recording is obviously not exclusively the personal property of V, even if a distant listening
would emphasise her solitary authorship. But in the light of the transcription we know
better. We are at the heart of what Bakhtin (1986, pp. 78, 89) calls ‘dialogism’ or ‘multi-
voicedness’: ‘Our speech (...) is filled with others’ words, varying degrees of otherness or
varying degrees of ‘our-own-ness’, varying degrees of awareness and detachment.’ This is
clearly identifiable in the language production process in French that interweaves highly
individualised words, intonations, gazes and gestures of all participants. The production of
utterances with TEO involves a speaker’s appropriating, invoking, or ventriloquating
through the voices of others, thereby entering into a dialogic encounter with them (Wertsch
et al., 1995). The individual utterance that fills V with pride can only be understood as the
result of the situated activity and of the circulation of knowledge between the human and
nonhuman actors in the TEO team.

A’s and V’s co-vocalising shows that language exists in other people’s mouths, in other
people’s contexts and serves other people’s intentions. We must take it from there and
make it serve our personal intentions through populating it with our timbres and overtones,
because language is not a neutral medium that passes easily into the private property of
the speaker’s intentions. Populating language with our own accents is a difficult and
complicated process (Bakhtin, 1981a). There are several levels of mediation through
which the utterance originally proposed by F comes to be finally thought of and performed
by V: mediation through human actors, mediation through the nonhuman actor or TEO
tool, mediation through language, mediation through gestures and gazes. As such, V’s
individual performing is the result of a co-authoring of all the actors in the team production
process. The correct grammatical structure and the correct vocabulary are mediated and
proposed first by F, then by A. V transforms the construction by splitting up the utterance
through intelligent pausing and tentative exploration of the grammatical structure. She also
brings her own accentuation to the appropriated speech (Voloshinov, 1973). The utterance is then twice re-mediated through the co-vocalising of V and A, later through the sub-vocalising of A. Finally TEO validates the production process through the replay and opens it up for interpretation and evaluation. In between, V’s radiant smile signals that she has internalised the structure of the utterance to a certain degree in her mind. What we have here is a process of successful interaction, communication and learning evidenced by the smooth flow of joint activity itself (Hutchins, 1996) based on language and gestures.

The whole sequence of the recording of the utterance serves as an illustration of the mechanisms of internalisation and externalisation that, according to Vygotsky, allow the human participants to construct higher psychological functions, in our case the competences for producing the French language. Vygotsky (1978) maintains that children grow into the intellectual life of those around them through internalising the processes occurring in the course of the interaction with the more competent member of the culture. In the TEO team performing the language learning of French, the processes of co-vocalisation and sub-vocalisation come to be internalised by all the human participants. The original model as given by F is transformed in the process and there is then room for innovation and accentuation in individual tones on the basis of the participants’ own characteristics, experiences and existing knowledge. ‘Comment s’appelle ton frère? [What is the name of your brother? FRENCH]’, as provided by F, transforms into ‘Comment … s’appelle … ton f(r)ère? [What … is the name … of your b(r)other? FRENCH]’, as this utterance is recorded by V with her own timbre and overtones. Ultimately the material carrier or the material extension TEO records, stores, replays and holds at the human actors’ disposition an utterance that is full of sounds, voices and intonations (Hall, 1973).

V’s recording itself is an instance of externalisation of the acquired and appropriated knowledge. In the case of the TEO team, the replay of the same utterance in Turn 104
acts as a double externalisation in that it re-presents the externalised utterance as yet another living example to which we can relate. In this way, fleeting features of our ongoing productions that would otherwise pass us by unremarked are re-called to our notice (Shotter, 1999). The replay confirms the utterance and establishes its robustness when confronted with disturbances. In Graphic 53 the replay of the utterance by TEO in Turn 104 is interwoven with a remark in Luxembourgish by F which refers to the lights in the room where the recording is made.

As TEO replays the utterance the children attend to the ceiling with F pointing with his left arm and index at the lights in Plate 54.
But the second externalisation of the utterance by TEO does not allow for distraction and on ‘s’appelle [is called FRENCH]’ V and A face the screen again. They now consciously and jointly engage with the French language produced by V, a process that necessarily combines affect with intellect (Van Lier, 2004). V is particularly fond of her language production and takes advantage of the TEO contribution and externalisation to explain how she feels about the learning process. Her intonation reveals that the question for evaluation is intended as purely rhetorical and that she thinks that she has done a fine job on the task: ‘As dat richteg? [Is that correct? LUX]’. While A agrees with V in a rather tired mood, an unnerved F vehemently opposes V’s positive evaluation of her own utterance. The heated discussion constitutes a very dynamic stretch of exclusively Luxembourgish discourse where V does not easily give in. The dynamics created by
emotional overtones best externalised in the familiar Luxembourgish language can be detected in the overlapping segments of speech in the graphical display and in the exact time measurements of the turns, as shown below.

In Turn 109 V stays very confident with a strong voice and maintains her position, although F almost simultaneously challenges her claim in Turn 110. F’s challenge obliges V to adopt a new strategy for maintaining her dominating position in the discourse. She recruits a supplementary ally in the person of the nonhuman actor TEO: ‘Hei da lauschter emol! [Here listen to it! LUX]’. In Turn 112 TEO replays V’s utterance that she recorded in Turn 103: ‘Comment … s’appelle … ton f(r)ère? [What … is the name … of your brother? FRENCH]’. At the same time V turns her head to the left away from the screen and looks directly at F who initially responds to her look, then looks down and plays with his fingers for the rest of the utterance. A also looks at F in Plate 55.
At the end of the TEO utterance in Turn 112, on ‘f(r)ère’, F is nodding with his head as if he was underscoring his intimate belief about the faultiness of V’s production and as if he was judging it as insufficient in this context. He looks at A and then at V and speaks in a determined voice, again accompanying his utterance with nodding head movements: ‘Jomee … du hues fère gesoot … dat as net richteg … fRRRère! [But … you said fère … that is not correct LUX … bRRRother! FRENCH]’. Semantically in French, F may be making the difference for himself in inner speech between the verb ‘faire’ (to make) and the noun ‘frère’ (brother). That is the difference he wants to externalise and to impart on V for the start of her particular internalising process. F insists on the semantic difference by emphasising the significant phoneme-sized difference between the two words in French, that is by over-articulating the ‘r’ in a demonstrative and exaggerated way. Interestingly, when F says ‘you said fère’, V immediately turns to the screen, maybe to get support from
her occasional ally TEO, but more likely to produce a new recording, as can be detected in the continuing discourse. On F’s Luxembourgish ‘that is not correct’ A also turns her head towards the screen as if she was also ready to embark with V on a new recording for the contested utterance.

The readiness of the TEO team to amend and re-record is evidenced by the rather large overlapping of the turns in the sequence below.

V immediately tries to replicate F’s articulating of ‘frère’ in Turn 114. Turn 114 signals a very significant change in V’s attitude as can be detected in her posture in Plate 56.

Plate 56: V’s confidence has melted away as is revealed in her decomposed look and in the change of the tonus of her face in Turn 113.
Foremost, it is the emotional load of V’s utterance that for the first time indicates a kind of fragility and hesitancy in the continuation of the discourse and in the production of the French word ‘frère’. With a clearly audible falling pitch, V tries to articulate the required ‘r’. A feeble trembling in her voice however prevents the clear articulation. The result is such a smooth ‘r’ that it immediately calls for another stint of F in Turn 115. F now boldly challenges V’s previous effort by rather coldly and ruthlessly interjecting: ‘Du hues de R vergiess! [You forgot the R! LUX]’. At the same time and in an effort to annihilate F’s rather destructive contribution, A had already responsibly reacted to V’s desperate attempt and almost vicariously proposed the recording of the whole new utterance in Turn 116: ‘Comment s’appelle ton frère so emo! [Comment s’appelle ton frère? FRENCH now say it! LUX]’.

As can be seen in Graphic 57, V and A launch again into the recording procedure with TEO in Turns 117 to 128 exactly in the same way as in Turns 87 to 104, that is they repeat the same exercise as it were for the third time.
The whole recording procedure including co-vocalisation, sub-vocalisation and imitation as outlined above is started off with V’s ‘Comment [What FRENCH]’ in Turn 117. V speaks with a rising pitch signalling that she is a little bit unnerved by F’s request and attitude. By turning her head towards A and by her searching look V shows that she is in need of support. But A immediately and almost simultaneously joins V in the production process with a warm and caring voice. She establishes intensive eye contact with the doubtful V, leans towards her and thus comforts her with her bodily behaviour in Plate 58.
Plate 58 illustrates a role and function of TEO that consists in establishing and maintaining a zone of socio-material performance for the TEO team. I am coining the term ‘socio-material performance’ to refer to the bodily interplay between the three human participants in the TEO environment that propels their language learning experience. I unite the social and the material because bodies do not oppose social performances, but are part of them (Mol, 2002). Hence, bodies are an integral part of the social enactment of the TEO tool. In performing the storying activity with TEO in a socio-material matrix the children discover not only how to do what they do not know how to do, but also that they can do it. Performances then create stages for development and overcome the paradigmatic dualism of cognition and emotion (Holzman, 2009). The analysis of the transcription and of the video and the stills shows that TEO contributes to establish a learning ground where children can learn from each other especially through their
differential language competences in association with the performance of gestures and
gazes. This means that not only the actors' minds and speech are engaged in under-
standing or shared sense-making, but also their bodies. Thinking, understanding and
learning arise from the participants' practical, physical actions in the world and are part of
the larger multimodal organisation of human action (Streeck, 2009). I will now discuss
these points in some detail.

7.6.4 TEO as a tool for establishing and maintaining a zone of
socio-material performance

The TEO team is moved into and maintained in the language production processes
through the situated activity with TEO that allows for a positioning of the bodies of the
human actors in the space in front of the computer. The bodies move forward or away
from, or maintain careful spacing among, the participants of the interactional scene
(Birdwhistell, 1970). The ballets of gazes and gestures that accompany the discourse and
the learning of the French words and structures embody the language production
processes through their inextricable ties with the meanings produced. Language and
meaning are thus grounded in bodily actions (Glenberg and Kaschak, 2002). It is the
series of gestural acts that builds up the knowledge of language in the case of the TEO
team (Streeck, 2009). The language production process benefits enormously from the
interactive and contingent coproduction of a shared socio-material world (Suchman, 2007).
This socio-material world is established through touching as in Turn 30 mentioned above
or through the coordination of distant body movements in general. In a detailed study of
pupils in top and bottom reading groups in a first-grade classroom McDermott (1976)
revealed the bodily and concerted way in which failure and success were achieved in this
particular classroom. He located a number of typical bodily positionings that result from a
line of action by all participants to the action and in concert with one another. In this way,
people are each other’s contexts in that they form an environment for each other. Hence, body positionings, gestures and gazes establish a socio-material zone of fusion (Robbins, 2003) or a zone of performance representing the unity of both the individual and the social where the human actors are contributing their verbal enactments. In Turn 118 A leans towards V, a body behaviour that leads up to her nodding emphatically in Turn 122. A thus non-vocally prompts V on ‘Comment [What FRENCH]’ to carry on with the recording of the utterance, a common goal as evidenced by both of them looking at the screen. At the same time a rather withdrawn and distant F continues to play with his fingers, maybe intently listening to the other team members. His corporeal behaviour does not interfere at all with the production and recording process. The space for performance is shared between the bodies and gazes of V and A as is demonstrated in Turn 127, where A leans again towards V in order to make her stop the recording on ‘Stop’ while F has resorted to playing with his jacket. V’s intonation on ‘ton frère? [of your brother? FRENCH]’ is clearly indicative of her uncertainty in the production process. V is now forlorn and unable to interiorise either the prompts of F or even those of her loyal assistant A during the recording process. The reduced tonus of her face apparent in the stills is indicative of a loss of confidence in the language learning process. V’s production is thus left with a kind of suspension mark, revealing that she has not yet made the word ‘frère’ her own. The body behaviour is shown in Plates 59a, 59b, 60a and 60b.
Plates 59a and 59b: A is nodding emphatically as V is recording in Turn 122; V and A look at the screen.
In the language production process with TEO the human actors experience what Poyatos (2002, p. XV) calls ‘the triple reality of speech: what we say-how we say it-how we move it.’ Movement and coordination of moves and gazes keep propelling the discourse.

Plates 60a and 60b: In Turn 127 A leans towards V in order to make her stop the recording. V and A look at the screen and F plays with his jacket.
and the learning in the example above by initiating and maintaining a series of different acts in the matrix of the ongoing communicative event (Meyerson, 1955). The bodies of the human actors are the anchor points for a continuum of communicative activities through their movements and sounds as well as through the non-activities between them as manifested in the positions and silences that delimit and define those activities (Poyatos, 2002). The visual aspects of communication and social encounters are of utmost importance, the act of looking at each other being the primary form of conversation (Ichheiser, 1949). The beginning of the communicative act engaging speaker and listener tends to be a mutual gaze. In mid-turn, speakers often withdraw their gaze from the listeners who also tend to look away for brief moments when an extended turn is underway. Mutual gaze is commonly re-established during the completion of the turn or during important transitions (Streeck, 2009).

The importance of the visual contact for communicating something in and about a situation was often alluded to when parents or interested others commented on my pupils’ activities and performances in video-material recorded either in my classroom or elsewhere in the TEO recordings from 1994. They very often referred to the bright faces or shining eyes of the children and interpreted them as a sign for their delight in the work of speaking, writing, learning and communicating. It is disappointing that the importance of the inter-animation of the bodies has often been sacrificed in regular language learning in school where the abstract auditory and visual components of languages figure almost exclusively. These elements of language are all too often isolated from their context of use whenever they are taught so that their function in the context of the linguistic system is very hard to understand (Hall, 1973). This is all the more incomprehensible as even infants show this kind of bodily behaviour when they combine postural changes with vocalisations and gestures of the hand during their expressive outbursts, thus coming close to adults’ contributions to live conversation (Trevarthen, 1990). Saint Augustine (1961, p. 29) in his
‘Confessions’ refers to body movements in the process of learning a language, as ‘there is a kind of universal language, consisting of expressions of the face and eyes, gestures and tones of voice, which can show whether a person means to ask for something and get it, or refuse it and have nothing to do with it.’ The child’s self-motion and his gestures then assign the function of sign to the object and give it meaning (Vygotsky, 1978). All kinds of body activities such as intakes or exhalations of breath, movements of the head and body, intoned vocalisations and reactions to environmental elements can come to have semiotic significance, if reacted to and responded to as such by others. In a Vygotskian sense, gestures can be characterised as psychological tools, as mediating, enacted structures that are not only visible to interlocutors but also available to their makers, particularly through kinaesthetic perception (Streeck, 2009).

How then can educational discourse dispense with these corporealities when language learning processes, be they first, second or other, are at stake? In the following extract imagined by Bateson (2000, pp. 64, 65) as a discussion between daughter (D) and father (F), this situation is alluded to:

‘D: Daddy, when they teach us French at school, why don’t they teach us to wave our hands?

F: I don’t know. (…) That is probably one of the reasons why people find learning languages so difficult. (…) I tell you – we have to start all over again from the beginning and assume that language is first and foremost a system of gestures. Animals after all have only gestures and tones of voice – and words were invented later. Much later. And after that they invented schoolmasters.’

The situation invoked by Bateson does at the same time describe the regular situation in most Luxembourgish classrooms when it comes to the learning of French, and does contrast with the situation we witness in the TEO transcription where the children, although
sitting on a chair, are using a vast array of body features to propel their discourse and consequently the language learning processes.

In schools, children are often asked to sit still and not to move their hands or bodies while speaking. McNeill (2000) however points out that almost any speaker of a language and under nearly all circumstances will compulsively move the hands and arms in conjunction with the speech. In the language production process with TEO there is only one limitation to the instantiation of bodily behaviour by the human actors, and this concerns V in particular. The movement of her hands and arms in conjunction with the speech is impeded by her right hand being forced to control the mouse in the recording process. Nevertheless, the fact that her right hand is constantly hooked on the mouse does not prevent V from turning her body and her head. V constantly changes the tonus of her bodily behaviour, another sign for the robustness of gestures in talk where they appear to be integral to the speaking process itself (Iverson and Goldin-Meadow, 1998). In itself the presence of gestures during the discourse might be an indicator of learning. Gestures not only reveal a child’s unspoken thoughts, but they also can tell us that the children may be ready to learn new things (Goldin-Meadow, 2003). Thus, gestures indicate that the process of learning is not interrupted and can still be propelled by a vast array of non-verbal props. McNeill and Duncan (2000) have argued that it is precisely the interplay between gesture and speech that serves as the dynamic force that propels discourse and thinking forward. There are many ways in which gestures are associated with learning. Goldin-Meadow (2003) suggests that gesture can reflect moments of cognitive instability and thoughts not yet found in speech, thus prompting others to provide the learner with the input necessary for taking further steps in the learning episode. She also maintains that gesture facilitates learning by easing the learner’s processing burden through distributing the effort of learning and thinking across different modalities, i.e. speech and gesture. Gesture then serves as a ‘cognitive prop’, freeing up cognitive effort that can be used on
other tasks. With the help of gesture teachers may become able to discover thoughts that are on the edge of a student’s competence. The less proficient speakers are in the non-dominant language, the more gestures they seem to produce (Gullberg, 1998, Marcos, 1979) without any large cultural differences, even if some culture’s gestures may be more noticeable. Body gestures play an important role in the case of the French language learning processes with TEO where they even accompany the replay of one’s own utterance by TEO. The presence of gestures, even with vicarious utterances, is an indicator for the importance of the zone of socio-material performance in the learning process. Turns 128 and 129 from the transcription illustrate the importance of gestures.

<table>
<thead>
<tr>
<th>Turn</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>128</td>
<td>TEO</td>
<td>277.01s</td>
<td>284.76s</td>
<td>Comment ... s'appelle ... ton frère? [What ... is the name ... of your brother? FRENCH]</td>
</tr>
<tr>
<td>129</td>
<td>V</td>
<td>276.42s</td>
<td>280.70s</td>
<td>Chhh! [Chhh!]</td>
</tr>
<tr>
<td>130</td>
<td>F</td>
<td>287.21s</td>
<td>288.85s</td>
<td>Richteg! [Correct! LUX]</td>
</tr>
</tbody>
</table>

In Turn 128 TEO replays V’s utterance ‘Comment ... s'appelle ... ton frère? [What ... is the name ... of your brother? FRENCH]’ after the whole sequence of imitative and repetitive work by A and V detailed above. In Turn 129 V reacts in a very assertive way to F’s continued nestling with his fingers and with his jacket, which started during Turn 105 and which has accompanied the language production in French finalised in Turn 126. As V continues to hold the mouse with her right hand, her hand or arm movements seem to be restricted by this activity. V’s gesture at this moment is a simple turn of her head with her eyes directed towards F who continues to twist his jacket during the replay. V vocalises an unnerved and very guttural ‘Chhh!’ when moving her head, her eyes and also her lips in a loathing manner. The intonation of her utterance signals an intense dislike of F’s attitude. V’s gesture is not a simple motor accompaniment to the TEO utterance replayed in this instance, it is really a form of language and a form of socially expressive movement.
(Gallagher et al., 2001). Through her gestural body movement V expresses her resentment towards F for not concentrating on the replay of her utterance by TEO. She seems to fear the loss of attention of her most important interlocutor, the expert in French. V leans up against F’s attitude in the interaction that can be described as an unspoken dialogue manifested through bodily movements only. She uses her lips and the vocalisation of the guttural ‘Chhh!’ as a gesture for dramatic effect (Kendon, 2004), aimed at maintaining her strong position in the exchange. It is precisely due to humans' natural and very early developed capacity for multi-modal perception that all the forms of language and forms of movement seen in Plate 61 merge into a meaningful configuration (Leiman, 1998), thus contributing to the continuation and eventually to the completion of the dialogues in Luxembourghish and French.

