```
Fragment 2.2
011 A:   <<plaintive> what [are you doing tresa.  ] ((hits
         table)) ((3:01))
012      (2.69)
013 A:   um chums.
014 M:   <<p>what are you> DOing.
015 T:   <<p>aw chuggy just [copy me. >   ] ((English in
         original))
016 M:                     <<p>[okAY so first] [of all. > ]
         ((turns to Thérèse; English in original))
017 A:                          <<lamenting> [we have no] idea
         what youre dOIng sO> ((very high pitch, 570 Hz max,
         3:09, both A & M oriented toward T))
018      (1.33)
019 T:   dan dan dan dan ((she moves the chips away from her
         page and toward))
020      (4.14)
021 T:   <<confident>(qwi::::?) (gret?)>
022      (1.73)
023 T:   <<f>aLI::;> cameras wATching you. ((3:21, Thérèse
         fills up the table for Aurélie))
024      (6.45)
025 M    <<p>tresa, youre on camera; >
026      (1.19)
027 T    <<len>i=know, i=m not writing anything. >
```

Fig. 2.6. Aurélie stares at her hands placed on the worksheet, while explaining in a plaintive voice that she does not understand and that she will never understand (turn 029).

```
028       (3.41) ((Mario raises his hand, turns around))
029  A:   <<plaintive>i dont understAND; and I will nEVer
          understand.> ((Stares at her hands placed on the
          worksheet, Fig. 2.6)) (3:38)
030       (0.84)
```

Aurélie has placed her head on her hands on the table, while Thérèse, confident throughout this part of the segment, fills out Aurélie's table of values. That is, Thérèse exhibits a recognizable act of helping. In her actions, she exhibits for Aurélie and for the analysts her helping stance. Her actions realize a request for (provision of) help interactional pair. The 'request for help' is articulated in multiple ways. In other words, these emotional expressions in the intonation and the inactivity (frustration?) are produced simultaneously with the cognitive content about the state of their tasks (not knowing what Thérèse does), about not understanding, and, very importantly, about never being able to understand. Emotion therefore constitutes an index of the possibility Aurélie anticipates to have about obtaining control over the activity and achieving a successful outcome: realizing the object/motive. When there is a high to perfect likelihood that success will not be attainable, then the emotional valuation will be negative and there is less likely for it to pursue the activity. There is no reason to do so, for the prospect is that the activity will not lead to an expansion of control and room to maneuver.

Mario has begun to look around, as if searching for the teacher. He has raised his hand, but, after some time without response to the raised hand, returns his gaze to the worksheet. These may be seen as the first signs of uncertainty. Whether his action interactionally is realized as a request – by providing the requested help as a response – remains to be seen. Given our cultural experience with children in schools, we may anticipate particular responses to be exhibited if the request for help remains unanswered.

'This is Dumb. I Don't Understand'