Plate 61: In Turn 129, V turns her head softly towards F and utters a guttural 'Chhh!' that is marked with her lips.
In Turn 129, F changes his behaviour in response to V’s gesture, posture and vocalisation. He goes on to treat V’s utterance as replayed by TEO in Turn 128 very differently from his rather harsh judgment in Turn 113 of the TEO replay in Turn 112. The acoustic quality of both recorded utterances simply does not warrant this change of F’s mood. The ‘r’ is hardly, if at all more audible in the second recording and cannot warrant F’s emphatically legitimising and authorising V’s second production of the same utterance: ‘Richteg! [Correct! LUX]’ in Turn 129. Ironically, V forgot to stop the recording by not clicking on the mouse, so that F’s endorsement is replayed by TEO in Turn 132, leading to a double validation of V’s work in the French language production. In Plate 62 both V and F seem to enjoy the fact that TEO vicariously supports V’s production process by duplicating F’s positive evaluation.

Plate 62: V and F are pleased at the double validation of V’s utterance through the TEO replay in Turn 132.
The reasons for F’s change of mood may be manifold. It could be that the intensive work of elaboration in between A and V as well as the intensive replay by TEO have convinced F that V’s effort must be rewarded by a change in his appreciation. As many teachers do instinctively, F might prefer to positively evaluate the fact that A and V continue to be engaged in the learning process rather than to negatively judge the failing accuracy of the pronunciation. The ‘neutral’ replay by TEO might also play the role of a super-partner in the discourse appealing to F’s friendly dispositions towards V’s performance. But maybe V’s smooth gestural reaction at the onset of the replay by TEO on ‘Comment [What FRENCH]’ plays an important role simply because of the character of the gesture she chooses to produce: the guttural gesture ‘Chhh!’ involving her lips, eyes and brows. This gesture is surely a strong signal for her partners in the discourse. It is an external touchstone available to all participants in the conversation (Goldin-Meadow, 2003). V’s natural emotional reaction in Turn 129 is made possible by the delayed replay of her own utterance through TEO. It is the nonhuman partner in the TEO team who offers a possibility that would not be given in the pell-mell of ordinary conversation. The pause that TEO imposes in the discourse of the human actors allows for the utterance to become internalised, to become one’s own. TEO allows the human actors enough time to reflect on the utterances produced, to adopt them or to reject them. In Turns 128-130 the TEO replay offers room for gestures that reflect an individual stance towards one’s own utterance. This attitude may be an indication of the speaker’s cognitive development and induce cognitive change in the team and in the partners. When the utterance is on the way of entering the private domain of the individual speakers, the speakers can also take their time to produce gestures not only for signalling content to others but also to account for themselves and their position in the ongoing discursive process. I believe that V’s easily overlooked gestural behaviour in Turn 129 continues to carry her utterance, which she has been working so hard at in collaboration with all other actors in the TEO team. Vygotsky
(1986) has coined the term ‘material carrier’ for signalling the embodiment of meaning in concrete enactments or material experiences. McNeill (2002, p. 8) argues that the ‘concept of a material carrier implies that the gesture, the actual motion of the gesture itself, is a dimension of thinking.’ In our case the gesture carries, signals and enhances the utterance not during the actual production process but only during the replay by TEO.

The notion of material carrier can thus be extended with the help of our example: not only can V’s gesture be linked to the dimension of thinking during the production of the utterance, but it must be extended to the dimension of thinking about her utterance after the production. It is the reflection about the production and hence the evaluation of the utterance that we find in V’s gesture. She wants to re-establish and keep the floor for her particular utterance and she wants to be heard in her own way, in her own terms. Her inner voice has legitimised her authentic contribution and V uses her gesture to back up the representational power of her utterance and to validate the judgment of her auto-evaluation. The work within the TEO team creates a gestural space that allows the human actors to stay involved in the discursive process of producing utterances in French at all levels:
- in the elaboration of the utterances, done through the mediation of Luxembourgish,
- in the performance of the utterance in French,
- and even in the replay of the utterance by TEO in French.

The gestural space is enlivened by the strong emotional tensions that mark the embodied discourse. Under certain circumstances a particular gesture can display anger, irritation or annoyance in a combination of sounds and physical actions. Some parts of the transcription and of the video analysis reveal acts of protest, smooth as the one in Turn 129 (V: ‘Chhhh!’) or harsh as the one in Turn 214 (V: ‘Ochhh!’), mostly by V, who is the weakest partner in the team. However, Turns 129 and 214 may suggest otherwise. When challenged by the expert F, V continues to act through gestures and can even be said to
express a judgment on the moral quality of F’s correction of her performance. The gestural space created and mediated through TEO allows V to display her protest and to direct it implacably towards the expert F, who is thus not untouchable and who is judged as rather offending by V (Harré and Gillett, 1994). The emotions and the correlated gestural displays by V in Turn 129 and more so in Turn 214 maintain the dynamics of the language production in the TEO team. Plates 61, 63 and 64 show that the interplay of individuals manifests itself in the gestures that reveal their emotional tenor, their fears, joys, hesitancies and desires. The tense glottal articulation in both instances, but especially of ‘Ochhh!’ in Turn 214, expresses V’s physical or moral strength in the ongoing negotiation (Poyatos, 2002). As the particular emotional process is embodied in living and contradictory discourse, it is often far from harmonious (Kaptelinin and Nardi, 2006). Plates 63 and 64 show the dynamics of the particular exchange of attitudes and positions during Turn 214.
Plate 63: V swirls her head and her ponytail around. She turns to the left and looks intensely and furiously at F in Turn 214.

Plate 64: V clinches her left hand into a fist, her furious look resting on F while uttering a very determined ‘Ochhh!’ in Turn 214.

In order to discover and analyse the roles of TEO in the TEO team language production I will again follow the actor TEO and track its next appearance in the graphical transcription provided by TranScripter in Graphic 65.
The nonhuman actor TEO becomes active again in Turn 139 after the validation of V’s utterance by F had been recorded by V and replayed by TEO in Turn 132: ‘Richteg [Correct LUX]’. The satisfaction on V’s face in Plate 66 and on F’s and A’s face in Plate 67 leads up to a smooth transition phase in the TEO team language production.
The transition phase is characterised by V’s comments in Turn 133 while she manipulates the mouse icon on the screen and deletes the wrongly recorded utterance. In the same turn she is kindly soliciting F if there is something missing either in the utterance or in the part of the discourse about the family. At that moment video operator enters the scene in order to move F’s chair closer to the screen for better videotaping. This interlude does not prevent V from pressing ahead with the language production process in Turn 135 by repeating the last part of the utterance in Turn 133: ‘Frédéric, fehlt nach eppes? [Frédéric, is there something missing? LUX]’. As the human actors F and A do hesitate and do not join her in the construction process of the story, V chooses another path: she recruits the nonhuman actor TEO as a participant and interlocutor and tries to re-
contextualise the storyline of ‘The Family’. In Turn 138, V clicks the button for replaying the last utterance recorded with TEO and says: ‘Heihei Dat doten. [Here here That’s the one. LUX]’. As F and especially A are planning to jump into the elaboration of the discourse, V cuts short at their attempts by putting the index of her left hand onto her lips at the TEO replay in Turn 139 of ‘Comment s’appelle ton frère? [What is the name of your brother? FRENCH]’. This gesture signifies to the other human actors that they must now pay attention to the nonhuman actor TEO.

V’s gesture and intense look at A in Plate 68 are meant to interrupt A’s bid for a turn in the discourse that had started in Turn 137 with ‘Elo [Now. LUX]’.
By replaying her own utterance as a TEO recording V duplicates her voice, which is given extra authority because the two other human actors have previously validated V’s recorded utterance. In this way, V and TEO come to embody a combined expert position in the French target language production. The replay by TEO enhances V’s position and helps to propel the re-distribution of the roles in the Luxembourgish discourse leading up to the French story. Even before V starts the replay procedure, A marks her intention to take up her turn and role in the story with ‘Elo. [Now. LUX]’ in Turn 137. Then, as soon as V clicks for the replay by TEO and even before ‘Comment [What FRENCH]’ has been replayed, A interjects ‘Elo free froen ech. [Now you I ask. LUX]’. A thus tries to make the continuation of the discourse intelligible for the other human actors and especially for V.

There is doubt and hesitation in A’s attempt as indicated by the Luxembourgish particle ‘free’ of the word ‘frees’ - meaning ‘you will ask’ in contrast with ‘froen ech’
meaning ‘I will ask’ - that clearly addresses and identifies V as the person who is going to ask a question in the next turn. This choice will prove wrong in many terms: for the person who is doing the next utterance and also for the content of the next utterance that is not going to be another question. But A intuitively detects that it is her turn. After a pause of almost three seconds and just before TEO replays ‘s’appelle [is the name FRENCH]’, she continues with ‘Elo froen ech. [Now I ask. LUX]’. Immediately after the stop of the recording, F signals with an alert fresh voice ‘Eh Dat misst d’Anna sin! [Eh That should be Anna! LUX]’. In his opinion it is now A’s turn to answer V’s question. F’s position is immediately challenged by V who refers back to her own voice in the replay. Consequently, V moves her head from looking at F back to a gaze at the screen, as if she was looking for a back up by the nonhuman actor TEO. V goes on to assert in Turn 142: ‘Nee. Dat sin ech! [No. That’s me! LUX]’. Having wrongly interpreted F’s contribution as referring to the author of the utterance being replayed, she tries immediately to make clear that she is speaking in the replay by pointing with her left index at the screen on ‘Dat sin ech! [That’s me! LUX]’ in Plate 69.
But this is simply not the next step in the discourse that is required for the development of the story 'La Famille'. A decides to ignore V’s contribution and, in Turn 143, proceeds in Luxembourgish with the next utterance to be recorded: ‘Da soon ech: Mäi Brudder heescht Max. [Then I say: My brother’s name is Max. LUX]’. While saying so, A turns her head to her right and her eyes meet those of F in Plate 70. She seems to expect that he will provide the correct French form for the intended utterance.

F agrees with A’s proposal in Turn 144 by simply acknowledging with a light ‘Ehe’ while he sucks his right thumb. V also follows A’s move as their gazes meet and as her body posture suggests in Plate 70.
The continuation of the language production process in the stretch of discourse above does not go without misunderstandings, but it is nevertheless achieved in a very smooth way with A and F respecting V’s error in the interpretation of the distribution of the roles. How then is this supple transition from the evaluation in Turn 130 to the beginning of a new production phase in Turn 143 achieved? I will come closer to an answer to this question by following the nonhuman actor TEO in a longer stretch of discourse from Turns 145 to 194 represented in Graphics 71-75.
As this part of the transcription is important for the analysis of the role and function of TEO in the language production process I will provide the whole transcription of this sequence. Parts of this transcription will be scrutinised in detail below.

145  A  331.87s  333.83s  (whispering) Wël see! een dat?  
[How do you say that? LUX]
146  F  333.82s  337.13s  Eh Mon frère s'appelle Max.  
[Er My brother's name is Max. FRENCH]
147  A  337.35s  338.94s  Mon frère s'appelle Max.  
[My brother's name is Max. FRENCH]
148  A  339.04s  342.05s  recording with TEO, V, pushing the button: Mon frère s'appelle Max.  
[My brother's name is Max. FRENCH]
149  TEO  342.69s  345.69s  Mon frère s'appelle Max.  
[My brother's name is Max. FRENCH]
150  V  348.63s  350.82s  Sou. ... A wat muss ech da soen?  
[Fine ... And what have I to say now? LUX]
151  A  357.53s  360.38s  Da foon ech dech: Wël heescht d'ai Brudder?  
[Then I ask you: What's the name of your brother? LUX]
152 A 360.24s 361.73s Huel emol deen do.
[Take this one. LUX]

153 V 360.65s 361.37s Misha.

154 V 362.44s 363.87s Heid hun ech schon een.
[Look there I have already one. LUX]

155 TEO 363.66s 370.05s Comment ... s'appelle ton ... frère? (as recorded by V. before)
[What is the name of your brother? FRENCH]

156 V 370.02s 372.77s Misha fehlt nach.
[Misha is still missing. LUX]

157 F 371.13s 372.48s (belching) Pardon.
[Pardon. LUX/FRENCH]

158 V 372.76s 374.33s Misha.

159 A 373.77s 377.20s Comment s'appelle ton frère? Soen ech elo.
[What is the name of your brother? FRENCH I'll say that. LUX]

160 V 377.67s 380.23s Ok ... soen ech?
[Ok ... do I say that? LUX]

161 A 380.05s 381.97s Comment s'appelle ton frère?

162 V 381.39s 384.29s Hei da kuck DU hues oo.
[Now look YOU got here. LUX]

163 A 382.70s 383.27s Ma ... 
[But ... LUX]

164 TEO 383.73s 385.00s Mon frère s'appelle Max.
[My brother's name is Max. FRENCH]

165 A 385.61s 385.88s Comment ... 
[Comment ... FRENCH]

166 F 385.96s 386.73s Dat.
[Th... LUX]

167 V 386.57s 387.79s Da ... elo muss.
[Da ... now I have to. LUX]

168 A 387.05s 388.99s Da muss ech dech!
[Then I must you! LUX]

169 V 389.57s 391.60s Ech muss.
[I have to. LUX]

170 A 391.35s 394.31s Nee ech muss dech elo froen wěi heescht dăl Brudder.
[No I will have to ask you now what is the name of your brother. LUX]

171 V 394.09s 395.65s Misha.

172 F 395.89s 398.33s Jo, allez!
[Yes L, allez! LUX/FRENCH]
This stretch of 2 minutes and 46 seconds presents some interesting statistical data.

First, it has to be noticed that the percentage of turns in Luxembourgish is slightly higher in this part of the discourse compared to the total transcription: 58.30% vs. 51.70%.
Significantly, the data indicate that TEO doubles its contribution over the stretch of discourse above compared to its presence in the whole transcription (28.10% vs. 15.90%).

The position of V switches from being the most talkative in French over the whole transcription to that of using no French at all in this excerpt. However, she continues to speak as much Luxembourgish as on average.

A keeps pretty much in line with her overall performance and speaks only slightly more Luxembourgish and French than usual.

F’s position changes the most dramatically. In this current stretch of discourse he ends up speaking only one third of the Luxembourgish in comparison to the total transcription. Moreover, he speaks just two thirds of his usual French.

As for the total activity in Luxembourgish and French, V talks much less than in general, A a little more than usual and F less than half as much. It is the nonhuman actor TEO that in this extract almost doubles in percentage of talk compared to the whole transcription. There seems to be a re-distribution of the turns and of the functional talk between the human expert F and the nonhuman actor TEO. A switch of contributions, roles and functions can then be expected. I will need to scrutinise what kind of talk is eventually produced by TEO in the storying process. The context of the creation of the specific TEO utterances in this stretch of discourse needs to be addressed. I follow the nonhuman actor TEO again.

TEO appears first in Turn 149 where it replays the previous recording by A of the utterance ‘Mon frère s’appelle Max. [My brother’s name is Max. FRENCH]’. This is the third repetition in a row of the same utterance recorded by A. The most conspicuous role and function of TEO in this stretch of discourse is the recording and replay of A’s chosen utterance.
TEO appears again in Turn 155 where V stirs the TEO tool into action in quite a similar way as in Turn 139. Let us compare both instances:

On both occasions V refers to TEO as an expert contributor in that a previously or earlier recorded utterance by V is pointed at with the help of the mouse manipulated by V, clicked at and replayed. The active manipulation of the mouse and of the TEO tool is both times preceded by somewhat perlocutionary language structures used as rhetorical devices to appeal to the interlocutors’ understandings or to solicit a response (Streeck, 2009): ‘Heihei Dat doten. [Herehere That’s the one. LUX]’ and ‘Hei do hun ech schon een. [Look there I have already one. LUX]’. These perlocutionary language acts instantly lead up to the replay of some previous recording of V’s utterance by TEO. Exactly the same procedure happens when TEO becomes active again in Turn 164:
Although the procedure looks the same, the content of V’s manipulative activity of the mouse and of the TEO tool differs from the two small sequences above, as V now emphatically appeals to a recorded utterance of A: ‘Hei da kuck DU hues do. [Now look YOU got there. LUX]’. While speaking V looks confidently and directly at A. At the same time she opens up the palm of her left hand in front of her chest and points at the computer while saying ‘there’. The official expert F looks rather tired if not disinterested. By capturing the attention of her partners in Luxembourghish through ‘Kuck’ (‘Look’) ‘Hei’ (‘Now’, ‘here’, ‘there’) V attempts to incorporate her team-mates into her particular view of the story-building process, into the same horizon or universe of knowledge (Lusetti, 2004). She tries hard to reactivate common knowledge established in the course of the storying process with TEO and strives to maintain collaboration in the difficult process of learning basic structures of French. V is reviving her own authorial prompts in the construction of the story ‘The Family’ by referring to an utterance recorded with TEO by A. By turning to TEO for replaying A’s utterance and hence enforce her own position in the group discourse, V vicariously and with the help of the technological tool ventriloquates A’s voice, thus adopting a voice type available to her in the social environment (Haworth, 1999). A’s recorded voice thus allows V to complete her own intentions in the planning for the continuation of the story.

In the analysis of the long section above I have elucidated how TEO creates a zone of socio-material performance during the team language production process. TEO allows for the performance of language where the corporeal features of the production process are inseparable from the pure language content. Gestures in innumerable forms of body behaviour cannot be seen as peripheral to the team language production process.

I have described TEO as a powerful creator of such a socio-material space where the integrative system of language can be performed and even extended during periods of replay by TEO figuring as a material carrier for the volatile oral utterances. The emotions
lived through by the human actors in this gestural space created with the help of TEO keep the speakers in the dynamics of the Luxembourgish and/or French language performances. In the last part of the section above I described a transition phase where misunderstandings and tensions arising in the socio-material TEO space during the language learning are overcome by the children through referring to their own or to others’ voices stored in the TEO recordings. This process of ventriloquation of recorded utterances leads to the identification of another feature of TEO that I will discuss now.

7.6.5 TEO as a tool for collective memory

In the long section above TEO serves as a memory kit for contextualising actions, stances and participants, in terms of what just occurred and what is anticipated to occur next. The utterances recorded with TEO become significant symbols in their own right as they are understood and potentially shared between the participants in the discourse. Akin to human gestures they allow for the forward-adaptation of actions during interactions (Streeck, 2009).

I use the word ‘memory’ as referring to the continuous processes of interaction between the group of human actors and the TEO environment and as referring to the ways in which the previous experiences of the group members participate in the tasks they are currently involved in (Edelman, 1992). Memories are recalled by an individual externally, and it is the groups of which he/she is a part that provide the means to reconstruct them (Halbwachs, 1992). The TEO memory kit constitutes a dynamic system that can be compared to a self-organising network (Dufva, 2006) fed by the different utterances recorded by the group members. New experiences in the form of new chains of utterances permanently transform the existing organisation of the story and hence of the collective memory deposited within the TEO software. I will adopt Rosen’s (1998, p. 132) definition
of ‘collective memory’ as it fits the TEO environment very well: ‘A memory becomes collective because it emerges from the constant negotiation of conversation.’

The TEO replay serves the participants and particularly the targeted learner V for turn by turn monitoring the emergent, contingent interactional construction of the story (Ochs, 2002). V conducts and accompanies her business by indicating gestures, glances and smiles with the aim of luring her partners into a negotiation of the particular roles and of the corresponding utterances. She also tries hard to demonstrate shared intentionality through gesture, eye contact, engagement, and shared proximity (Iddings et al., 2005), an example of which is given in Plate 76.

Plate 76: V signals shared intentionality through an open palm gesture, eye contact, engagement, and shared proximity in Turn 162.

In Turn 162 V’s open palm pointed into the direction of the computer signals that she is offering, giving or showing something or requesting the reception of something (Kendon, 2004). It is as if V was requesting her partners’ assent to her personal view on the construction of the story. V’s particular open palm gesture also introduces the nonhuman
actor TEO back into the circulation of the knowledge to be elaborated by the human actors as it offers the TEO contribution for contemplation. Kendon (2004) mentions that when this kind of gesture is directed to a participant in a conversation it is actually acknowledging another as a source of something said or it indicates that what another has said is correct. Hence, TEO participates as a fully-fledged actor in the collective memory of the TEO team and can at all times be referred to as resource for constructing utterances in the French target language. Additionally the open palm gesture serves as a marker for the meta-discursive nature of V’s projected verbal discourse. It shows that V is inviting her interlocutors A and F to regard what is being said by the nonhuman actor TEO, i.e. A’s recorded utterance, as having a transitional status in respect to the rest of the discourse: the content of the verbal discourse that is framed by the open palm gesture is being made available as something that can be given or taken, but is not yet in current use (Kendon, 2004).