The third part of this instant of classroom life begins with Thérèse's instructions to Aurélie to do 'three plus six' and, mixing the two languages, 'to write whatever' (turn 031). Thérèse then turns around and begins to talk to the group behind at the next table. Nobody speaks during an extended period of time (49.52 seconds). During this period, Aurélie and Mario are writing, where Aurélie every now and then takes a look at Thérèse's worksheet (where she might be copying). Mario intently gazes at his worksheet, finger on table of values, moving up and down between the rows. He turns toward Thérèse, then turns about and gazes toward the other parts of the classroom. Near the end of the pause in speaking turns, Mario again raises his hand, continuing to look around. Thérèse breaks the silence saying 'Oh my god' and then, after another pause, turns back to the table and leans toward Aurélie. The latter pounds her fist onto the desktop (in apparent frustration), to which Thérèse responds by saying, 'We are all mixed up' (turn 038). Aurélie overlaps her, repeating in apparent frustration (intonation drops from much higher than normal pitch to very low toward the end) what she has said before, 'I don't understand' while pointing to her sheet (turn 039). Following a 2.46-second pause, Thérèse produces another confidently expressed interjection. A further long speaking pause unfolds. During this pause, Mario drops his hand (turn 042). During the same speaking pause, Aurélie pounds the desk again, throws herself against the backrest (turn 042). Mario gazes back at his sheet while Thérèse is writing something. Mario repeatedly shakes his head (sideways) in ways that we can observe in situations where the needs of someone (standing in line) are not addressed, which culturally competent people tend to understand as expressions of frustration. Thérèse continues to write, Aurélie places her feet on the bookshelf of her desk, and Mario raises his head again, looking around the classroom.

```
Fragment 2.3
031  T: here (0.30) you have to do (1.41) three plus six
        (0.60) yup. (1.79) <<len, p>y=write whatever>
        ((Thérèse turns around and speaks to members of Group
        4 about other things))
032     (1.29)
033  A: yeAH?
034     (49.52) ((Ali writes, Mario raises hand and Thérèse
        talks about something else))
035  T: ah my god.
036     (8.70)
037  A: ((pounds on the table))
038  T: <<p>kay we are all mi[::xed up>          ]
039  A:                      [i dont understand] ((points to
        her page, Fig. 2.7a))
040     (2.46)
041  T: <<confidently>uh hu:::; uh huh. >
042     (25.56) ((M drops his hand)) ((Ali pounds table again,
        throws herself back against back of seat)) ((4:57,
        Mario gets back to the task, A leans back, Fig. 2.7b))
043  J: <<f>yes.> (0.52) whAT is the ques[tion.]
```
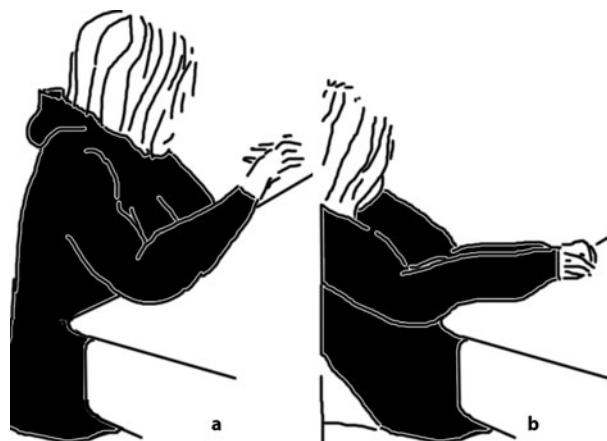
Fig. 2.7. a. Aurélie throws up her hands as she reiterates saying that she does not under-stand (turn 039). **b.** She throws her body backwards, visibly disengages with the task (turn

```
  044  M:                               [its  ] ^this :::
               (0.38) <f>um[::>] ((hands move downward, restrains not
               to pound on table, gazes at sheet, Fig. 2.8))
  045  T:            [aur]élie sit properly (55:00)
  046  M: look this is (.) dUMb, <<p>i dont understAND. >
               ((487>217Hz))
```

Mario turns back to his worksheet noting something, then turns both hands up-side, moves lips as if saying 'quoi' (what?) (just before turn 043). He looks up, and just at that moment, we can see the teacher Jeanne approach stating, 'Yes . . . what is the question?' (turn 043). With this, Jeanne exhibits a response to Mario's re-quest for help, or rather, in approaching the table and asking 'what is the question', she formulates for us her understanding of the nature of Mario's preceding actions to be a question. 'It's this', Mario responds, and then produces an interjection. The palms of his hands open toward the ceiling, his arms move up and down as though he is containing himself with a lot of effort (Fig. 2.8). The intonation falls from high (480 Hz) rapidly to a much lower pitch value (300 Hz). The mean pitch is 396 Hz, up from 280 Hz, F1 mean is up from normal 500 Hz to 787 Hz.[4] All of these are consistent with the research that shows correlations of these parameter changes with despair/disgust and irritation (Scherer 1989). Jeanne then addresses the way in which Aurélie is sitting and articulates it as an improper way of sitting during this task: 'Aurélie, sit properly' (turn 045). Mario continues with expressions that pro-vide intellectual assessments of the situation: 'look this is dumb, I don't under-stand' (turn 046).

---

[4] The pitch, or F0, is the main and lowest contributing frequency of the voice. F1, F2, . . . are the next (higher) contributors to the voice. Psychological and sociological research have shown significant cor-relations with emotions of the first two frequencies, F0 (pitch) and F1 (e.g., Scherer 1989).

Fig. 2.8. Mario expresses spending energy containing frustration, as if taking something and shaking it between his hands (turn 044).

Signs indicating that Aurélie and Mario do not understand mark this third part of the fragment. Their frustration is 'written all over the situation'. The emotional expressions include the pounding of the desk, leaning backward, looking around the classroom with raised hand, and the shaking of hands while articulating the fact that he is not understanding. The fragment does begin with the marking of an insight and the subsequent articulation of what the task is about. From the perspective of a person 'in the know', he is absolutely correct. Yet Mario apparently seeks the teacher's help substantiated in her addressing him with 'Yes, what is the question?' Jeanne has recognized that Mario has a question, and she articulates this understanding for us. The teacher also lets Aurélie – and everyone overhearing – know that her current way of sitting is not appropriate, and she asks the student to sit in the way one is expected to sit. Mario has filled the first row of his table of values, which is one of the goals communicated on the worksheet, and, despite successfully doing so (as judged from the outside), has become increasingly frustrated. That is, in the unfolding of his activity, as he realized his activity in a concrete way, Mario also changed his emotional tonality from confidence to frustration. As the activity is concretely realized in the material outcomes of Mario's actions, it also produces a negative affect. The coincidence of the affective expressions with the cognitive expressions is observable throughout this fragment. In fact, the difference between the two is undecidable, as they are produced simultaneously, in the case of the verbal productions even in the same medium (sound). One part of the sound material is heard as expression of cognitive content, the other as emotional content.

The instant is an expression of an inner contradiction, the co-presence of the current state and an object/motive that is not yet realized. The contradiction is reflected in consciousness, and expressed in both cognitive and emotional terms. Because cultural-historical activity theory is a dialectical approach, inner contradictions of the activity are understood as drivers of change: they are expressions of

change itself. Thus, contradiction is regarded 'as a necessary form of development of knowledge, as a universal logical form' (Il'enkov 1982: 234). That is, this contradiction is a necessary but, as we see, not sufficient condition for learning to occur.

The Relation of Emotion, Cognition, and Practical Activity

In this lesson fragment involving Mario and his two peers, the object/motive of activity does not and perhaps cannot emerge from their engagement because what they are conscious of (in what they make available for each other) is not that from which the generalization can (more easily) emerge. They count, they are busy with filling the required number of chips into the goblets, and they fill the upper row of the table of values. But this is not the object/motive of the activity. Mario announces his recognition of this fact in the expression 'I don't understand [Je ne comprends pas]'. It is precisely the momentary abandonment and the intonations that allow us to perceive the emotional quality of Mario's and Aurélie's current state, their frustration, their disorientation, and their questions. Each announces his/her assessment of his current cognitive state, 'I don't understand'. There is a gap between what they know and the object/motive of the learning activity, and this gap is so *large* that their current actions do not get them any closer; in fact, they cannot even establish how far away or how close they are to the object/motive. The contradiction that exists here is that Mario has already stated how to fill the table, already is on the way of realizing one of the goals toward the completion of the activity, but his emotional valuation is negative. Also of importance is the fact that Aurélie expresses extreme frustration although in the course of this fragment, her worksheet comes to be filled. That is, completion of the worksheet is not a sufficient criterion for completing the activity. Her frustration is the expression of the emotional valuation of the distance between where she is and the object/motive of the activity; this valuation goes hand in hand with the cognitive assessment: 'I don't understand. I will never understand'. We can appreciate here that the question for Aurélie is not just to get the table filled. She *wants* to understand, and not only to please the teacher.