The role and function of TEO that can be retrieved from Turns 162-164 relates to the mobilising of previously recorded and stored utterances of V and A with the help of the nonhuman actor TEO at the cost of the human expert F. The same procedure and the same appeal to the collective memory of the TEO team are detectable in earlier turns (Turns 138-139 and Turns 154-155) and also in Turns 187-194.
This sequence illustrates a peculiarity of intermental functioning as stated by Wertsch (1991, pp. 38, 39): ‘In such cases, we cannot answer the question “Who did the remembering?” [The TEO team] as a system performed the function of recollection on the intermental plane.’ The visual data are very impressive and reproduced in Plates 77-79 although the dynamics of the situation (throwing of hair, pointing and warding off gestures) can only be partially reproduced and reconstructed through the stills.
Plate 77: In Turn 187 A first throws her hair and turns to the expert F, probably looking for help. Shortly after this V also looks at F.

Plate 78: Still in Turn 187, A now points at TEO.
Plate 79: In Turn 189 A is warding off V with her open right hand. Just before, V had proposed the name ‘Misha’.

The warding off gesture by A in Plate 79 signifies that she wants to stop or interrupt a line of action that is in progress. Kendon (2004, p. 249) qualifies as line of action ‘any project that someone might be engaged in, whether this involves physical action, communicative action (such as saying something), or mental activity, such as pursuing a train of thought or assuming a certain mental attitude towards something.’ As A moves her hand forward towards her interlocutor V, she proposes that V stop what she is doing and saying, i.e. V should stop proposing the name of her brother ‘Misha’ and instead engage in the production of the sentence pattern ‘My brother’s name is …’. V and A go on to retrieve A’s own recording Number 8 under the silent attention of F who can be seen gazing at the TEO display in Plate 80. The process of negotiation does not immediately succeed in retrieving recording Number 8 as intended by A who is eager to have it replayed, as can
be detected through her slips of tongue in Turn 191 and from her repetition of the number that is also stressed by her voice.

A’s pointing with her right index towards TEO can be characterised as a rather loose movement in Plate 80.

<table>
<thead>
<tr>
<th>Turn</th>
<th>Speaker</th>
<th>Time1</th>
<th>Time2</th>
<th>Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>189</td>
<td>A</td>
<td>445.25s</td>
<td>449.76s</td>
<td>Nee hai mo! stop... hai emoi op hai ma emoi and keler! stop! LUX</td>
</tr>
<tr>
<td>190</td>
<td>Y</td>
<td>449.62s</td>
<td>450.43s</td>
<td>DO?</td>
</tr>
<tr>
<td>191</td>
<td>A</td>
<td>450.46s</td>
<td>452.66s</td>
<td>Jo nee do! Acht! Acht!</td>
</tr>
</tbody>
</table>

Plate 80: In Turn 189 A points with her right index towards TEO.

This pointing becomes insistent in Turn 191 as is revealed by A’s extended and tense arm in Plate 81. The pointing gesture is clearly in advance of A’s utterance of the number of the TEO recording to be replayed, which she says while withdrawing her arm. In Plate 81 A’s gesture directs the gaze of all the human actors to the screen with the TEO tool.
In the act of pointing towards Number 8 A’s index gives her access to the hard facts of reality. Recording Number 8 has been performed, recorded, evaluated, validated, stored and inscribed in the collective memory of the TEO tool and hence of the TEO team a certain time ago. It has been institutionalised and provisionally withdrawn from circulating directly between the human actors of the TEO team. The numbered recordings function as technical delegates of human action and as a sort of congealed labour (Latour, 1999) that can be reactivated by the human actors at any time in the language learning process where, according to Latour (1999), properties can be swapped among inert, symbolic, concrete, and human materials. A as well as the other human actors are in need of inscriptions like those of the numbered TEO recordings in order to oversee the economy of
their small world (Latour, 1999). With TEO there is a double inscription, first on recording the utterance that is immediately replayed and second the pre-installed ordering of the recordings by number that is carried out automatically. As mentioned before, a third possibility for inscription, i.e. the adding of a small caption in place of the number of the recording was not used by the children. Inscriptions are all the more important in the flux of recorded oral language, as the human actors need such anchor points for identifying particular contributions of a particular speaker in the stream of ceaseless communication and interaction. Thanks to inscriptions, we are able to oversee and control a situation in which we are submerged. We are able to gather synoptically all the actions that occurred over many days and that we have since forgotten. Thanks to TEO’s possibilities for inscription, for traceability and for retrieval of validated experiences or utterances, the children do not risk getting lost in the vast territory of a second or additional language. In the case of the language learning with TEO it is precisely the collective regime of activity shared between the human actors V, A and F and the nonhuman actor TEO that decides what is insignificant noise and what must be taken into account in the production of the French target language (Stengers, 1997).

In Turns 187-194 the human actors A and V trace the pattern of the utterance to be performed with TEO and track it down as recording Number 8. TEO replays A’s utterance, which figures as the blueprint of the next utterance to come and to be recorded in Turn 193:

Plate 82 shows the next gestural move that accompanies A’s transformation of the TEO replay by a change in the brother’s name from ‘Max’ to ‘Michel’:
Plate 82: In Turn 194 A is circling three times with her right hand and open palm in an upward motion in the direction of V while replacing 'Max' with 'Michel' in the TEO utterance; she then tells V in Luxembourgish to repeat this transformed utterance.

A is circling three times with her right hand open palm and pointed index, a gesture used for clearly establishing and highlighting the task that awaits V. This gesture is clarified by A’s suggestion of the utterance to be performed, specifically when she insists on ‘Michel’ for replacing V’s previously voiced ‘Misha’ in Turn 188. The circling move and the index enhance the pressure on V to adopt A’s suggestion as they hand over A’s new utterance to V for the continuation of the discourse. No wonder, that at the end of this stretch of conversation V inclines her head and takes a subordinate body position towards
A, a position indicating a loss of authorship or a loss of confidence in her own productive abilities.

Turns 189 to 191 constitute the scene for a ballet of exclamations. In Turn 189 A wants V to stop uttering a single word, i.e. the name of her brother ‘Misha’. Instead, A wants to retrieve a sentence structure from the TEO recordings and is aiming for her own utterance Number 8. In Turn 190 V raises her voice and asks ‘There?’ in a pronounced Luxembourgish exclamation. Such exclamations as well as those in Turn 191 by A seem to indicate and act as a break in the representation of the task and procedure to be completed. When accompanied by gestures within the integrative system of language production these exclamations might also signal the emergence of new representations (Caron-Pargue and Caron, 1995) and language structures.

I will continue with the discussion of another role and function of TEO that has pervaded the visual representations of the interaction in Plates 76-82, i.e. A’s and V’s pointing gestures.

**7.6.6 TEO as a tool for pointing**

Plates 76-82 indicate that each human actor has a body that learns to be affected, moved, put into motion by other entities, humans or nonhumans (Latour, 1999, 2005). The stored utterances of the nonhuman actor TEO offer the human actors the possibility to continue the discourse in Luxembourgish and to build up and refine their competences in French in a process where the pupils can learn through thinking with their eyes and hands (Latour, 1986). Plates 78 and 79 show that this thinking with the hands is orchestrated by A’s intensive and lineal pointing gestures. Pointing gestures establish a shared focus of attention where a single entity is individuated and elevated to a central position in the field of interaction. Someone’s attention can thus be directed by means of hands, fingers, thumbs, head gestures, pursed lips, eyes or other body-parts like elbow or even foot
(Kendon, 2004, Streeck, 2009). Pointing gestures are not primarily descriptive but are rather made to figure intentional relations (Barresi and Moore, 1996) where self and other will relate to one another and to the object of their attention in the interaction to come (Streeck, 2009). The object pointed at becomes a mediator of communication in the team discourse (Moro and Rodriguez, 2005).

According to Stahl (2006), pointing provides a basis for different functions in small group interactions in the TEO team:

- pointing establishes a fundamental social bond by orienting the human actors to a common intended object, in our case the TEO software and the encapsulated process of storying;
- pointing immediately coordinates the orientation of the human actors involved into the same direction within storying and thereby provides a practical basis for collaboration.

A’s intense pointing in Turn 191 re-focuses all the human actors on her own utterance Number 8, which was recorded at the beginning of the storying process and is part of the collective memory of the French language already recorded by the TEO team.

Stahl also insists that pointing is used to control the pointer’s own behaviour, and it is internalised; in our example, A would then use her gestures and pointing for regulating her access to the stored utterances and proceed to a re-internalisation of the language she has identified as suitable for the continuation of the discourse; the language that has to be performed would grow out of A’s gesture and after replay by TEO it is again amenable to internalisation by all the members of the TEO team.

Hence, the pointing gestures control others and the self. Pointing can be seen as instantiating a cycle of internalisation of language where it is necessarily accompanied by silent talk, sub-vocalising, co-vocalising, rehearsing, inner talk and talking aloud, as in the transcription of the storying process above. Members in a language learning community rely heavily on indexing or deictic gestures that allow for pointing, referring, and partici-
pating. Van Lier (2002) maintains that, from a semiotic perspective, language is supported by other signifying material (gesturing, posturing, drawing, facial expression, the local or remote objects of joint attention, etc.). From these indexical activities language gradually emerges.

TEO affords a direct access to the recorded utterances not only through the physical and bodily pointing by A but also through pointing the mouse cursor on the screen at the icon of utterance Number 8. This is a vicarious pointing carried out by V who is controlling the mouse. V thus transforms or translates A’s bodily pointing into a virtual pointing in a different physical space. This double pointing supports the team’s language production. The complex phenomenon of pointing encompasses A’s, V’s and the software’s instantiations of the process and can thus be characterised as a material carrier for the launching of the collective and individual memory during the language production. Hence, TEO literally provokes gestures and pointing that function as enactments of meaning and signs of thinking (McNeill, 2002) and that create access to the collective endeavours stored on the computer. Language is then naturally supported and carried by corporeal and material social activity.

The four contributions of TEO to the ongoing discourse in Turns 139, 155, 164 are deliberately borrowed by V and by A in Turn 193 from the collective memory of the TEO team either through direct bodily pointing or through vicarious virtual pointing with the mouse cursor. This collective memory is established by V’s and A’s recorded utterances according to their planned story. Their utterances have been recorded, labelled, numbered consecutively and stored by the TEO software. As the utterances have been approved by the expert and also by the other team members, they become part of the culture of the TEO team and can be retrieved at any time in order to function as expert utterances. At this stage, the expert status is no longer reserved for F but has been transferred to the voices of the novices. These expert voices can at any time be externalised through
activating the TEO recordings by one of the participants in the discourse. The nonhuman
actor TEO now functions as a memory kit that is coextensive to the bodies of the human
actors (Latour, 1999). At any time in the Luxembourghish and/or French language
production process, the human actors can point to and enrol TEO to support their
endeavours in the contradictory moments of the interaction. By recording and certifying
their utterances with TEO they can divide the world of experience into meaningful and
manageable chunks (Harste et al., 1984). These chunks of French can be attended and
pointed to again and again. They can even be combined and divided again into larger
textual units that can be replayed in sequence, as in Turns 181-186, shown in Graphics 83
and 84.

<table>
<thead>
<tr>
<th>Turn</th>
<th>Speaker</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>F</td>
<td>411.56s</td>
<td>413.84s</td>
<td>Lauscht der mol nach eng këier.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Listen one more time. LUX]</td>
</tr>
<tr>
<td>180</td>
<td>V</td>
<td>414.19s</td>
<td>415.86s</td>
<td>Wart ee moment!</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Wait a moment. LUX]</td>
</tr>
<tr>
<td>181</td>
<td>TEO</td>
<td>418.00s</td>
<td>423.53s</td>
<td>after click by V: Comment s’appelle … ta soeur?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[What is the name of … your sister? FRENCH]</td>
</tr>
<tr>
<td>182</td>
<td>F</td>
<td>423.47s</td>
<td>424.02s</td>
<td>Tessy (whispering)</td>
</tr>
<tr>
<td>183</td>
<td>TEO</td>
<td>423.52s</td>
<td>425.95s</td>
<td>Ma soeur s’appelle Tessy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[My sister’s name is Tessy. FRENCH]</td>
</tr>
<tr>
<td>184</td>
<td>TEO</td>
<td>426.42s</td>
<td>432.88s</td>
<td>Comment … s’appelle … ion frère?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[What … is the name … of your brother? FRENCH]</td>
</tr>
<tr>
<td>185</td>
<td>TEO</td>
<td>435.98s</td>
<td>438.38s</td>
<td>Mon frère s’appelle Max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[My brother’s name is Max. FRENCH]</td>
</tr>
<tr>
<td>186</td>
<td>TEO</td>
<td>438.81s</td>
<td>441.33s</td>
<td>Comment s’appelle ion frère?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[What is the name of your brother? FRENCH]</td>
</tr>
</tbody>
</table>
These larger textual units taken from the collective memory of the TEO language production team embody a very differentiated external memory structure and memory process made possible by the features of the computer and the TEO software as nonhuman actors (Hutchins, 1996). In Turn 179 and after a stretch of seven seconds of rather disorganised and resigned talk in Turns 175-178, the expert F recommends listening to TEO: 'Lauschter mol nach eng kéier. [Listen one more time. LUX]'.

Immediately, the previously rather scattered attention of the human actors re-orientates towards the screen all the while V is manipulating the mouse to find the start of the replay sequence. In a calm, confident and authoritative voice V tells F and A to wait a moment: 'Wart ee moment! [Wait a moment! LUX]'.
V's exceptional demand for completing the vicarious pointing gesture with the mouse is altogether accepted by her human partners. One more time, V's position as a member in command of the TEO team is supported by her controlling the nonhuman actors, i.e. the mouse and the TEO software. The co-activity of the human actor V with these nonhuman actors confers upon V the control and the direction of the group discourse. In Turns 181 to 186 and in Plate 85 however, the nonhuman actor TEO appears to control the behaviour of the human actors in the language production team.

Plate 85: The start of the replay of the collective memory by TEO in Turn 181 captures the attention of V, A and F.

TEO holds the floor for an impressive stretch of about 23 seconds of connected utterances with the exception of a soft whisper coming from F's mouth in Turn 182. F is anticipating TEO's Turn 183 in completing the Turn 181: 'Comment s'appelle … ta soeur? [What is the name of … your sister? FRENCH]' by providing the right name in the context of the storyline of 'The Family': 'Tessy'. F whispers the name in an authoritative way. His mood is corroborated by his bodily behaviour in Plate 86 where we can see his crossed
arms resting in his lap, his body displaying a relaxed attitude. The utterance ‘Tessy’
embodies a speech event that is at the same time speech for oneself and speech directed
to others as it makes for the continuation of the discourse replayed by TEO.

From Turn 184 on, A changes her position in a very subtle way and stops looking at
the screen. Gradually her look seems to turn inward as can be seen in Plate 86, which
represents Turn 185. A appears to look into herself while co-vocalising the TEO utterance.

Plate 86: A’s look turns inward while she is co-vocalising the TEO utterance
in Turn 185.

After TEO’s Turn 184 ‘Comment … s’appelle … ton frère? [What … is the name … of
your brother? FRENCH]’ which is a question directed at her role in the story, A silently
articulates the first syllable ‘Mon [My FRENCH]’ of the next TEO turn. TEO’s Turn 185 is
A’s own recording of ‘Mon frère s’appelle Max. [My brother’s name is Max. FRENCH]’. A
clearly anticipates this replay. The children superimpose multiple representations of the
same action in order to produce the memory of the action, i.e. the memory of the
utterances in the context of the story. The vocal, subvocal and silent performings of the
utterance serve to establish the memory of the utterance. The human actors in the TEO team are monitoring the utterances and are hearing what they mean in the chain of the story elements. By subvocally or silently shadowing the TEO utterances or replays, the children add a well-organised set of constraints to an already well-constrained problem. As a result, the performance is very robust (Hutchins, 1996).

By mobilising the collective memory in Turns 181-186 the potential interruptions of the language learning process as actualised in Turns 175-178 have been discarded. The utterances to be remembered are present and stored in the TEO environment and software. They are potential anchor points for ensuring the continuation of the language learning process in French in the face of ‘the multiplicity of activities that are going on, the interactional nature of these activities, and the shifting and negotiable nature of the problem-solving environment’ (Cole et al., 1982, p. 371). The TEO language production process is then distributed through time in such a way that the products of earlier events can transform the nature of later events (Hollan et al., 1999). The language performers can have access to and point at TEO as a collective memory kit with the technology providing an anchor for collective remembering of their trajectory (Crook, 1999). They can point at TEO at any moment for a replay of a given chain of utterances by different human actors. This procedure allows the children to re-contextualise the story-building process whenever they are led astray by the humdrum of ongoing authentic conversation and negotiation, at times involving confusion, interruptions, disputes and heated arguments.

The coherence of the story-building process is particularly at risk due to the intensive practice of imitation and repetition of utterances seen before. The children try hard to imitate, to learn and to perform the language structures in the French target language that they need for the construction of the story ‘The Family’. Consequently, they easily lose sight of the overarching story structure and of their respective roles in the story. This is why in the transcription we find intense discussions on who is to speak next in the chaining
of the utterances. Hence, it is all the more important to insist on the process of storying wherein memories are continuously rehearsed, reshaped and thus saturated with one’s present and future (Gee, 1991) despite the difficulties occasionally experienced by the TEO team. The collective memory of the TEO team as stored in the software can be an efficient and functional tool for re-focusing the human actors on the history of their work and for situating their current endeavours in the trajectory of their story. The children have transformed their performances into competences that lie stable within the TEO tool and represent a particular history of the language learning process (Latour, 1999). TEO functions as the repository of the collective memory of the human actors who can then use the remembered contents for becoming aware of how they go about their learning in the French target language and their constructing the storying framework in Luxembourgish. The children use TEO to regulate their own behaviour as well as that of their partners in the joint discourse activity. TEO supports the dialogic reflections of the children by offering a kind of half-way stage between the ephemerality of talk and the permanence of written texts (Ravenscroft et al., 2007). Like written texts the oral utterances recorded with TEO can be pointed at and be constantly consulted and referred to for ensuring the continuation of storying and language learning.

TEO thus not only promotes the cognitive activity of speaking and learning but also engages the human actors in the meta-cognitive activity of thinking about their own language productions and performances. TEO mediates the children’s meta-cognitive abilities of viewing themselves as relentless and continual learners in search of adapted strategies and necessary adjustments when the process fails. I have shown these strategies at work in the analysis of the transcription so far and will provide evidence for this process below. TEO assists and mediates the meta-cognitive strategies of the children who regularly behave as rather self-regulated and autonomous learners in the TEO team.
7.6.7 TEO as a tool for meta-cognitive mediation

In Daniels’ (2001) words, TEO can be characterised as a tool for meta-cognitive mediation in the sense that it is a semiotic tool that supports the children’s activity of self-regulation, self-planning, self-monitoring, self-checking and self-evaluating. These attitudes of language learners in the TEO team have already been highlighted in my analysis of TEO as a tool for collective memory and as a tool for pointing. In its function as a depository of collective memories TEO can also be characterised as a prosthetic device (Bruner, 1986) or a cognitive prop (Goldin-Meadow, 2003) that frees up cognitive effort for the team and the individual by offering the learners the opportunity for listening at will to various parts of their previous recordings. With this assistance by TEO, the language learning team can then use its distributed cognitive abilities for other tasks, i.e. for the development and transformation of the human actors’ language competences. Put differently, the TEO team can be seen as a context for cognitive bricolage where the human actors function as cognitive bricoleurs – opportunistic assemblers of functional systems composed of internal and external structures (Hutchins, 1996). They bring their own cognitive abilities in concordance with the abilities offered by the team and the nonhuman partners. TEO as a cultural artefact provides people with opportunities for language learning in the interactions of mental structures (their own), material structures (the TEO soft- and hardware) and social structures (the team and the storying process). TEO can be a sort of co-author in the narrative process that leads up to the completion of the story ‘The Family’. The role of the material tool TEO is all the more important as Galperin (1998) has experimentally demonstrated that certain material forms of monitoring and checking one’s performance in children gradually become transformed into a new psychological process, i.e. the process of attention (Arievitch, 2008).
In order to refine the meta-cognitive role and function of TEO I must follow the human and nonhuman actors in the continuation of the sequences where TEO displayed the collective memory of the group. Memory always and obviously refers to the past. But the replay by TEO of these parts of the recorded discourse or collective memory seems to have a dynamic of its own. There are five instances of replay with TEO referring to the collective memory of the team that can be isolated from the long stretch of transcription presented earlier. Under each transcribed sequence I have indicated the chaining of the utterances with the correspondent speakers and also, in parentheses, the original speaker of the TEO utterance.

1 Replay: V to TEO (V) to A to F

V mobilises TEO for a replay of an utterance of her own whereupon A, at about one second and a half after the onset of the replay and long before its completion, asserts that the next turn must be performed by herself. Immediately after the TEO replay, F backs up A’s position and presses for the continuation of the language production process.

2 Replay: V to TEO (V) to V
After discussing with A about who is going to ask the question 'Wéi heescht däi Brudder? [What's the name of your brother? LUX]', a turn that A claims for herself, V proposes the name of her brother: ‘Misha’. Then, V recruits TEO for replaying her own question about the name of A's brother. This replay is a rehearsal that V proposes for A’s next utterance and for her coupled and intended answer to A’s question. At the stop of the TEO utterance V immediately wants to complete the question with the missing name of her brother Misha. This sequence is a subtle example of how in dialogue and conversation each voicing, due to its living responsive effect on us, moves us in a certain way and how others – although unconsciously – sense the tendencies towards which the speaker's words gesture. In our responsive talk we are then answerable for our unique, momentary sense of our position in existence (Bakhtin, 1993). V positions herself uniquely with her brother’s name ‘Misha’. It is precisely this name still missing in the TEO recordings and hence in the collective memory of the TEO team that, as a potential answer but also as an addressee, has an enormous impact on the continuation of the language learning process in French through negotiation in Luxembourgish. The emotional responses linked to V’s brother’s name are of central importance for the dynamic nature of the dialogue inside the TEO team (Foppa, 1990) and for the reflective stance towards the content of this particular utterance.

3 Replay: V to TEO (A) to A
V appeals to a TEO recording by A where A tells the listeners that her brother is called Max. At the ending of the TEO utterance, A promptly sets the dialogue on track as she wants to continue with the recording of her next utterance. The group however needs another 12 seconds of discussion before finally proceeding to the recording hinted at by A in Turn 165.

<table>
<thead>
<tr>
<th>Turn</th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>F</td>
<td>411.56s</td>
<td>413.84s</td>
<td>Lauscht mir noch eng kloer. [Listen one more time, LUX]</td>
</tr>
<tr>
<td>180</td>
<td>V</td>
<td>414.19s</td>
<td>415.88s</td>
<td>Wart ee moment! [Wait a moment! LUX]</td>
</tr>
<tr>
<td>181</td>
<td>TEO</td>
<td>416.00s</td>
<td>423.53s</td>
<td>after click by V: Comment s'appelle ... ta soeur? [What is the name of ... your sister? FRENCH]</td>
</tr>
<tr>
<td>182</td>
<td>F</td>
<td>423.47s</td>
<td>424.62s</td>
<td>Tessy (whispering)</td>
</tr>
<tr>
<td>183</td>
<td>TEO</td>
<td>423.52s</td>
<td>425.96s</td>
<td>Ma soeur s'appelle Tessy. [My sister's name is Tessy, FRENCH]</td>
</tr>
<tr>
<td>184</td>
<td>TEO</td>
<td>426.42s</td>
<td>432.88s</td>
<td>Comment ... s'appelle ... ton frère? [What ... is the name of ... your brother? FRENCH]</td>
</tr>
<tr>
<td>185</td>
<td>TEO</td>
<td>435.98s</td>
<td>436.38s</td>
<td>Mon frère s'appelle Max. [My brother's name is Max, FRENCH]</td>
</tr>
<tr>
<td>186</td>
<td>TEO</td>
<td>438.81s</td>
<td>441.33s</td>
<td>Comment s'appelle ton frère? [What is the name of your brother? FRENCH]</td>
</tr>
<tr>
<td>187</td>
<td>A</td>
<td>441.69s</td>
<td>444.86s</td>
<td>Af ter V's clicking TEO to stop: Wëi haochi dái Brudder? Eeëh [What is the name of your brother? Eeëh LUX]</td>
</tr>
</tbody>
</table>

4 Replay: F to TEO (V) to TEO (A) to TEO (V) to TEO (A) to TEO (A) to A

F insists on the mobilisation and activation of TEO for a collective listening experience. Consequently, the group members listen to a stretch of TEO discourse of about 23 seconds with two pairs of utterances initiated by V and answered by A and with the last utterance of A asking V 'What is the name of your brother? FRENCH'. At the end of the TEO replay A instantly translates her recorded French utterance into Luxembourgish in order to ease the continuation of the dialogue for V. In effect, A has noticed that V has turned her head to the left and is looking for support from the expert F. I link this part of the transcription to the next one where A is still giving direction and assistance to V with the help of an individual TEO recording.
A eagerly continues in the same vein by attracting V’s attention to her own TEO recording Number 8: ‘My brother’s name is Max. FRENCH’. Again and with the help of intense circular enticing gestures of her right hand, A is prompting V to repeat the same language structure in French, the only difference being the name of the brother: the name of A’s brother Max will be replaced by that of V’s brother, i.e. in A’s words by ‘Michel’.

I will explore the meta-cognitive role and function of TEO in the five excerpts above in order to identify other roles and functions of TEO.

First of all it is to be noticed that all three human actors have been activating TEO in order to have a rather powerful ally in the planning for the continuation of the storyline and of the discourse that accompanies it. The replay function of TEO seems to come in handy when the human actors want to assert their positions in the story and in the negotiation process leading to the completion of the task. Personal intentionalities can be reinforced by deliberately recruiting the approved utterances embodied as competences in the TEO tool. It does not even matter if these utterances were spoken by oneself or by others. In TEO these utterances have found a voice of their own belonging to the group memory and detached from the immediate experience. It is as if the personal meanings and intentionalities - as the result of the activity of language learning with TEO - become sedimented, embodied and objectified (Daniels, 2008) in TEO. The alleged neutrality of
the TEO voice may explain why the children refer as easily to the recordings of others as to their own. Human intentionality and human voices are encapsulated in the TEO environment and in the TEO recordings in a way very similar to the famous nested Russian dolls: whenever a human voice is fixed in a recording it is represented by a numbered icon visible on the screen in a physical layout that may be personalised with comic figures. My analysis thus leads up to another role and function of TEO.

7.6.8 TEO as a tool for intentionality

TEO facilitates the mobilisation of recorded intentionalities in many ways. Whereas it seems natural that only humans can take the initiative in the construction of new assemblies of humans and materials (Miettinen, 1999, Kaptelinin and Nardi, 2006), it is worth scrutinising the status of intentionality in the TEO team where human and nonhuman actors combine their potentialities in language learning. The computer-based system TEO not only encapsulates the derived human intentionality of its developers but much more so that of its users, thus mediating human cognition and learning in complex interactions between the artefactual and the social (Stahl, 2006). The voices of one or more authors can be made to support the current intentions of the human actors in the lived situation of the storying process, be it the planning or the completed discourse. There is a constant process of enrichment of the TEO team members’ language that rests on the instantaneous replay of the recorded utterance as well as on the possibilities for deliberate replay at the service of the human actors’ intentions. Words then are enriched through their intense use and, in a way, a word has a memory (Peuranen, 1998). The automatic replay by TEO after the recording of an utterance doubtlessly affixes a certain agency to the nonhuman actor TEO. A sort of intentional circle operates between human and nonhuman actors of the TEO team having the potential to mediate the language
production process. It is the memory of previous intentional utterances that is constantly re-activated by the human TEO team members in the examples above. TEO becomes active in the course of the story-building and hence the language learning process in French, because as a collective and intersubjective phenomenon it is shot through with the intentions of the human actors. It is then possible to attribute to the nonhuman actor TEO a degree of agency in the sense that someone or something is not following some pre-established programme of action, is not simply expressing some pre-existing structure (Middleton and Brown, 2002). By its in-built flexibilities (the splitting-up procedure, the collective memory, the derived intentionalities of the human actors) TEO actively participates in the establishment and in the maintenance of a shared knowledge-construction space. From the stretches of discourse under analysis it is obvious that this space supports more complex discussions and learning situations than ephemeral face-to-face conversations (Stahl, 2006).

By re-presenting and re-contextualising chunks of narrative construction and of French language structures to the human actors in the example above, the nonhuman actor TEO not only acts in retrospect but much more so in prospect of future utterances. By corroborating and certifying previous utterances as recorded by the human actors, TEO launches a new language production process. This happens in Example 5 on the basis of the paradigmatic transformation of the TEO recording where the name ‘Max’ is simply replaced by the name ‘Michel’ with the rest of the utterance remaining unchanged. In the first four examples analysed in the section above the transformation of the TEO recording induces a new syntactical structure and a new chain of discourse, thus resulting in a syntagmatic transformation of the TEO utterance. There is also a recording by A that instantiates a replay by TEO of a language structure leading to the transformation of a single declarative utterance in French into the process of V’s planning for further utterances in Luxembourgish that can complete the storying process.
TEO can then be considered to play the role of a propeller of transformation in the language production and learning process.

### 7.6.9 TEO as a propeller of transformation

The notion of transformation calls for a view of language learning that cuts with notions of copying, rote learning or repetition drills prevalent in Luxembourg’s primary classrooms, even in the newest books and programmes based on competences. By transforming the language structures into either new structures in the French target language or into a new organisation of the planning and evaluating discourse in Luxembourgish, the children in our examples are active meaning-makers during the conversations of which they are a part (McDermott, 1996). They transform the structure of their story and of the corresponding French language according to their own interest. Kress (1997, p. 113) aptly describes the attitude of the human actors in my transcription as they ‘act energetically, intelligently, perceptively, out of their interest, innovatively making for themselves their means of communication and representation.’

As a nonhuman actor, TEO plays an important role in the team because it affords the transformations that are realised by the human actors. Gibson (1979) has defined affordances as what the environment offers to the animal, what it provides or furnishes, either for good or for ill. According to Van Lier (2004, p. 91) affordance ‘refers to what is available to the person to do something with. (...) Affordances are detected, picked up,
and acted upon as part of a person’s resonating with, or being in tune with, her or his environment.’ While Gibson is reluctant to recognise the roles of other persons in the establishment and maintenance of affordances, the notion of affordance in the work with TEO is intimately related to the active and creative meaning making of all the human actors building on perception, interpretation and negotiation of the TEO recordings (Lektorsky, 1999). In the examples above, the contributions of TEO as embodying the recorded intentionalities of the human actors can be considered as expert contributions. They are on almost the same level as those of the official expert F and might replace them at times, even if the human expert’s continuous monitoring role goes unchallenged by the nonhuman actor TEO. But we have seen that in Turns 139, 149 and 155, TEO affords anchor points for the development of the story, for the learning of structures in the French target language, and for the continuation of the meta-discourse on the story. The recruiting of TEO by the human actors allows them to ‘over-write’ their oral productions, to transform potential errors, to participate silently or ‘sotto voce’ or to join in the chorus. The TEO environment affords a wide choice for action, participation and hence learning: ‘Students are free to decide whether to participate, when to participate, and how to participate (loud voice; whisper voice; no voice; silent lip-modelling), in accordance with self-monitored measures of competence and confidence. (…) everyone is the speaker’ (Van Dam, 2002, p. 246). The instances of co-vocalising and sub-vocalising analysed so far testify to the affordances for Luxembourgish and/or French learning in the TEO team where the participation structure affords differential opportunities for students to do inner speaking (Ohta, 2000).

Learning with TEO is synchronised in a format that provides for both the need for involvement and the need for independence of individual students. Errors do not involve loss of face because they are not classroom events but meta-communications about events in a story world (Van Dam, 2002).
I now re-focus on TEO as providing affordances that establish relations of possibility between language users and that are acted upon to make further linguistic action possible (Van Lier, 2004), be it in Luxembourgish or in French. From the analysis of the role and function of TEO in all the examples in this chapter I infer that TEO is not just a backdrop to the action, perception and negotiation of the human actors. In Latour’s (2005, p. 72) words TEO might ‘authorize, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid, and so on.’ TEO even re-enforces utterances by replaying them instantly and by joining the human actors in their inter-subjective endeavours as shown above. This view does not imply that objects or nonhuman actors do things in place of human actors. In the storying process the nonhuman actor TEO participates in a team activity that weaves together different types of forces because they are different (Latour, 2005). In this collective action working on the constitution of a collective memory in the language production process, the human and nonhuman actors are constantly re-assembled in a certain pattern. Latour (2005) maintains that the continuity of any course of action will rarely consist of human-to-human connections or of object-object connections, but will probably zigzag from one to the other.

The most complex zigzagging from human to nonhuman actors and back again in the examples above is in Number 4:

4 Replay: F to TEO (V) to TEO (A) to TEO (V) to TEO (A) to TEO (A) to A

In the language performance within the TEO environment the material tool and the human participants cannot be artificially separated, but form an organic whole, as shown in the six examples above. After the first minute and a half at the beginning of the transcription when the stage is set for the beginning of the story, the TEO team production does not proceed any longer without the nonhuman actor or object TEO taking a relay. A relational, performative account of the socio-material phenomena in the TEO team makes
it clear that the nonhuman actor TEO as embodied in the soft- and hardware does not interrupt the children’s engagement in the language production activity as bad teachers or supervisors do all too often due to their perceived superior position of authority. On the contrary, at each time in the six examples above, the recruitment of TEO by the children affords potentialities for action and for language development, either at the syntactical or the discourse level because the TEO tool does not occupy a superior position in the TEO team. I can then characterise TEO as a generator or propeller of discourse that actively participates in the construction of competences in the French target language through giving new orientations to the performances in the storying process. TEO can legitimately be considered as co-creator or co-author of the ongoing discourse and of the recorded utterances (Halasek, 1999). In effect, when it comes to the learning and performance of French language structures, the TEO propeller seems to function in the team in almost the same way as does the human expert F by providing input in the target language that has been validated previously by team consensus. Thus, TEO is outgrowing the metaphor of prosthetic device attached to a particular human actor. It affords all the more opportunities for individual language development as a consequence of its embodying the validated competences and expertise of all the human members of the TEO team. These can be mobilised as prompts or props for oneself or for the human partners to continue the discourse and/or to use new French language structures, thus making for a continuous language learning environment. Furthermore, the human actors’ recorded utterances are objectified by the TEO replay. These utterances are open for inspection in a way similar to written texts. TEO constitutes and affords an institutional frame that allows the human actors to re-examine oral language parts as they are re-presented through the re-playing of the utterances recorded. By this process, TEO sets the condition within the TEO team for the emergence of an oral meta-language for talking and thinking about the structures, properties and meanings of the accumulated oral texts and the intentions of their authors
(Olson, 1991). TEO actively produces this kind of meta-language, which fuels the process of conscious language use by the human actors in the six short examples above and in this excerpt:

<table>
<thead>
<tr>
<th>Turn</th>
<th>TEO</th>
<th>Time(s)</th>
<th>Language</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>193</td>
<td>TEO</td>
<td>452.68s</td>
<td>French</td>
<td>After V's clicking TEO: Mon frère s'appelle Max. [My brother's name is Max. FRENCH]</td>
</tr>
<tr>
<td>194</td>
<td>V</td>
<td>455.00s</td>
<td>Luxembourgish</td>
<td>Mon frère s'appelle Michel mus du da soon. [My brother's name is Michel FRENCH you must say now. LUX]</td>
</tr>
</tbody>
</table>

The TEO team effort is propelled by the replay in Turn 193. Consequently, in Turn 194, A uses the TEO prop for inserting the correct name into the French language structure and exhorts V in Luxembourgish to continue the discourse by repeating her own contribution in French. A’s meta-language produces continuity in the language learning process, a metacognitive strategy that is again mediated by TEO. Hence, I will be able to describe a further role and function of TEO.

### 7.6.10 TEO as a tool-and-result

The previous excerpts show that the human actors focus easily on the contributions by the nonhuman actor TEO as they afford a re-set of the conditions for negotiating the continuation of the discourse and hence of the language learning in French. TEO thus preserves the ongoing construction process at the same time as it records the resultant if provisional utterance or French language structure. TEO might be a type of artefact that propels the multifaceted collaborative effort of performance and negotiation. Much more than a tool for result, TEO must be considered as a tool and mediator for structuring social practices and procedures that lead up to the interpretation and negotiation of discourse and language structures in the target language.

TEO with its in-built objectifying functions of splitting up and replay, scaffolds the negotiation process whereby the human actors arrive at a group decision (Stahl, 2006)
that generates or propels the learning process as shown in the last example. The social process of language construction and learning by the TEO team trades superficial opinions and attitudes for much more conscious and reflective decisions. Specific features of TEO (the recordings and icons on the screen, the replay and splitting up procedures) can be used by the human actors for the refinement of the discourse and the improvement of language structures through reflection and re-organisation of the elements. The learning of the French target language is then a knowledge building process that emerges from the collaboration discourse afforded by the tool (Stahl, 2006). Hence, TEO is really a tool-and-result in the Vygotskian sense for managing the inevitable uncertainties of authentic language learning in the French target language. The TEO team activity generates both the tool (i.e. the recording of the utterances with TEO) and the result (i.e. the finished story) at the same time and as a continuous process (i.e. the process of storying). Tool and result are related in a dialectical unity (Holzman, 2009). The metaphor of tool-and-result, of means and ends (Latour, 1999) refers to the unpredictable process of transformation and completion in the language performance of human and nonhuman actors, the transformation and completion of discourse and of particular French language structures with the help of the mediator TEO.

I will give one example from the transcription for illustrating the process of transformation and completion as performed by and through the tool-and-result TEO.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
</table>
| 85 | F | 201.17s | 203.47s | Comment s'appelle ton frère?  
[What is the name of your brother? FRENCH] |
| 86 | A | 203.70s | 205.70s | Comment s'appelle ton frère ... so! (directive)  
[What is the name of your brother FRENCH ... say so! LUX] |
| 87 | V | 205.64s | 206.65s | Comment  
[What FRENCH] |
| 88 | A | 206.64s | 207.61s | s'appelle  
[is the name FRENCH] |
| 89 | V | 207.57s | 208.46s | s'appelle  
[is the name FRENCH] |
The French language structure ‘What is the name of your brother? FRENCH’ as modelled first by F in Turn 85 and then by A in Turn 86 is taken up by V after A’s very directive command. However, V does not repeat the entire utterance in Turn 87, but opts for a possibility offered by TEO that the children have already experimented with, i.e. the splitting up of the utterance into several parts. V transforms the given utterance and
prefers to start just with ‘Comment [What FRENCH]’. This clever strategy transforms the task into more manageable bits and at the same time into a task that has to be completed by two further bits of the whole utterance, i.e ‘s’appelle [is the name FRENCH]’ and ‘ton frère? [of your brother? FRENCH]’. Turns 87-103 instantiate the same process of transformation three times in a run! V and A are collaborating ceaselessly with substantial co- and sub-vocalising by A in order to support V in the imitation procedure. Finally, the utterance is recorded by V in the third run with TEO in exactly the same way as it was rehearsed. There are substantial pauses - due to A’s sub-vocalising - in between the parts of the utterances that are nevertheless recorded in one run. Hence, the total utterance is completed in Turns 99-103 by V while she is recording. The result can be heard in the immediate TEO replay in Turn 104. However, the process is not complete, as the recorded and already replayed utterance is immediately up for a new transformative process in Turn 106 where V asks the group about the correctness of her recording. In the particular example above it is the ongoing relational activity of the group, not the behaviour of the individual child that is the tool-and-result of developmental learning. The possibilities afforded by TEO allow the TEO team to perform, to transform and to learn language structures in French and hence to develop as a learning group. TEO as a tool-and-result method gives the human actors the possibility to continuously create and re-create their learning environment even as they learn in it (Holzman, 1997).