    In cultural-historical activity theory, 'the particularity of emotions is that they reflect the relation between the motives (needs) and the success or the possibility of a successful realization of the corresponding activity of the subject' (Leontjew 1982: 145). That is, 'emotional valences arise from emotional valuations of sensorially or cognitively comprehended object properties with respect to the 'appropriateness' for the reduction of certain negative state value and *change with the changes of the cognition of the corresponding objects*' (Holzkamp-Osterkamp 1976: 49). Emotions are the product and the mechanism of the motion of the activity. In Aurélie's and Mario's instance, we observe their emotive reaction as a result of the fact that despite their efforts, the motive of the activity does not reveal itself. We can also see in Thérèse's expressions of confidence the expressions of positive

valuations, as she has completed the important third row of the table of values with the corresponding values (3 x 1 + 6, 3 x 2 + 6, . . .). As the first part of the episode progresses, this becomes increasingly evident, and initially the girl, then Mario, indicates not to understand ('I will never understand'); both demonstratively stop their engagement. It is only at the very end of the events analyzed here (see next section), the positive valuation occurs as the motive progressively reveals itself, leading to a positively valued emotional state, clearly available to the onlooker in his comportment and the satisfied cognitive assessment of his current state by means of the utterance 'I understand'.

To become a learning *motive*, it is insufficient that the learner be conscious of the difference between his/her current prior knowledge and the learning object. S/he also needs to experience *directly the insufficient and partial nature of his/her current articulation of the learning object*. This experience necessarily introduces an emotional-motivational component: 'The obstructions to the realization of actions implies – as a limitation of control/life quality – a certain emotional sense of insufficiency, "frustration", disquietude, fear, and the likes as undisclosed premises with respect to the grounds and possibilities for overcoming the obstacles to action' (Holzkamp 1993: 214). It is this realization that serves as the emotional valuation at the source of the actions that diminish the gap between the current knowledge and the learning object. And the successful disclosure of the object/motive of the learning activity in its entirety – its objectification – is marked in terms of a positive emotional quality. Thoughts do not think themselves, and they do not *inherently* push themselves to learn and develop (Vygotsky 1986). It is only when there is an inherent emotional quality to knowing and thinking that we can understand why someone *wants* or *should want* to learn. But learning activity is easy to understand if successful disclosure of the initially unknown learning object leads to increases in control and action possibilities, increases that are associated with positive emotional valuations. It is precisely here that emotionality obtains an orientational function in activity with respect to the acquisition of knowledge (Holzkamp-Osterkamp 1978).

Evaluative feedback occurs by means of an emotional tone, which has a complex quality, and 'condenses all particular evaluations automatically into a unitary execution of action, on the basis of which alone goal-directed action is possible' (Holzkamp-Osterkamp 1991: 104). The emotional valuation of the conditions constitutes the first step of cognitive processes, including those that are involved in learning. 'The emotional reaction, generally a more or less diffuse feeling of "ease" or "unease" evoked by the complex situation, serves to inform and correct the conscious goal- or task-oriented exchange with the environment' (ibid.: 105).

Some educators might think that the teacher should have simply given the students the instruction to copy the number of chips into the equivalent table cell and given them the formula that could have led him to fill each of the cells in the third row of their table of values. But this would have been a mechanical acquisition of a lifeless fact that Mario might remember but that he would have less likely been able to use. It is possible, writes Leont'ev, to acquire factual knowledge in mathematics or physics in such a way that it remains dead and unused until life itself

awakens it – if the student does not forget the facts in the meantime. But 'if the subject matter content is not to be acquired in a formal manner, then we must not just "sit through" the lesson during learning, but we have to live it through' (Leont-jew 1982: 281). This living through a productive process changes the person, who, in productive activity objectifies himself in the product of his labor and is subjecti-fied as he becomes conscious of the outcomes of production, subjectifies the thing and activity in the form of the inner reflection and object/motive (Marx/Engels 1983). 'The inner (the subject) operates on the outer and thereby changes itself' (Leontjew 1982: 174). The lessons themselves have to become part of the signifi-cations for students generally and Mario here particularly. This signification arises from the motive of his activity, which is, as activity among other activities, consti-tutive of the totality of his life. It is precisely in the real life of the child that mo-tives develop. The purpose of the lesson is not just to fill the worksheet, to get the numbers right in each cell. The purpose is for Mario and his peers to become con-scious of the object/motive of their activity, which discloses itself in the course of the activity. It is not just the fact of the entries taking the form $3n + 6$ that matters but the child's consciousness of *his* activity and the role the object takes. Con-sciousness of his activity is possible only when the child actually brings about the activity, not when he is presented with the fact that the content of the cells take a particular form.