TEO provides the methodological tool-and-result through offering the children the joint experience of splitting up normal dialogue yet still producing a coherent discourse by completing the performance. In the realm of teaching and learning language structures in the French target language, the tool-and-result metaphor means that something that has to be learned in the end, must be entirely present right from the beginning of the learning process, as a sort of constraint enabling the development of the to-be-acquired new system of mediation. In our case, the combined human and nonhuman TEO system can
to coordinate the learners’ act of speaking in French before the child can accomplish this activity for him/her self (Cole and Engeström, 1993).

This view can be related to the concept of prolepsis in learning experiences which is ‘a form of looking ahead, of assuming something to be the case before it has been encountered, a foreshadowing in some sense’ (Van Lier, 2004, p. 152). The completion of utterances is facilitated in language learning situations where a proleptic approach by caregivers or peers attributes intent to the language learning endeavours of novices (Kozulin, 1990, Van Lier, 1996). I now discuss the definition of TEO as a tool-and-result in some detail.

The model utterance in Turns 85 and 86 to be learned by V corresponds to the structural endpoint of V’s learning process. This model has been proposed by F and A as a result of the TEO storying process in Turns 76-84 where the children discuss the redistribution of the roles in the story. In Turn 87, V is unable to imitate the complete utterance, which is beyond her immediate language competences in French. The stretching of the learning sequence across other things and people (Daniels, 2001), however, affords the continuation and development of V’s learning of oral French by procedures that have been adopted by the human actors from the nonhuman actor TEO, i.e. the splitting up of the discourse into smaller bits and pieces. The double rehearsal by V and A of the compilation of the smaller units into the larger final utterance leads to the joint - albeit subvocalised by A - final version that is recorded with TEO. The initial proposition of the endpoint utterance by F and A has been slightly transformed by V’s and A’s endeavour, as shown in the duration of the total utterance that increases from 2.30 seconds for F and 2.00 seconds for A to 8.50 seconds for the TEO recording by V. Nevertheless, V has been given the unique opportunity by the TEO tool-and-result to complete the utterance as well as her learning experience in the French target language with the help of her human partners F and A and of her nonhuman partner TEO.
Furthermore, the learning process for V and the TEO team does not end with the recording and the replay of V’s utterance. The TEO tool-and-result provokes an evaluating discourse which means that the storying and hence the language learning process continue to be propelled. TEO functions as a tool-and-result even in the face of intentionally disruptive behaviour, as in Turn 105, where F wants to direct his partners’ attention to the lights above their heads while the TEO recording had been replayed already for two and a half seconds. This simultaneous TEO replay provides a powerful tool-and-result as it re-contextualises the production process during 8.50 seconds and is thus propelling the learning sequence for the team members. This fact might be sufficient for conferring on TEO a role and function as a semi-human actor or an ally for resisting or reinforcing human actors’ voices, in our case those of V and A in the face of F’s disturbances. The ceaseless process of transformation of utterances yet to be completed by the TEO team is exemplified in the continuation of the stretch of discourse above.

<table>
<thead>
<tr>
<th>Turn</th>
<th>Actor</th>
<th>Time (s)</th>
<th>Time (s)</th>
<th>Utterance</th>
</tr>
</thead>
<tbody>
<tr>
<td>105</td>
<td>V</td>
<td>237.77</td>
<td>239.79</td>
<td>As dat richtig?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>240.16</td>
<td>241.30</td>
<td>Dach!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>240.40</td>
<td>241.73</td>
<td>Nein!</td>
</tr>
</tbody>
</table>
|      |       | 240.83   | 243.53   | Heil de lauscht ermol!
|      |       | 242.99   | 250.96   | Comment ... s’appelle ... ton frère? |
|      |       | 250.64   | 257.05   | Jomee ... du hues fère gesook ... dat as net richtig ... bRRRèrèr! |

After V’s request for confirmation of her performance in French, A seems to take a break after almost 40 seconds of intense collaboration with V in turns 84 to 104: A is rather wearily giving in to the rhetorical content of V’s question. V’s contentment is met with an
unnerved F who intensely marks his discontentment with the performance in Turn 108. But V, who seems indeed satisfied with her provisional completion of the intended utterance, does not abdicate and resolutely challenges F in Turn 109 with a firm shout of ‘For sure! LUX’. Although the expert F interferes with V’s turn by shouting ‘No! LUX’ in Turn 110, V immediately refers to the tool-and-result TEO in Turn 111 for re-presenting the challenged performance and utterance to the participants in the TEO team and to F in particular: ‘Hei da lauschter emol! [Here listen to it! LUX]’. The beginning of the utterance, i.e. ‘Hei da lauschter’, is spoken by V with the same intensity and charisma as were her rhetorical question in Turn 106 and her interjection in Turn 109. The falling and fading intonation on ‘emol’, as TEO is already replaying her utterance, is however a first indication of V’s lingering doubt about the validity and the conformity of her performance at the TEO team level. Anyway, the replay by the tool-and-result TEO leads to a next transformation of the initial utterance as planned by F and A in Turns 85 and 86 and as recorded by V in Turns 99-103. The human actors find themselves again and again in the midst of purposeful action that is characterised by the fact that projected outcomes of action are a resource for producing the course of the action. The effects of actions carried out are compared against expected outcomes in order to judge the adequacy of the action (Suchman, 2007). In the course of the activity of constructing the target utterance, the material artefacts created as outcomes of one phase serve as meditational means or tools in a subsequent phase (Wells, 2002). This is an important characteristic of the work with the TEO tool-and-result. Material action as embodied in the TEO software, and when activated through replay, results in new semiotic action, as evidenced by the team discussions. Material and semiotic actions are necessarily complementary and interpenetrate one another under dialogic conditions of joint activity (Lantolf and Thorne, 2006).

The materialisation of V’s provisional performance now passes the test of the expert F’s newly awakened critical mood in Turn 113, where F recovers from his momentary
absent-mindedness in Turn 105. The TEO replay in Turn 112 has brought him back into the critical dialogue of the TEO team. As a result, the validity of one part of V’s performance is vehemently contested by F through an exaggerated intonation, pronunciation and insistence on the ‘r’ in his utterance in Turn 113: ‘But … you said fère and that is not correct LUX ... bRRother! FRENCH’. Both examples from above are instances of joint or relational learning and development with the tool-and-result TEO where instruction between the TEO team members proceeds ahead of the individual development of some members of the group. Vygotsky (1987) insisted that instruction is only useful when it moves ahead of development and when it is itself a source of development by propelling fragmentary and not yet matured learning episodes. The TEO tool-and-result is such an instructional methodology as envisioned by Vygotsky. It enables the learners to participate right from the beginning in a whole, meaningful unit of functional activity (Cazden, 1996), in our case the telling of a story through planning and constructing utterances. In Turns 85-104 the TEO environment sort of encapsulates the ideal final form of the story that actually interacts and exerts a real influence on the primary form, that is on the first steps of the children’s language learning and development. In Vygotsky’s (1994, p. 348) words: ‘Something which is only supposed to take shape at the very end of development, somehow influences the very first steps in this development.’

In Turns 85 and 86, F and A provide the entire utterance to be recorded and to be learned by V, although V has had some difficulties with the pronunciation of the individual words ‘soeur’ in Turns 27 and 29 and ‘frère’ in Turns 47 and 49. V’s mispronunciations led F to propose in Turn 31 that V should record the utterance bit by bit, i.e. by breaking it up into its syntactical parts. This is the strategy that V spontaneously adopts in Turn 87 when she hints at using the splitting up procedure when uttering the single word ‘Comment [What FRENCH]’. By re-running three times the splitting up of the utterance ‘Comment ... s’appelle ... ton f(r)ère? [What ... is the name ... of your b(r)other? FRENCH]’, V, assisted
twice vocally and once sub-vocally by A, finally records the whole utterance in Turns 99-103. The replay of the whole utterance by TEO in Turn 104 testifies to the result of the learning episode in the French target language. The steps of this learning event enacted by V with the help of both partners F and particularly A, lead to the constitution, or better, re-constitution with the help of TEO of the whole utterance already there in the beginning and in the context of the story ‘The Family’. The sequence of instruction and learning involving the human actors V, F and A as well as the nonhuman actor TEO moves well ahead of V’s individual competences in French. Vygotsky (1987, p. 212) thinks that when instruction is moving ahead, ‘it impels or wakens a whole series of functions that are in a stage of maturation lying in the zone of proximal development.’ The zone of proximal development (ZPD) is for Vygotsky the proper unit of study for understanding uniquely human mental activities, especially learning and development and their relationships in a historical unity (Newman and Holzman, 1993). In the case of language learning in the TEO team the children then develop language competences through performing, i.e. through their participation in and internalisation of social-cultural-historical forms of language activity, in our case the language structures and vocabulary used for the historically situated description of family structures within the story ‘The Family’. According to Vygotsky (1978) all the higher mental functions actually originate as relations between people. It is in the network of relations of the ZPD that the children and language learners learn to be and to continue to be learners, thus propelling their own learning and development in the presence and under the influence of human and also of nonhuman actors or objects, that represent and fuse complex social significations (Moro and Rodriguez, 2005).

In our example V’s task seems to be slightly beyond her level of actual development as far as the particular language competences are concerned, but as this is not the case with the expert F and the other participant A, the TEO team establishes a ZPD where
learning can be continued and continuously re-organised for the learner V. The focus in the ZPD is precisely on what is only partially developed as the precondition for learning leading development (Newman and Holzman, 1993). In the TEO environment A and F generally treat V as if she had the abilities for performance in French that she does not yet possess (Bakhurst, 1991). The work in the ZPD does not exclude that at times A and F are well aware of the difficulties experienced by V in the performing of language structures in French, as suggested by F’s contribution in Turn 31:

31  F 76.03s 79.47s  Oder... du kannst und zwar auch stückweise sein.
[Or... but you may also break it down into parts. LUX]

The TEO tool-and-result must be integrated into the description of the ZPD which then encompasses both the human and nonhuman actors of the TEO team. Many overlapping ZPDs constitute the language production activity between the human and nonhuman actors in the TEO team.

TEO as tool-and-result instantiates the ZPD, for example by creating a space for relations, circulations and translations between the team members when they elaborate the semantic and syntactic content of the utterances to be performed and recorded. Provisional utterances are ceaselessly transformed and reorganised as can be seen in the examples above. While V and A are working in V’s ZPD through the process of vocalising and sub-vocalising, TEO is also participating in the same ZPD as it replays V’s recording that was completed in joint effort with A in Turn 104. The TEO tool-and-result is the environment where not only V’s learning but also that of F and A are propelled at different levels within the ZPD of the group. With the help of TEO and with learning leading development in the ZPD, the human actors become able to engage in developmental activity volitionally and with conscious awareness rather than merely spontaneously (Newman and Holzman, 1993). In the transcription figure many instances of conscious
verbal behaviour by the human actors of the TEO team, a conscious behaviour that is at times mediated by the nonhuman actor TEO:

15  V  45.89s  48.80s  A wat muss ech da scen?  
     [And what will I have to say? LUX]

24  F  01.25s  04.48s  Nee DU sois HAT froun.  
     [No YOU should ask HER. LUX] (insisting)

31  F  76.03s  79.47s  Oder ... du kanns eur awar och stëckerweis scen.  
     [Or ... but you may also break it down into parts. LUX]

39  V  93.88s  95.09s  As dat scho besser?  
     [Is this now better? LUX]

43  A  102.29s  105.80s  Du bass naischt mat du wees dat jo. (whispering)  
     [You are not participating, you know that. LUX]

45  F  106.44s  108.26s  Oder ech kann och nach ...  
     [Or I could also ... LUX]

60  V  130.13s  132.66s  As dat f...? ... richteg?  
     [Is that wr...? ... correct? LUX]

64  A  147.31s  151.60s  (laughing) An elo hm ech.  
     [And now hm it is my turn. LUX]

75  F  171.09s  175.48s  De Pino huet gesoot ech dierft zwar och matmaschen wann ech welt.  
     [Pino told me that I could also participate if I went to. LUX]

111 V  241.58s  243.53s  Hei da lauschter emol!  
     [Here listen to it! LUX]

113 F  250.64s  257.05s  Jomme ... du hues f'ere gesoot ... dat as net richteg ... TRRère!  
     [But ... you said fere and that is not correct LUX ... trrrëther! FRENCH]

114 V  258.73s  258.42s  Frère. (hesitant, smooth r)  
     [Brother. FRENCH]

115 F  257.54s  260.30s  Du huet de R verglesai!  
     [You forgot the R! LUX]
135 V 311.09s 313.67s F., fehlt nach eppes?
   [F., is there something missing? LUX]

141 F 323.53s 329.99s Eh Dat misst d'A sin!
   [Eh That should be At LUX]

142 V 326.00s 327.52s Nee. Dat sin ech!
   [No. That's me! LUX]

143 A 327.31s 330.25s Da soen ech: Mäi Brudder heescht Max.
   [Then I say: My brother's name is Max. LUX]

150 V 348.63s 356.82s Sou ....... A wat muss ech do soen?
   [Fine ....... And what have I to say now? LUX]

151 A 357.53s 360.38s Da froen ech dech: Wël heescht däl Brudder?
   [Then I ask you: What's the name of your brother? LUX]

152 A 360.24s 361.73s Huel emol deen do.
   [Take this one. LUX]

153 V 360.65s 361.37s Misha.

154 V 362.44s 363.87s Hei do hun ech schon een.
   [Look there I have already one. LUX]

156 V 370.02s 372.77s Misha fehlt nach.
   [Misha is still missing. LUX]

170 A 391.35s 394.31s Nee ech muss dech elo froen wël heescht däl Brudder.
   [No I will have to ask you now what is the name of your brother. LUX]

179 F 411.56s 413.84s Lauschtar mol nach eng kéier.
   [Listen one more time. LUX]

180 V 414.19s 415.88s Wort oo moment!
   [Wait a moment! LUX]

181 TEO 418.00s 423.53s after click by V.: Comment s'appelle ... ta soeur?
   [What is the name of ... your sister? FRENCH]

189 A 445.25s 449.76s Nee hat mol op ... hai emol op hei ma emol eng kéier do!
   [No stop it ... Stop it look do it there! LUX]

190 V 449.62s 450.43s DO?
   [THERE? LUX]

191 A 450.48s 452.66s Jo nee do! Acht! Acht.
   [Yes no there! Eight! Eight. LUX]

192 V 451.25s 451.88s Do.
   [There. LUX]

193 TEO 452.88s 455.09s After V.'s clicking TEO: Mon frère s'appelle Max.
   [My brother's name is Max. FRENCH]
As can be seen by examining the transcriptions, conscious and volitional behaviour is demonstrated by all the human actors without exception and even - at times – by the TEO tool as it embodies human intentionality. The language structures in French are not learned by way of a teacher’s explanations or by a succession of grammatical drills imposed by the teacher’s authority. By relating to each other as capable peers and as performers and transformers of language, the learners enact conscious language use and continuously practice their meta-language. They come to learn Luxembourgish and/or French in the TEO team on the basis of affect and intellect, of their desires and needs, of their interests and emotions that constitute their motivation (Vygotsky, 1986) and that are truly instruments of cognition (Goodman, 1984).

The children are raising their own language awareness when they emotionally debate about what they are trying to say (Turns 15, 24, 64, 111, 135, 141-143, 150-154, 156, 170, 179-181, 189-193), how they are saying it (Turns 39, 60, 113-115) and when they come up with more efficacious ways of saying that thing (Turns 31, 43, 46, 75) (Van Lier, 2004). New ZPDs are constantly created as the children negotiate the continuation of the discourse in Luxembourgish and/or French. Consequently, their learning experience leads the development of their languages by constantly creating the motivation for the completion of their utterances.

Viewing the ZPD as a dynamic learning environment and as a tool-and-result is a serious challenge to the traditional understanding of ‘motivation’ as being internal and a prerequisite for, rather than an outcome of learning. Children must learn in order to be motivated (Newman and Holzman, 1993) because the producing of the language clearly precedes the understanding of the language. The performance of storying in the TEO environment creates a relational and circulatory activity wherein children can learn and develop (Newman and Holzman, 1997). Within the TEO team the TEO tool-and-result has the three children participate in the execution of a goal-directed task on the interpsycho-
logical plane. Only subsequently do they recognise and master the strategic significance of their behaviours. Rather than having understood the task after deliberate teaching and then performing it, the children seem to do the task as participants in the interpsychological team and then understand it (Wertsch, 1985). The goal-directed task is the recording of a story with French utterances that are discovered and learnt in joint interpersonal activity by the human actors via the nonhuman actor TEO. The storage in the collective TEO memory and the continuous or occasional replay set the environment for conscious and volitional language performance and learning. The possibilities afforded by the TEO tool-and-result are a supplementary prop for the children to be able to relate to themselves as communicative social beings in Luxembourgish and also in French. In effect, the TEO tool-and-result is a constant if virtual provider of the recorded and validated French target language while keeping at the same time a place for the common language Luxembourgish, which is needed to establish the story-line and to enable the meta-discourse on the recordings in French. TEO then has the status of an ‘equal peer’ that may impact the learning process in the same way as more advanced learners do. It is one more source of sufficient target language cues in the environment whereeto language learners can turn and upon which they can act appropriately in interactions (Van Lier, 2004). Interaction among learners and TEO at equal levels of expertise can then constitute an efficient context for language learning (Donato, 1994, Rogoff, 1993, Ohta, 2001).

The human and nonhuman actors relationally create and re-create the TEO environment that dialectically affords learning and development for the children who can behave in advance of their development (Holzman, 1997). The development of potentialities of the individual learner but also of the group in the ZPD is dependent on dialogue, negotiation and feedback in the TEO team. Assistance in the ZPD should be contingent on actual needs (Lantolf and Thorne, 2006). TEO can point to such needs through its feature of automatic replay of each recording. The TEO tool-and-result
optimises contingent assistance by allowing for a graduated support through the features of splitting up the discourse and of selected replay of stretches of discourse for re-contextualising and re-organising the storying process and the related language learning episodes. There is ample evidence for this assistance in the discussions above. I now give concrete examples of the language learning opportunities afforded by the TEO tool—and-result through reflections on an earlier activity in the ZPD.

V refers to an earlier TEO recording by herself for confirmation of her performance. But F challenges her confidence and contests the validity of the utterance.

V mobilises an earlier TEO recording of herself for re-setting the context for the continuation of the discourse and for the re-distribution of the roles in ‘The Family’. The re-distribution is cunningly achieved first by A in Turn 140 and confirmed by F in Turn 141.
A and V refer to an earlier TEO recording of V that has to be completed by an answer to the question, that is a new utterance.

V refers back to a TEO recording by A, the TEO replay propelling a completely new move in the discourse and in the storyline by A.
F prompts V to listen to an earlier recording whereupon V replays a whole stretch of discourse in French. This long stretch leads to a translation of the last utterance by A into Luxembourgish, which serves as a prop for preparing V’s answer to the question and for moving on in the story.

A insists that V go back to A’s own recording Number 8. After the TEO replay, A transforms her own previous utterance into a new utterance to be performed by V. A replaces the name of her brother ‘Max’ with that of V’s brother ‘Michel’.

V replays a previous TEO recording by herself and A continues the process by completing the utterance with the required words, thus providing a model for V.

My analysis reveals that TEO as tool-and-result instantiates an expanded ZPD where language teaching and learning proceed through dialogue and assisted use in a variety of ways:
- with more capable peers,
- with equal peers,
- with less capable peers,
- with a collective memory at group level involving human and nonhuman actors,
- with the nonhuman actor TEO serving as a depository of the collective memory and as a tool-and-result with its functions of replay and splitting up of the discourse.

It is this TEO activity space that generates the context and the affordances for developing the potentialities of the human actors in Luxembourgish and/or French. The ‘P’ in ZPD can usefully be changed from ‘proximal’ to ‘potential’, a change that reflects the dynamics in the transcriptions of the language learning situations. In the multiple ‘zones of potential development’ the learners are active members of a social-cultural-historical life space (Lewin, 1943), of an ecosystem or an ‘espace vécu’ (Merleau-Ponty, [1962] 2002, Kramsch, 2000) sustained by the practice of storying with TEO that unites human and nonhuman actors in a relational network. The learners grow into the intellectual life of those around them through a variety of proximal processes (Bronfenbrenner, 1993) that provoke learning and development by integrating emotion and cognition. The TEO tool-and-result generates and propels learning in the target language by presenting the learners with tasks that at times are beyond their abilities and by making available an artefact like TEO embedded in the practice of storying and that can potentially be used by the individual child to solve the task in the team (Lantolf and Thorne, 2006).

In order to learn language structures in the target language the learners must be hooked on the TEO tool-and-result with its auxiliary means (icons, recordings on the screen, collective memory stored in the story) and stay in tune within the ZPD. In the transcriptions below I follow the nonhuman actor TEO and the human actor V in order to understand what exactly keeps V in the business of language learning and development. I
want to know if the TEO tool-and-result can guarantee a robust setting for language learning where V can enjoy the continued pleasure of new learning and development through ongoing dialogue and relations within the TEO team. Is the TEO tool-and-result promoting the phenomenon of resilience in that V can maintain control over her own development or even emerge stronger in the team in the face of unpredictable challenges and contradictions in the language learning process?

7.6.11 TEO as a tool for sustaining dialogue, learning and development in the ZPD and for promoting the phenomenon of resilience

Graphics 87 and 88 show the interval of production in the TEO team in between two appearances of the non human-actor TEO.

In Turn 193 TEO appears as a replay by V of A’s utterance ‘Mon frère s’appelle Max. [My brother’s name is Max. FRENCH]’. After this replay A tells V what utterance she will have to record next in order to follow the agreed storyline: ‘Mon frère s’appelle Michel muss du da soen. [My brother’s name is Michel. FRENCH you must say now. LUX]’.
Before the next appearance of TEO in Turn 220, almost 55 seconds are spent in dialogue between the three human actors, especially between F and V.

193 TEO 452.68s 455.09s: After V.’s clicking TEO: Mon frère s’appelle Max. [My brother’s name is Max. FRENCH]

194 A 455.00s 457.93s: Mon frère s’appelle Michel muss du da soen. [My brother’s name is Michel. FRENCH you must say now. LUX]

195 F 458.84s 461.29s: Mon frère … [My brother … FRENCH]

196 V 461.04s 463.17s: Mon frère … [My brother … FRENCH]

197 F + A 462.69s 464.07s: s’appelle [is called FRENCH]

198 V 463.79s 466.20s: s’appelle … Misha. [is called Misha. FRENCH]

199 F 465.43s 466.07s: inaudible (mon frère?)

200 V 466.21s 467.71s: Misha!

201 A 469.04s 470.08s: Michel.

202 F 469.08s 470.74s: Dài Brudder! [Your brother! LUX]

203 V 471.03s 473.57s: Misha heescht en! [Misha is his name! LUX]

204 F 472.55s 473.73s: Michel!

205 V 473.89s 476.61s: Ne net Michael. Misha! [No net Michael. Misha! LUX]

206 A 477.55s 478.06s: Allez! [Let’s go! FRENCH! LUX]

207 F 478.09s 480.06s: Dat as kee Numm fie Jong! [That’s not a name for a boy! LUX]

208 A 479.56s 482.24s: Da so! Lo so! [Now say. Now say it! LUX]
In this stretch of discourse A leaves the floor to V and F who are engaged in a lively debate, mainly about the correct French name for V's brother 'Misha'. Statistically, V practices her French even more than normal (23.54% vs. 15.26% in the total transcription), while F increases his normal contribution in both languages, principally at the cost of A who speaks much less than normal.

After A had urged V in Turn 194 to continue the storying process with the utterance 'Mon frère s'appelle Michel. [My brother's name is Michel. FRENCH]', F in Turn 195 wants to make sure that V will not forget the 'r' in 'frère' and hence resolutely claims the floor by distinctively and exaggeratedly articulating the 'r' in 'Mon frère [My brrother FRENCH]' . Obviously V is irritated by F's insistence in Turn 196 as she repeats his verbal input. She is emotionally challenged by F's subliminal charge and shows this through a harsh, crisp and rising intonation that almost leaves her breathless. During V's attempt, F and A, in a remarkable team effort, co-vocalise in overlapping discourse the continuation of V's
utterance to be recorded: ‘s’appelle [is called FRENCH]’. At the same time and also in overlapping discourse, V completes the teamwork in Turn 198 by stopping her irritation and by finishing her contribution with a rather neutral intonation on ‘s’appelle … Misha. [is called … Misha. FRENCH]’. She has automatically inserted her brother’s real name, forgetting about the French version ‘Michel’ that had been suggested by the two experts, F and A. In Turn 199, F immediately challenges this transformation of the planned utterance by V with an inaudible remark. Incidentally, V has not even had the time to finish her utterance. V fearlessly takes up the challenge by turning to F and by facing him as seen in Plate 89. V’s posture is aggressive and dominant. She is not willing to give in to F’s demands as is evidenced in her provocative and exaggerated pronunciation of her brother’s name ‘Misha!’. Everything in her determined bodily behaviour suggests that she has had enough.

Plate 89: In Turn 200, V turns onto F for reinforcing her choice of her brother’s name ‘Misha!’.
In Turn 201, A, in a low and neutral tone, one more time suggests 'Michel', but she is obviously not bidding for F’s higher position in the debate. A’s soft contribution rather resembles speech for oneself, as if she was checking and confirming for herself that the correct name in a French language context is 'Michel'. At the same time and ignoring A’s effort, a stressed F has already responded to V’s claim by vehemently insisting with a rising intonation on the fact that they are definitely talking about V’s brother: ‘Däi Brudder! [Your brother! LUX]’. A and V attend to the expert’s voice. In my interpretation, Turn 202 signals F’s insistence that V should distance herself from her emotional view on the utterance to be performed. Instead, F wants her to recognise the need to switch to a French interpretation of the affair, to trade her home culture for the official French culture so to speak. But F’s mention of V’s brother is not taken up by V. In Plate 94 she looks directly at F and says in a neutral assertive tone in Turn 203: ‘Misha heescht en! [Misha is his name! LUX]’. V is not embarrassed at all by F’s challenge at this moment of the discussion. There is just a slight trembling trace of a doubting moment when V pronounces ‘heescht en [is his name LUX]’ that might be an indication of not so bright a future.
Plate 90: In Turn 203, V’s relaxed body posture and her direct look at F signal her confidence in the discussion about the name of her brother.

In the overlapping Turn 204, F neutrally insists on ‘Michel’. V counters him in Turn 205 with ‘Ne net Michael. Misha! [No not Michael. Misha! LUX]’, interestingly having mentioned the German version of the name: ‘Michael’, an indication of Luxembourg’s multicultural and multilingual background. V goes on to speak in an assertive tone, but a look at Plates 91 and 92 reveals a change in her bodily behaviour that can be considered as an indicator for an alteration in her mood and confidence as a learner and a member of the TEO team.
Plate 91: In Turn 205, V changes her body posture and her face. She stops looking at F directly and looks down as if she was giving in to F’s arguments.
A then unconvincingly tries to put an end to the discussion between V and F by suggesting the continuation of the recording process in Turn 206 with a neutral, soft and almost inaudible ‘Allez! [Let’s go! LUX/FRENCH]’. Behaving so nicely makes it impossible for A to catch V’s attention and there is no hope that the discussion can be closed, as F is jumping in with a rather derogatory contribution in Turn 207: ‘Dat as kee Numm fir e Jong! [That’s not a name for a boy! LUX]’. Immediately V’s head swirls around to her left and she faces F again in Plate 93. All the while she shouts with a rising and a lengthening intonation in Turn 209: ‘Daach! [It iis! LUX]’.

Plate 92: In Turn 205, V finishes her utterance forcefully with ‘Mishal’ and with a slight lengthening on the final ‘a’. Simultaneously she turns her head in an upward movement to her right and away from F. It is as if she was finally tired of arguing about the name of her brother.

Plate 93: In Turn 209, V tries to fight back in the argument with F.
Even before V had tried to re-impose her authority in the discussion with F, A had started in Turn 208 in a soft and almost inaudible voice to lure V back into the continuation of the recording performance: ‘Da so. [Now say. LUX]’. As V does not react to her invitation and after V’s clash with F in Turn 209, A changes her tactics and completes her utterance with an intense rising intonation, almost shouting at V: ‘Lo soo! [Now say it! LUX]’. As a result, V now turns to A in Plate 94.

Plate 94: V looks bewildered at the end of the argument with F. She turns to A at A’s insistence for continued performance in Turn 208.

In Turn 210, V takes up A’s incitement and produces the first word of the next utterance ‘Comment [What FRENCH]’ in a slightly irritated tone and with an insisting downward head movement towards A. It seems as if V was already in doubt about the appropriateness of her utterance. Actually, this is the start of a false utterance in the context of the story: V should give the name of her brother instead of asking some other person for the name of her brother. I reproduce the end of the head movement in Plate 95.
as it is exemplifies the importance of gestures, in this case head and probably also eye movements, in the shared physical space that supports the work in the ZPD of the human actors (McCafferty, 2000). V’s head movement mirrors the head movement by A on ‘Lo sool [Now say it! LUX]’. The mirroring of gestures and postures is an important indicator of the embodied nature of the ZPD that is afforded by the TEO tool-and-result. The bodies of the participants in the TEO team are then linked to the processes of transformation of the language structures resulting in a change in the consciousness of the human actors.

Plate 95: In Turn 210, V acts on A’s orders with the start of a false utterance, an attitude showing in her changed body behaviour.

At the onset of V’s false utterance, F throws in ‘Mon frère s’appelle … [My brother’s name is … FRENCH]’ in a rather neutral but decided tone in Turn 211. The discourse is largely overlapping at this moment of the language production. In Turn 212 and after F’s ‘Mon frère’, V emphatically corrects her original start by imitating and transforming F’s proposition with an exaggerated ‘r’ on ‘frère’: ‘Mon frère … [My brrother … FRENCH]’.
She thus appears to have internalised the intense discussion about the pronunciation of ‘frère’ in Turns 113-115 as she now re-utilises the knowledge with its exaggerated connotation as an efficient memory tag or as a word with a sideward glance (Bakhtin, 1984). V has internalised the evaluations of her partners in the TEO team and uses them for re-accentuating and re-interpreting her own old utterances through new intonations. She infuses her language production with a deliberate emotional-volitional tone that illustrates her emotional-volitional thinking, a thinking that intonates (Bakhtin, 1993). Within the complex of her feelings, desires and moral evaluations, V orients her language production and performance through her emotional-volitional intonation of ‘frère’, thus signalling the transformation of her initial competences as well as the continuation of the authoring process. Her authoring self is nevertheless challenged by a short intervention of F in Turn 213 and during V’s production of ‘Mon frère [My brother FRENCH]’ as he is starting to suggest the name ‘Mich’ again. His suggestion meets with intense resistance by V as is shown by her bodily reactions in Plates 96a, 96b, 96c and by a rough vocalisation signalling exasperation: ‘Ochhh!’
V manifests bodily and vocal resistance to F’s suggestion of calling her brother ‘Michel’. She swirls her head and hair to her left for an intense furious look at F and clinches a fist with her left hand in a rigid posture. V’s spectacular and dramatic gestures may be as well directed at her partners to signal utter determination as well as at herself to encourage her own contributions to the ongoing discourse (Kendon, 2004). Meanwhile, V has interrupted her utterance and the communication in the group is on the verge of breakdown. V is emotionally charged and her attitude contrasts with that of her partners in the TEO team. In Turn 215 and after a resolute beginning, a patronising F continues to explain in a rather dismissive way and with a falling intonation that basically reveals his loss of interest: ‘Michel … op Franséisch op Franséisch seet een awer Michel … also so Michel. [Michel … in French in French you must say Michel … so say it. LUX]’. Like a
robot V repeats the name ‘Michel’ in Turn 216 in a totally neutral voice as if the word was taken from an impersonal dictionary, without any personal accent nor overtone. There is absolutely no speaking personality and consciousness in her vocalisation (Bakhtin, 1981a). At this particular moment, such conscious language is simply not at V’s disposal. V’s condition is embodied in Plates 97a and 97b.
V’s body behaviour shows her growing discomfort with the ongoing situation. While she is repeating ‘Michel’ like a robot, V is looking down as if she was ashamed of her performance in the language production process. She firmly grips the mouse to retain some control in the interaction. After the completion of her utterance she smiles unnaturally and uneasily, thus reflecting her uncertainty and her desperation over the language learning situation. A sympathises with V in Turn 217 and asks in a rather soft but emphatical voice: ‘Weess de et elo? [Do you know it now? LUX]’, an utterance probably intended to lead V back on the track. At the same time and overlapping, F throws in another authoritative charge in Turn 218: ‘Mon frère s’appelle Michel lo dreck op de micro da sees de dat! [My brother’s name is Michel FRENCH now push the microphone and say it! LUX]’. He accompanies the utterance with an energetic upward movement of his right hand with which he points towards the screen while rising from his chair in Plate 98.
In Turn 219 V seems to comply with F’s direction as she records the following utterance with TEO: ‘Mon frère … s’appelle Misha. [My brother’s name … is Misha. FRENCH]’. But her looks, her bodily behaviour and her intonation once again betray her real feelings. After clicking the mouse to record and after speaking the first two words ‘Mon frère’ with an accentuated rising intonation, V looks submissively at A with wandering eyes as if she was in need of support to continue with her utterance. In desperation, V sinks down on her chair in Plate 99.
After ‘Mon frère’, V pauses for about a second while looking at A who can be seen subvocalising the utterance to be recorded by V. V then turns back to the screen and records the end of the utterance: ‘s’appelle Misha. [is Misha. FRENCH]’. V does so in a very poised way probably due to the manifest support given by A. The change in attitude from uncertainty to confidence may also be connected to the emotional-volitional overtone associated with the real name of V’s brother ‘Misha’. However, the TEO replay in Turn 220 leads to a dance of gazes towards F whose authority in the evaluation of the utterance is first solicited by A and then by V who looks quite unsettled again. On ‘s’appelle’ already and before the TEO replay has ended, as is visible in Graphic 100, F, in Turn 221, brings in the French name ‘Michel’ again with a categorical if tired: ‘Du muss Michel soen. [You must say Michel. LUX]’. In order to describe more precisely the role and the function of TEO I will follow the human and nonhuman actors until the end of the transcription. Graphics 100-102 show that there are substantially longer stretches of discourse by the
human actors in both languages that I need to analyse. It is also obvious that F retires from the dialogue after Turn 237.

Graphics 100, 101 and 102: The display shows long stretches of discourse of the human actors with F retiring from the dialogue.
The total dialogue is produced below.

<table>
<thead>
<tr>
<th>Time</th>
<th>Role</th>
<th>Speech</th>
<th>Language</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>TEO</td>
<td>509.71s</td>
<td>515.10s</td>
<td>Mon frère ... s'appelle Misha.</td>
</tr>
<tr>
<td>221</td>
<td>F</td>
<td>512.70s</td>
<td>515.14s</td>
<td>Du muss Michel sein.</td>
</tr>
<tr>
<td>222</td>
<td>V</td>
<td>516.28s</td>
<td>528.57s</td>
<td>An den Dreckshack dann ... (dafür dat net ... inaudible) an den Dreckshack ...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mon frère Michel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[into the trash then ... (not allowed to ... inaudible) into the trash. LUX ...]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My brother Michel. FRENCH]</td>
</tr>
<tr>
<td>223</td>
<td>V</td>
<td>528.72s</td>
<td>531.78s</td>
<td>recording with TEO: Mon frère Michiel.</td>
</tr>
<tr>
<td>224</td>
<td>F</td>
<td>531.79s</td>
<td>533.23s</td>
<td>Nee!</td>
</tr>
<tr>
<td>225</td>
<td>TEO</td>
<td>533.03s</td>
<td>536.76s</td>
<td>Mon frère Michiel. Nee.</td>
</tr>
<tr>
<td>226</td>
<td>V</td>
<td>533.56s</td>
<td>534.17s</td>
<td>Dach!</td>
</tr>
<tr>
<td>227</td>
<td>F</td>
<td>534.25s</td>
<td>536.02s</td>
<td>As net esou.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[No it isn't so. LUX]</td>
</tr>
<tr>
<td>228</td>
<td>A</td>
<td>536.90s</td>
<td>539.45s</td>
<td>Mon frère s'appelle Michel.</td>
</tr>
<tr>
<td>229</td>
<td>F</td>
<td>539.00s</td>
<td>539.87s</td>
<td>Jo!</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Yes! LUX]</td>
</tr>
<tr>
<td>230</td>
<td>V</td>
<td>539.35s</td>
<td>542.26s</td>
<td>Mon frère ... (A inaudible) Misha.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[My brother ... (A inaudible) Misha. FRENCH]</td>
</tr>
<tr>
<td>231</td>
<td>F</td>
<td>542.25s</td>
<td>545.42s</td>
<td>Mi ... Mon frère s'appelle Michel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Mi ... My brother's name is Michel. FRENCH]</td>
</tr>
</tbody>
</table>
232 A 545.46s 548.29s Mon frère s'appelle Michel.
[My brother's name is Michael. FRENCH]

233 V 547.31s 549.40s Du weess jo nàischs!
[You don't know anything! LUX]

234 F 549.45s 558.74s Dach ech ka Franséisch. Du kanns kee Franséisch....
Mon père s'app.... mm Mon frère s'appelle Michel.
[Yes I can talk French. You don't know any French. LUX ....
My father's na ... mm My brother's name is Michel. FRENCH]

235 V 556.52s 560.37s Mon frère .... ech meachen dat a Stécker.
[My brother's ... FRENCH I'll record this in parts. LUX]

236 A 560.43s 562.45s Jo allez.
[Yes allez. LUX/FRENCH]

237 F 560.85s 564.95s Weis de wells. A stéckerweis hallet fan ech der net.
[As you like it. But in parts I will not help you. LUX]

238 V 563.53s 564.90s Mon frère ....
[My brother ... FRENCH]

239 A 564.93s 566.43s Mon frère .... sou as el schon.
[My brother FRENCH ... that's it already. LUX]

240 V 565.77s 568.76s recording with TEO: Mon frère
[My brother FRENCH]

241 TEO 568.53s 570.24s Mon frère
[My brother FRENCH]

242 A 570.28s 571.59s s'appelle
[is called FRENCH]

243 V 571.77s 577.53s s'appelle Misha.... Aoh.
[is called Misha.... Aoh. FRENCH]

244 A 579.04s 581.92s Michel net Misha.
[Michel not Misha. LUX]

245 V 581.50s 583.21s Hel kuck!
[Lock here! LUX]

246 TEO 582.80s 584.57s Mon frère
[My brother FRENCH]

247 A 584.75s 586.05s s'appelle Michel.
[is called Michel. FRENCH]

248 V 586.25s 588.63s s'appelle Michel.
[is called Michel. FRENCH]

249 A 588.25s 588.70s Jo.
[Yes. LUX]

250 V 588.58s 591.62s clicks the recording button: Eh.

251 A 589.93s 590.96s So.
[Say so. LUX]

252 TEO 592.38s 594.03s Eh.

253 V 593.59s 595.05s Mon frère
[My brother FRENCH]

254 A 595.25s 596.51s s'appelle sco elo s'appelle Michel.
[is called FRENCH now say LUX is called Michel. FRENCH]

255 V 597.59s 599.49s s'appelle Michel.
[is called Michel. FRENCH]
Statistically, V does almost half of the speaking of the human actors (46.64% in this stretch). F contributes a little more than A to the conversation within the team. It is remarkable that more than a third of the total talk is devoted to the speaking and learning of the French target language by V (34.06%), who talks more than twice the usual amount in this particular stretch of dialogues. This happens despite the aforementioned emotional conflict apparent in the transcription, a point that I will take up in my analysis.