For Leont'ev, the transformation of the materials and means – that is, the text of the task into the goblet-chip model, and the table of values into the $3n + 6$ and into the consciousness of this product as it relates to the activity as a whole – *consti-tutes* the object/motive. The subject's awareness of how close it is to achieving the motive expresses itself affectively: positive emotive valuation when the ob-ject/motive is realized, negative emotive valuation when the object/motive remains out of reach. The thing subsequently produced is $3n + 6$. This is the *goal* of the activity and, at the same time, is only the material side of the double nature of the *object*. The formula $3n + 6$ is a material instance of the ideal object of the activity, which is *thinking algebraically about patterns*. The object only exists in this dual nature, and this would not exist if the teacher had told him that what he had to do was to fill the bottom row of the table according to the formula. This would have allowed Aurélie and Mario to fill the table of values in a routine, mechanical (thoughtless), and alienated manner. But this cognitive motive does not fulfill it-self; rather, there has to be some *reason*. This reason is not the Kantian legislative and schematizing reason of human actions. It is rather one of the cultural and his-torical possible reasons that opens up possibilities for *thinking and feeling* marked by resonance in social forms of knowing. It is a reason out of which a sense of be-longing is made apparent to the students. It lies in a positively valued subjective experience of an increase in control over life conditions, and room to maneuver and express oneself in a field of potential actions, agreements and disagreements.

In activity there is a primary sensuousness that contains cognitive and affective moments. As constitutive moments of sensuousness, the two moments cannot be understood independently but they are mutually constitutive and subordinate to the sensuousness, a psychic reflection of material activity. The vocal track, too, is a

means to articulate cognitive content (language) and emotional valence simultaneously. Mario does not just say that he does not understand, but the various prosodic parameters all are consistent with despair/frustration as shown in research on the correlates of affect and prosody (Scherer 1989). Because they are available to others, including the teacher, they also become resources in the interactional setting. These moments are created in sensual practical activity and are a reflection of the material world. Cognition reflects the object-content aspect of the conditions; emotions constitute valuations of the current conditions with reference to the object/motives that the ongoing activity is to achieve. *In* and *as result of* practical activity – which may entirely concern ideal entities – the 'affectogenic character of entities may be changed' (Leontjew 1982: 190). The same entity, in Leont'ev's case, a bear, may be the source of fear, during an unexpected encounter, or joy, in the case of a bear hunters waiting for their game. The emotional tonality of actions reflect the object/motives of activity, even when these are not present in consciousness, so that object/motives are never separate from consciousness, that is to say, from *objectifying* processes.

Emotions are expressed in sound as much as cognitive content is: Both are part of the same expressive material and therefore should not be considered as functioning independently (Merleau-Ponty 1945) but as two moments that each reflect the same situation but only partially and one-sidedly (Leontjew 1982). It is their embodiment and their physical co-presence that allows participants to make and have access to emotional valuations of each other: In this way that they shape the interaction rituals in and through which participants create society at the microscale (Collins 2004). The co-expression of cognition – Mario knows that he does not know – and emotion – Mario, as Aurélie, expresses frustration – is available to others, here Jeanne the teacher, who act upon these expressions. Jeanne and Mario are not mindless machines (computers) passing information (signals) between each other, they are corporeal human beings with emotions that they, too, make available by a variety of means including their body positions, body orientations, gestures, and prosody. Jeanne and Mario jointly orient to and collaborate in the production of sympractical activity, and this joint orientation is constitutive of their *participative (non-indifferent) understanding* (Bakhtin 1993). But theoretical cognition alone cannot explain the events we followed so far. Only activity as a whole gives us an understanding of the actually observed events. Cognitive content, too, may be articulated for others by nonverbal means, such as when a person nods to suggest agreement, and even hand gestures. In fact, hand gestures may articulate both, an affirmation that a response was appropriate (see gesture) even in the absence of words and a particular emotional orientation to the situation. Thus, just before the end of a subsequent fragment, Jeanne will make a two-handed gesture that might be glossed as 'You got it, so what was the problem'. We come to this and similar expressions on the part of the teacher in the following two chapters.