In Turn 222, V surrenders to F’s authoritative voice in a long stretch of more than 12 seconds of monological speech to herself: ‘An den Drecksback dann … (därf dat net … inaudible) an den Drecksback. … Mon frère Michel. [Into the trash then! (not allowed to … inaudible) into the trash. LUX … My brother Michel. FRENCH]’. She seems to give direction to herself by stating to herself that she is not allowed to proceed according to her own voice and authorial stance regarding the name of her brother. This kind of self-talk, be it silent or overt as in V’s case, is the start of the stream of consciousness that forms our private mental life within the narrative accountable frame of our actions (Stahl, 2006). In this episode V still feels accountable for her actions in the TEO team in that she can refer to the possibilities afforded by TEO to delete her utterance. She stays consciously involved in the process of transformation of her initial contributions and in the process of learning French. The TEO team continues to produce language even as V is challenged and has to use a diversion for continuing her part of the story.

V’s effort is an illustration of the phenomenon of resilience afforded by the TEO tool—and-result in that she is still in command of the tool and of the language learning process. TEO enables V to keep control over her trajectory in the language production process and
to continue to develop successfully in spite of events that should have harmed her
disposition and motivation. Hence, TEO can be characterised as a tool for promoting
resilience in the Luxembourghish and/or French language learning process.

However, I must point out that the recording and the replay of the utterance ‘Mon frère Michel. [My brother Michel. FRENCH]’ not only brings about the loss of the part of the
utterance ‘s’appelle [‘is called’ FRENCH]’, but also signals the loss of V’s particular voice
that inhabits the name ‘Misha’ and certainly not the name ‘Michel’. There is a sort of
fatalism and resignation in V’s voice that is also reflected in her body position and lip
movements in Plate 103.

![Plate 103: In Turn 222, V’s resignation is reflected in her body position and in her lip movements.](image)

After clicking the mouse, V records ‘Mon frère Micchel. [My brother Micchel. FRENCH]’
in Turn 223 with a trembling intonation and a slight lengthening in the middle of the name,
thus clearly signalling a lack of confidence. V’s recording even incorporates F’s teacher-
like immediate riposte in Turn 224: ‘Nee! [No! LUX]’. This is spoken in a presumptuous tone without any sign of compassion for V’s difficulties with the task. The TEO replay in Turn 225 is nevertheless a powerful ally and it keeps alive V’s resilience in the language learning process. In any case, the replay sufficiently boosts V’s confidence for her to come up with a fierce, aggressive, explosive (on ‘D’) and adamant ‘Dach! [Yes! LUX]’. Again V swirls her head and ponytail as she turns left to directly challenge the expert F while A is also looking at him. In Plate 104 V moves her left arm towards F as if she wanted to touch or even hit him.

Plate 104: In Turn 226, V swirls her head and ponytail to her left and challenges the expert F.

V’s rather radical behaviour does not impress the expert F who objects in a calm, emotionless and factual way ‘As net esou. [No it isn’t so. LUX]’ even before V’s ally TEO has finished replaying V’s utterance including F’s reply. After F’s comment, V turns back to the screen as if preparing for further action. This is the time for A, in Turn 228, to jump in
while also turning her head to the screen: ‘Mon frère s’appelle Michel. [My brother’s name is Michel. FRENCH]’. In doing so, A joins forces with F by adopting the same neutral and factual stance. The TEO tool-and-result in the guise of the screen attracting V’s and A’s attention can again be considered to promote the phenomenon of resilience in the language learning process. A’s body behaviour translates a quiet assurance, as she has her left hand at her chin and is slightly nodding her head. In Plate 105 A’s high body posture seems to signal her predominance over V’s position and discourse.

Plate 105: A agrees with F and calmly proposes ‘Mon frère s’appelle Michel. [My brother’s name is Michel. FRENCH]’ in Turn 228.

The consensus between A and F is corroborated by F’s overlapping utterance in Turn 229: ‘Jo! [Yes! LUX]’ that is accompanied by a meeting of A’s and F’s gazes. So much harmony between her two partners is hard to take for V who has already started to produce a new utterance. After A’s proposition from Turn 228, V goes ahead with ‘Mon frère … [My brother … FRENCH]’, although she is already at the verge of crying as can be
detected in her tense trembling voice that hardly finishes the word ‘frère’. However, she continues to be determined to stick to the emotional-volitional value of her brother’s real name and quickly adds his name ‘Misha’ in total desperation. While doing so she has completely forgotten one part of the correct French utterance, namely: ‘s’appelle [is called FRENCH]’. V’s behaviour is shown in Plate 106.

In Turn 231, F immediately reacts to V’s stubbornly sticking to the value of her brother’s real name ‘Misha’ and talks in a very excited and tense intonation which even fails the beginning of his utterance, as he first tends to propose the name ‘Michel’ again but then resorts to the total sentence structure: ‘Mi … Mon frère s’appelle Michel. [Mi … My brother’s name is Michel. FRENCH]’. His utterance is accompanied with big gesticulations as he is flapping his arms and hands. Powerful head movements assist these gestures as if to confirm the utterance that is presented. Such pragmatic gestures
frame the interaction in that they point to objects or tasks that the interlocutor is invited to share or to assume (Kendon, 2004, Müller, 2004, Streeck, 1993). In Plate 107 F seems to offer his utterance to V with the palms of his hands open. This ‘invitation’ or ‘offer/receive’ gesture frames the spoken discourse and indicates its transitional status. Such a gesture functions as a comment on the speaker’s own speech. Hence, F’s suggestion of the next utterance is declared ‘obvious’. It is as if there is nothing further that can be added (Kendon, 2004). Now it is V’s turn to take over. This moment of transition in the discourse is marked by F’s open palms gesture with which F has handed the complete utterance over to V (Streeck, 2009). F is adding emphasis to his utterance by his head movements and by his turning and leaning towards V. This particular zone of proximal body behaviour between the interlocutors is also created and maintained through reciprocal gazes. The human actors carry on with the development of their language potentialities because these gestures reach beyond the bounds of the current utterance to operate in relation to the implied dialogue within which the utterances are embedded (Kendon, 2004).
While V does not seem to catch F’s message and looks at him in disbelief, A in Turn 232 is again joining F with a repetition of his utterance: ‘Mon frère s’appelle Michel. [My brother’s name is Michel. FRENCH]’. She does so in a much less passionate tone than that of F. Her utterance is embodied in a circling move with her left hand that reduces the distance between the three human actors. The circling gesture acts as a gentle invitation for V to reproduce the language model provided by A and by F just before. A also puts a soft stress on the part ‘s’appelle [is called FRENCH]’ for making sure that V will not miss out this sentence structure while recording her utterance. In this stretch of discourse, F’s and A’s gestures as well as the integrated body behaviour of the three interlocutors succeed in creating a zone of proximity. In Plate 108 A, V and F are looking at each other while negotiating this difficult part of the ongoing discourse.
In Turn 233, V does not take up A’s suggestion but instead chooses to reply to F’s agitated gestural and oral recommendations by opposing the transfer of the semantic content of F’s proposition: ‘Du weess jo näischt! [You don’t know anything! LUX]. I am certain that V does not put into question the competences in French that are the hallmark of F’s supposed expertise in the TEO team. By firmly issuing her statement despite a voice hesitant with tears, she seems to stick to the emotional-volitional quality of her brother’s real name. V thus questions the real world knowledge of F who in her eyes does not even know her brother’s real name, which forms a constituent part of her family identity. The dispute between V and F about the value and the appropriateness of a single name illustrates Bakhtin’s (1971, p. 195) statements about the versatility of the meaning of each word: ‘By no means does each member of the community apprehend the word as a neutral element of the language system, free from intentions and untenanted by the voices of its previous users. Instead, he receives the word from another voice, a word full of that other voice. The word enters his context from another context and is permeated with the intentions of others speakers. His own intention finds the word already occupied.’

But F remains unimpressed by V’s arguments. In Turn 234, he insists: ‘Dach ech ka Franséisch. DU kanns kee Franséisch. … [Yes I can talk French. YOU don’t know any French. LUX …]’. Referring to himself and to his abilities in French he speaks in a neutral yet authoritative tone revealing his confidence in his own expertise. Addressing V on ‘YOU’ he adopts a very aggressive and emotionally charged intonation. It does not miss its effect on V in Plate 109 where V wants to interrupt the ongoing challenge from F by turning her head away from him in dismay.
This highly emotional and stressful interaction also impacts on F’s own behaviour as he mixes up lexical elements in the continuation of his utterance: ‘Mon père s’app … mm Mon frère s’appelle Michel. [My father’s na …mm My brother’s name is Michel. FRENCH]’. But F immediately shakes his head after uttering ‘My father’, thus showing a high level of self-control in the discourse. He correctly continues to propose the same utterance for recording, although now in a much friendlier tone, first leaning to his right towards V and then looking to his left for support from A. But even before the end of F’s proposition, V has already made a decision. She needs to breathe deeply while trying to hold on to her own intentions in the storying process. She resists her participants’ constant challenges by referring to the TEO tool-and-result as can be read in the stretch of discourse below.

Plate 109: Challenged by F’s continuous insistence on his expertise, V turns away in dismay in Turn 234.
After repeating the first two words of the utterance suggested consecutively by F and A: ‘Mon frère [My brother’s FRENCH]’, V promptly and insistently announces her decision to record the utterance by splitting it up in parts. V claims this procedure even before F has finished with ‘s’appelle Michel. [is called Michel. FRENCH]’. She really puts a strong and staccato-like emphasis on the word ‘Stécker [Parts LUX]’ as it symbolises and represents her new strategy for completing the intended utterance. V thus consciously recruits TEO as an ally to fulfil her communicative intentions and to subsist in the dialogue with her partners. Her tactic is successfully implemented as A, in Turn 236, immediately backs V’s effort: ‘Jo allez. [Yes allez. LUX/FRENCH]’.

The TEO tool-and-result affords V the opportunity to face up to the challenge of F’s and A’s consecutive propositions, as can be seen in the body postures and gazes in Plate 110 that converge on an equal level. V’s face has turned from dismay into poise.
V’s recourse to TEO, which has been supported by A, assuages F’s desires as he abdicates in Turn 237: ‘Wéis de wells. [As you like it. LUX]’, even if he finishes his utterance in a low voice with a rather menacing and uncooperative: ‘A stéckerweis hellefen ech der net. [But in pieces I will not help you. LUX]’. V simply does not care about F’s withdrawal for the next 33 seconds as, with the help of A and of TEO, she continues the language recording process. She ignores F’s muttering, turns back to TEO and to the screen and in Turn 238 utters ‘Mon frère … [My brother … FRENCH]’ in an irritated, exasperated and staccato-like tone underlining the stress of the situation. V also tries to recruit A’s support through a direct look at her on ‘frère’. With a left hand move that comes to rest on her chin, A embodies a calm and imperturbable posture in Plate 111 when she supports V in Turn 239: ‘Mon frère … sou as et schon. [My brother F … that's it already. LUX]’, thus softly encouraging V to finish with the recording of the total utterance.
A’s position in the TEO team is one of negotiation rather than of confrontation, as is the case with F. By her contributions, A always optimises the solutions offered by TEO and hence encourages the struggling V to continue with her learning process. Such an attitude is conducive to a lessening of V’s emotional burden. Thanks to A and to TEO, V can gain some distance from the emotional challenge. She can re-concentrate on the recording process and she definitely does so in Turn 240 where she continues with ‘Mon frère [My brother FRENCH]’ in a slightly shaky though light-hearted and less irritated tone.

Everybody in the TEO team is now focused on the recording and on the replay of this utterance. In Plate 112 V is gazing at the screen and A seems to be looking inward and rehearse the utterance as she holds her head with her left hand. Even F looks to the screen, obviously in order to check if V can make it despite his refusal to continue the collaboration in the recording process.
So much concentration by all the human actors cannot but propel the discourse after the replay by TEO in Turn 241. A simply carries on with the TEO replay in Turn 242 and instantiates a dynamic language part calling for further completion by a name. She achieves this by a rising intonation asking for more on ‘s’appelle [is called FRENCH]’. Effectively V, confident again, repeats A’s utterance and completes it one more time with her brother’s real name: ‘s’appelle Misha. … Aoh. [is called Misha. … Aoh. FRENCH]’. V clicks the recording button after uttering ‘Misha’, so that she misses the beginning of the utterance, whereupon she comments with ‘Aoh’, the only sound that is recorded and replayed immediately by TEO. V self-consciously shakes her head and just smiles at this misfortune, another indication that she is back to normal confidence and control in the language learning process. Finally, the TEO team is completely back on the track and in control by combining its performances into a resilient language learning behaviour.
In Turn 244, A vigorously brings back V’s attention to the important issue of her brother’s name. While continuing to look at the TEO screen, she insists on the French version in a neutral, alert but rather sympathetic tone: ‘Michel net Misha. [Michel not Misha. LUX]’. But V does not take up A’s lead. Instead, she prefers to recruit the nonhuman actor TEO in Turn 245 for a replay of the utterance recorded in Turn 240. Interestingly V wants A to have a look: ‘Hei kuck! [Look here! LUX]’, thus uttering a language structure that allows to anchor the clicking gesture and the pointing gesture on the TEO screen in the ongoing talk (Streeck, 2009). V and A look at each other and enjoy a conscious listening experience, as V has clicked on the icon of a previous TEO recording. In such a way V re-contextualises and re-initialises the language production process, an occasion that is not missed by A, who, in Turn 247, completes the TEO replay softly with: ‘s’appelle Michel. [is called Michel. FRENCH]’. In Plate 113 A’s open left hand palm has her thumb, index and middle finger spread out. Her index slightly beckons V into a new turn. The passage of time in the language production sequence and the simultaneous micro-movements tend to create the effect of an upgraded solicitation. By performing such actions during turn-transitions, interaction participants construe their conversation as a give-and-take. Utterances are produced for the benefit of the other to whom they are given, and they may require that something - a response, a token of reception - is given in return (Streeck, 2009). The give-and-take between A and V is another instance of TEO as a tool for resilient language production in the TEO team.
In Plate 113 A gently completes the TEO replay in Turn 247 and, with her hand and look, invites V to do the same. V accepts A’s invitation and takes pains in repeating A’s utterance in Turn 248. She does so in a conforming intonation that is only hesitant on ‘ch’ or ‘sh’, another indicator that she might still be thinking of her brother’s real name ‘Misha’ instead of the French one ‘Michel’. Nevertheless, the negotiation and cooperation performed by A and V appears to be very effective. Again, A supports V very soberly in Turn 249: ‘Jo. [Yes. LUX]’ and even starts to subvocalise and to say ‘So. [Say so. LUX]’ in Turn 251, while V is clicking with the mouse to record ‘Eh.’ in Turn 250. During the TEO replay of ‘Eh.’ in Turn 252, V is nodding with her head, hereby acknowledging with a smile on her face that she has been recording inadvertently. However, she still feels very confident and even before the end of the replay repeats the beginning of the utterance to
be recorded in Turn 253: ‘Mon frère [My brrother FRENCH]’ with a falling intonation in the end that should provoke a continuation by A. V one more time remembers the importance of the ‘r’ in ‘frère’ and over-emphasises its articulation, thus showing that she has learnt and is aware of the correct use of the word. Following V’s move of intonation at the end of her utterance, A contributes once again the end of the utterance in Turn 254: ‘s’appelle so elo s’appelle Michel. [is called FRENCH now say LUX is called Michel. FRENCH]’. A gives clear and unmistakable directions to V as she repeats ‘s’appelle’ twice and tells V in a composed voice to imitate her production. All the while, A circles again with her left hand, then arranges her hair rather nervously and points with her right hand into V’s direction. A’s body behaviour and her gaze - concentrated first on V and then on the screen - implicate V in a resilient language production process. Consequently, V produces an utterance in Turn 255 that is largely overlapping with A’s contribution from the previous turn: ‘s’s’appelle Michel. [is called Michel. FRENCH]’. V is tentatively stressing and prolonging the ‘s’ in ‘s’appelle’, but she repeats A’s utterance in a very concentrated, calm and composed way. She does so in the face of F’s re-entering the scene by diverting A’s attention in Turn 256 with the following remark: ‘Jo Anna, lo kuck emol do uewen. [Anna, now look up there. LUX]’. At the same time F leaves the floor to V who continues to look at the screen in a very concentrated way to continue with the TEO recording. In this way V demonstrates again the resilience of her language learning attitude. In Turn 257, V records her utterance: ‘s’appelle Misha mm. [is called Misha mm. FRENCH]’, while A is re-directing her look from the ceiling towards V. Against her partners’ disinterest, V chooses again the real name of her brother, i.e. ‘Misha’, for insertion into the next utterance. By doing so, she has the final say in this long process of negotiation around the appropriate name. Hence, V develops successfully in a potentially harmful and stressful environment by manifesting a resilient performance. Despite heavy emotional challenges V, does not become fixated on these issues but continues the language production in the TEO team.
Her sense of triumphant authorship transpires in a big smile on her face in Plate 114, even before her recording is replayed and before both her intentionality and authority are confirmed by TEO. A slight ‘mm’ comes out of V’s mouth after a strong and sharp-cut ‘Misha’ that relativises V’s highly personal contribution to the storying process. Murmur as in ‘mm’ above indicates V’s reflection or profound satisfaction, but also her concentration in the language performance (Lusetti, 2004).

Plate 114: V beams with triumphant authorship before and during the replay of her recording in Turn 258.

In Plate 115 I contrast the final moment in the negotiation process of this transcription as evidenced by V’s beaming smile in Turn 258 with a moment from the transcription earlier on in Turn 222. In this earlier turn V’s face looks troubled at a moment when she is facing a loss of voice and control in the same language learning and storying process.
Plate 115: V’s troubled face in Turn 122 versus V’s beaming smile in Turn 258.

What then makes such a spectacular reversal of the situation possible? What exactly is responsible for V’s resilient performance in the language learning of the TEO team? Does the TEO tool-and-result play a particular role in promoting the phenomenon of resilience in this negotiation process?

Human actors are obliged to turn to the nonhuman actor TEO for making the recordings that propel the storying process. Using TEO as a tool-and-result is an important factor in the maintenance of a language learning situation where the actors need to be involved over a long stretch of time. Language learning and language development as cognitive activities are intimately linked to emotional and motivational factors. The activities of negotiation and production of Luxembourgish and French necessarily lead to a permanent reorganisation of affect and attitude (Newman and Holzman, 1993). TEO
participates in this process through replay of recorded and highly personalised utterances and through the mediation of human intentionalities. The recruitment of TEO at controversial times in the discourse allows for a welcome interruption of a threatening emotional ‘overcharge’ in the conflicts and uncertainties that arise in the negotiation between the human actors. The controversy, especially between V and the expert F, about the appropriateness of the names ‘Michel’ and ‘Misha’, shows that the TEO team treats language learning as authentic language in action where every action or language move is an invasion of the future, full of conflict and uncertainty (Dewey, 1922).

My data analysis shows that new language structures to be learnt by members of the TEO team are born out of conflicts and uncertainties that are, in the mix of the moment, ultimate settings for culture and language. Utterances never mean what they say independently of context, circumstance, and consequence (McDermott, 2005). It is in the interaction between the human actors and in their access to the possibilities afforded by TEO that precision can be aimed at by transforming mutterings and hesitations into well-formed utterances. In the example above, the TEO tool-and-result guarantees the robustness and resilience of the language learning and of the language development by offering a permanent site of transformation. The accuracy of V’s statement about her brother’s name in the French target language has been arrived at through a traceable series of transformations. This multitude of transportations from one utterance to the next has established an authentic language learning experience that leads up to an utterance that is constantly evaluated through the performance of the mediating actors of the TEO team (Latour, 1999).

V survives the relation and negotiation with her always interfering expert F only through her more symmetrical encounter with A and through the support from TEO, which is also of a symmetrical kind as it vicariously embodies the symmetrical voices of A and V. Asymmetrical expert relations do often lead to a learner’s or non-native speaker’s
incompetence and to a debilitating of her performance (Van Lier, 2004). Crook (1994) argues that it is the symmetry of peer-based discussion that effectively forces useful reflection. This symmetry in authority encourages active evaluation of the status of one’s ideas and prompts resolving argumentation and reflection rather than deference to authority.

The TEO environment promotes such resolving argumentation as the expert F chooses withdrawal. The two other more symmetrical partners, however, continue the performance of recordings with their own authority shining through in the TEO replays. Frustration is no longer to be eschewed in the authentic language learning process related to the French target language. Frustrations and constraints can be overcome and even be benefited from because the human actors can constantly refer to the TEO tool-and-result: ‘The conditions attending frustration are true opportunities - maybe the only real opportunities that actually exist - for improvement. The sense of frustration instead of being dodged and avoided must be accepted as a challenge’ (Ames, 1960, p. 223).

V transforms her frustrations in the language learning process. She regains her authority in the process of imitation of language structures provided by the human actors and by the nonhuman actor TEO encapsulating her own voice and the speaking personalities of the TEO team. The process of imitation is not a parroting as prevalent in audio-lingual methods of foreign or second language learning, but it is for V a complex process of creative transformation where a simple name or a simple French language structure gathers richness of meaning through repetitive usage (Stahl, 2006). This imitative process is embodied in different forms in the transcription above: it ranges from overt and loud individual speaking to co-vocalising and to the processes of individual sub-vocalising leading up to more private or inner speech. The process of imitation in the TEO team is framed by semantic treatment in Luxembourgish that guarantees understanding during the negotiation and production process (Griggs, 2004).
At the end of the team practice, V brilliantly overcomes the emotional challenge and triumphs over loss of face and errors. The name of V’s own brother ‘Misha’ symbolises and encompasses the emotional-volitional and the intentional dimensions that must be tapped for efficient language learning situations. The TEO team not only validates and sometimes overcomes improvisation and uncertainties, but also generates such improvisations and uncertainties that are part of authentic learning and development in the French target language (Middleton and Brown, 2002). Kozol (2005) characterises such learning activities as poking around in the satisfaction of uncertainty.

By constantly propelling, generating and expanding discourse in Luxembourgish and in French, the TEO tool-and-result robustly contextualises cues by which people produce the mutual intelligibility of their interaction (Suchman, 2007). These cues include intonation or speech prosody, body positions and gestures, gazes and the precision of collaboratively accomplished timing as revealed by the transcription tool TranScripter. In the transcription the children together with TEO enact a highly skilled ensemble performance where the language production process lives from simultaneous talk, from the joint production of a single sentence, and from silence (Suchman, 2007). The transition from vocal to subvocal and finally to inner speech represents the move from performance of language to competence in language. The simultaneous collective performance of the language production is the precondition for the ultimate possibility of individual competence in the target language. The TEO tool-and-result can be seen as instantiating and affording the welter of communication that exists in the social world generally (Bernard-Donals, 1994). This is why V kept playing and expanding the game of language learning in the French target language with her human partners in the TEO team. Even in the face of some rough tides the game never stopped and support was permanently available by a human actor or by the nonhuman actor TEO. Hence, the phenomenon of resilience in language learning is actively supported by TEO in the transcribed data of my thesis.
I now give a short summary of the findings on the roles and functions of TEO in the Luxembourgish and/or French team language production processes. In the next section I provide an alternative critical reading of the findings. This critical analysis of my findings is not specifically directed at each role and function identified in the transcribed data but is more generally directed at the issue of generalisation of a tool like TEO in the institutionalised setting of normal classrooms. Possible applications for TEO will be sketched. There will also be speculations about the relevance of my analysis to the theoretical field of Vygotskian Activity Theory and Actor-Network-Theory.
8 Summary and Critical Analysis

In my analysis I have been able to show that TEO is much more than a simple tool in the hands of human learners. TEO figures prominently in the team effort of storying that associates different actors in the complex process of learning the French target language that is embedded in Luxembourgish discourse involving the children in my study. The following roles and functions of TEO have been traced and identified in the discourse where TEO is used by the human actors:

- TEO as a tool for replay, repair and accountability
- TEO as a tool for imitation
- TEO as a tool for splitting up discourse, for co-vocalising and sub-vocalising
- TEO as a tool for establishing and maintaining a zone of socio-material performance
- TEO as a tool for collective memory
- TEO as a tool for pointing
- TEO as a tool for meta-cognitive mediation
- TEO as a tool for intentionality
- TEO as a propeller of transformation
- TEO as a tool-and-result
- TEO as a tool for sustaining dialogue, learning and development in the ZPD and for promoting the phenomenon of resilience

Due to the impressive variability of these roles and functions of TEO in the language learning endeavours of the TEO team, I have argued that the status of a nonhuman actor can be attributed to TEO. The TEO setting is akin to a laboratory with many actants (Latour, 1989) where, as I have shown, the nonhuman actor TEO at times can be identified as assembling or re-assembling the human actors around the task of storying.
and the learning of the French target language. Hence, TEO can qualify as an actor in its own right, albeit a nonhuman one, with human intentionality and voice encapsulated in its recordings. TEO is an actor in that its direct or vicarious mobilisations and interventions make a difference in the process and in the result of the language learning effort by the TEO team. Its contributions to the ongoing discourse and its partaking in the learning episode (Mol, 2002) are unique and not substitutable by efforts of other team members in the network. The evidence for the TEO actor was particularly impressive whenever the children tried to recruit it as an ally in strategic moments of the language learning endeavours: the more actors the more potentialities in the language production process as the network of relations expands.

The detailed analysis of the transcripts has revealed the high versatility of TEO concerning the sustainability of the Luxembourgish and/or French language learning process involving children of diverse abilities. I have shown that the method of language learning with TEO represents a comprehensive situation where the process of language production with the glue provided by the storying approach is in effect the product (Wertsch and Stone, 1979) that makes continuous language learning possible. TEO then constitutes a social activity where the children can bring in earlier experiences, share and discuss them, join others’ accounts or resist them mainly through Luxembourgish discourse, but where they nevertheless can gain in understanding and use of the French target language through their constant authoring process with TEO. The activity of learning French with TEO in association with the practice of storying is maintained through many moments or actions that are reflected in the different roles and functions of TEO outlined above. For instance, children imitate individual utterances, correct or repair each other’s utterances, split up the discourse for better understanding and performance, co-vocalise and sub-vocalise utterances, integrate gestures and body behaviour with their verbal contributions, point to recorded utterances for sustaining their discourse, transform each
other’s discourse or utterances and use TEO for affirming or maintaining their intentions and for reflecting on their productions. All the roles and functions of TEO and hence all of the actions of the TEO team are interwoven and kept together in and through the storying process. The storying activity as embedded in TEO prevents the disassembling of the TEO team into human and nonhuman members and transforms the team into a highly skilled, intricate and potential institution (Latour, 1989). It is the institutionalised practice with TEO that allows for the inscription of the children’s utterances in the target language and for their subsequent treatment by referring to principles of mobility, transformation, combination and stability of the language structures chosen by the team members (Latour, 1989). It might be speculated that the language learning competences of the TEO team largely outperform those of the individual learner or of the solely human members of the same team. This may be due to the storying process within the TEO team that can move us
- away from a situation where stories and dialogues in classrooms are used as tools to help children learn prespecified nuggets of knowledge and
- towards a situation where induction into storying and dialogue is itself the main aim of education (Wegerif, 2008).

The team practice with TEO is based on the cultural belief in the developmental potentials of pupils and in the educational value of interaction and participation (Van Oers, 2008). Interaction and participation in the TEO team manifest themselves in discursive actions in Luxembourgish around the planning and recording of French utterances with TEO as well as in discursive actions in French as a result of the recording and replay of the utterances. Van Oers (2008) considers such discursive actions as a revolutionary transformation of learning in school practices over the past decades. As has been demonstrated in the analysis of the empirical data, TEO opens up a space for constant
discursive actions around the production of the French target language, which remains the ultimate goal in the curriculum of the school setting. At the same time the characterisation of such discourse as a revolutionary transformation of learning in school practices leads me to speculate about the difficulties in implementing the possibilities afforded by TEO.

The activity of language learning in Luxembourg’s schools at all levels is often very different from a discursive environment as it is embodied by TEO. In Chapter Two I have described how performing and speaking correct French in Luxembourg’s regular classrooms is broken down into numerous isolated actions such as the mastery of diverse grammatical and orthographical skills. Communication is then regarded as a sequential, alternating exchange of well-formed spoken sentences (Kendon, 2004). Hence, the model for the correct speaking of French is borrowed directly from a model of correct writing in French, thus leaving no room for the vernacular variation of oral French. In contrast to the classroom where my data were gathered, most of the time, even in so-called model schools, there will be found a practice of streaming the children in homogeneous performance groups that do not capitalise on the different competences in oral French that exist in the immigrant population. Based on my findings with TEO, speculating about the difference between the TEO environment and regular classrooms leads me to identify five critical and interdependent dimensions of the organisation of language learning situations:

1) the spatial, temporal and emotional dimensions,
2) the discrete and stepwise actions directed at the individual pupil,
3) the sense-making quality of the discourse around TEO,
4) the status of nonhuman actors like TEO,
5) the importance of the storying activity in the TEO team.

First, I highlight the spatial and temporal dimensions in which language learning of the French target language comes to be organised. The children in the TEO team were
working together in a room adjacent to the regular classroom where they could talk with each other and produce the oral target story in French in relative autonomy. It is this setting that established a working order and atmosphere that made it possible for the TEO team to engage in the discourse documented in the transcription. Space as needed by the TEO team might however be a scarce resource, even in such a wealthy country as Luxembourg. My data indicate that the establishment of a zone of socio-material performance through the use of TEO is an essential feature of the TEO team’s language production process. The children must be in a position where they can display normal body behaviour in order to capitalise on the integrative system of language and gesture in general and on the possibilities for pointing directly or vicariously with the TEO tool in particular, that is for embodying a view of language as a form of constructive and manipulatory activity (Kendon, 2004). Such language learning activities may best be enacted by the TEO team in the absence of teachers or of overzealous adults. The emotional dimensions of language learning that have been exposed above in relation to V’s maintenance in the complex learning process must also be given room. Emotional outbursts are often not accepted by teachers fearing loss of authority and direction in the educational discourse. Hence, the TEO setting functions at its best when the teacher physically withdraws from the socio-material space and enacts his or her responsibility at the confines of the language learning episodes. The teacher thus keeps the language learning experience embedded within the TEO activity system where the utterances are manipulated, modified, organised and created (Kendon, 2004). In effect, utterances, communicative action-sequences, bodily behaviour and gestures are environmentally coupled, that is they cannot be separated from the spatial (bodily and built) TEO environment (Goodwin, 2007, Streeck, 2009).

My analysis shows that TEO functions as a mediator for promoting the phenomenon of resilience in the language production process. It sustains the learning of the French target
language in the conflict-laden zones of potentialities that engage the emotions and voices of the human actors. By externalising their inner feelings related to personal experiences a powerful link with the language to be learned is established by the children. These potentialities for language learning can best be mobilised by the children in a socio-material zone to be created and authored by the actors of the TEO team (Latour, 1989) where the human and nonhuman actors remain constantly framed by the institutionalised task of storying. Even if the teacher relinquishes some part of his or her control in regular classrooms by adopting differentiated group work for instance, we generally stay a long way from the relaxed working atmosphere witnessed in the transcription and video stills of my thesis. All too often then, the integrated system of language and gestures cannot be put into play in regular classrooms, despite studies revealing that young children can be introduced to cultural meanings and tasks not only by means of language but also through other semiotic means such as gestures (Van der Veer, 2008, Moro and Rodriguez, 2005).

Second, the organisation of language learning in regular classrooms tends to focus on discrete actions that are designed to lead the individual pupil step by step towards the mastery of the French target language. The use of TEO within the process of storying as a context for learning and development is difficult to establish inside a regular classroom for many teachers in Luxembourg and elsewhere despite their efforts to adopt manifold learning techniques such as communicative language teaching (Widdowson, 1978) and task-based instruction (Ellis, 2003) instantiated in group-work, workshops or other differentiated forms of work. Complex activities are broken down into many discrete actions that are exercised through the monotony of worksheets or question and answer sequences conducted at an individual level, even when the aim is the practice and learning of oral language skills for communicating with other people. This situation is due to the relative undertheorising of context as ‘individual experience is described and analysed as if consisting of relatively discrete and situated actions while the system or
objectively given context of which those actions are a part is either treated as an immutable given or barely described at all’ (Engeström, 1996, p. 66). In my analysis I have tried to show that the work of storying within the TEO team is a leading activity of language development and establishes zones of actual performance and zones of potential development. Neither zone is oriented towards the development of skills through particular tasks, but towards the development of the whole personality (Chaiklin, 2003, Giest, 2008).

Hence, TEO might be particularly difficult to implement in regular classrooms, where the bulk of the work is directed at the completion of singular and individual tasks, be it in or out of school (in the case of homework, for example).

Daniels (2008) describes school as a message that - as an institution and quite apart from the content of its teaching - implies a certain structuring of time and space. School is based on a system of social relations between pupils and teacher, between the pupils themselves, between the school and its surroundings. Such an institution is easily led into ignoring the essential dimensions of the TEO team activity of language learning as outlined in my analysis. Work in regular classrooms is often organised by exclusively resorting to verbal communications and transmissions between the teacher and the individual pupil or the totality of the class (Daniels, 2008) and fails to capitalise on the improvisational, uncertain and contradictory qualities of the storying approach in language learning.

As a third major critical point, I draw attention to the fact that the regular classroom does not feature prominently the sense-making quality of the discourse around the use of TEO within the storying process. The subtle nuances and overtones that emerge from the children’s voices and utterances are at risk inside the regular classroom, where discussion is largely dominated by the teacher: ‘Emphasis on developing effective direct teaching approaches has led, at best, to good whole class discussion but, in too many classes, discussion is dominated by the teacher and pupils have only limited opportunities for
productive speaking and listening’ (OfSTED, 2005). The authentic and autonomous communication that is deposited into the TEO recordings contrasts with the more artificial communication around textbooks or audiolingual material. The performance of language with and around TEO is related to the whole personality and to the social-cultural context of the storying activity. The zones of actual and potential performance are then dependent on each individual’s meaning and sense making activity in the team and hence linked with the functional needs of the individuals. Although Giest (2008) mixes sense and meaning it is appropriate to signal that Vygotsky (1986) and Bakhtin (1979) refer to ‘sense’ as expressing the individualised and emotional character of language material as opposed to the neutral and common ‘meaning’ fixed in a dictionary, which predominates in ordinary classroom discourse. In teacher led classrooms it can be very demanding to deal with the dynamic system of sense that reflects the unity of intellect and affect (Leontiev, 1992) and that embraces the ‘dynamic of thought and of concrete activity of personality’ (Vygotsky, 1982, p. 22).

A certain wholeness of mental life can be resiliently preserved in the TEO team’s language production process through the maintenance of personal sense making (González Rey, 2008). V’s complex episode of maintaining the name of her brother in the face of her partners’ challenge is difficult to create and to resolve in the normal classroom. The name ‘Misha’ is a socially produced element of sense that is separated in time and space from the current activity of checking its validity against the proposals of ‘Michel’ by the two other members of the TEO team. The learning, discussing, adopting or rejecting of the name ‘Michel’ represents a French language learning activity that has a real social and historical character (González Rey, 2008). In this process persons and hence their languages and identities are flowing on the boundary (Bakhtin, 1984). The processes of adoption and/or rejection of the names ‘Misha’ and ‘Michel’ indicate that this boundary is populated with complex transformational procedures: repetition, imitation, adaptation,
rejection, resistance, frustration, uncertainty, determination, withdrawal, empathy, menace that all co-exist and are intertwined. The processes of transformation of particular utterances lead to the establishment of individual voices that continue to propel the language learning with TEO. The boundary alluded to by Bakhtin then functions as an area or arena of transformational processes and of intense learning involving subtly developing changing identities. Complex social and historical issues are rare in teacher led discussions; such a setting might have discarded and silenced V’s emotional and self-organised subjective sense in favour of dominant cultural meanings and emotions (González Rey, 2008). In that case, the production of new sense as well as the rebuilding of V’s own voice would inevitably have been hampered. In the work with TEO we witnessed the playful but serious tension involving the brother’s name ‘Misha’ as sense and ‘Michel’ as meaning among the partners in the TEO team. Confronting personal sense and general or public meaning (Hakkarainen and Veresov, 2001) constitutes an important driving force in children’s language learning and development, both for the novice and the expert. Even if in the end V did not adopt the French name that was deemed appropriate by her expert partners, there was ample opportunity for discussing the rights or wrongs of the choice. Hence, a social situation for the development of attitudes, values and competences in the targeted area came to be established. V was completely right to stick to the personal sense embodied in her brother’s name as her partners in the discourse had probably overextended the objectives of the task of elaborating the French target language. In regular classrooms, such work based on personal sense that is present before, during, and after the action (González Rey and Chaiklin, 2002) might however be difficult to achieve.

Fourth, the importance for enrolling nonhuman actors like TEO in the language learning and storying process is not yet recognised by teachers in Luxembourg’s primary schools. At best, teachers use electronic tools for finalising written texts, for presenting
excerpts of children’s performances on the web, for publishing photos and videos of their classroom life and for corresponding with colleagues. The recording of pupils’ oral language productions is not considered a necessity for validly evaluating the performances of each child. My experience in teacher-training confirms that Actor-Network-Theory’s insistence on the need to integrate nonhuman actors as mediating tools into the network of human actors learning in a team fails to be taken into account in the educational arena. Teachers are often not aware that the functioning of a team, group or association is in need of nonhuman actors that guarantee the circulating of the knowledge to be created (Latour, 1989). In Calvino’s (2009) words, the materials of the human endeavours can be many, all interchangeable; hence the equality and the unity of all existing things afford many possibilities in the language production and learning process. But the constitution of a network in which one can follow multiple routes and draw multiple conclusions is hard to achieve for most teachers obsessed but also harassed by the need for individual assessment. The redistribution of the capacity of speech between human actors like the three children in our episode and nonhumans like TEO has certainly a long way to go before its integration into the general educational discourse. Actors in the educational arena should realise that use of electronic tools like TEO does certainly not decrease the pupils’ autonomy but foster it (Latour, 1999). A high esteem for electronic tools is however largely warranted in other areas of human life, especially in relation to medicine, transport and communication.

Fifth, the glue or the process of storying that organises the network of ramified routes in language learning might not yet be a valued didactical choice in regular classrooms as it requires substantial time on task in the face of the ongoing fragmented curricular tasks. Teachers might not accept the overlapping of utterances and the playing with metaphors that characterised the storying activity of the TEO team in my study. I would like to remind the reader of the highly emotional, conflict-laden and embodied team discourse about the
name of V’s brother that dealt in a metaphorical sense with the concept of ‘brother’.

Generally, at least in Luxembourg, teachers do not consider storying as a primary act of mind that maintains the pupils’ basic attitudes towards language learning by relying on their speaking, writing, and exchanging about the banalities and vagaries of their own life. Instead, most teachers think that children should be prepared step by step in sequences of pre-planning, successive drafting and revision before being entrusted to craft the perfect oral or written story or text. Teachers often do not pay heed to Lewis’ (1982, p. 36) words: ‘He who would bring home the wealth of the Indies must carry the wealth of the Indies with him.’ These words mean to me that the products of the targeted language learning must be present in some form right from the beginning of the learning process or sequence. The stories lived through by the children can be such a propeller of the development of oral and/or written language. However, in Luxembourg’s primary schools the teaching of isolated bricks is the leading activity in multilingual language learning. The values of shaping at the point of utterance and of spontaneous inventiveness (Britton, 1982) are very often disregarded as they are hard to evaluate in a formal way. Vygotsky (1986) describes the simplest utterance as a process. Oral but also written verbal expressions cannot emerge fully formed, but must develop gradually. They are in need of the dynamics of interchanges in groups of people in order to emerge, to develop and to be completed.

Storying as the collective activity outlined in my thesis does not fit the individualistic performances by which children come to be judged during and at the end of the academic year. Storying as a team activity is based on interactions and dialogues between several pupils involving the construction, interpretation and negotiation of meaning, emotion and identity. As such it does not exist at the level of examinations. The simultaneous use and learning of several languages does not figure in the official curriculum. Hence, storying as a collective activity of the TEO team must be legitimated by each teacher.
My speculations about the differences between the TEO setting and the regular Luxembourgish classroom setting are tributary to my methodological choices for establishing the role and function of TEO in the language learning process. In order to highlight the TEO tool I chose to follow and to describe its activities in the TEO team by means of a videorecorded sequence transcribed with TranScripter. Other choices would certainly have provided different insights and would hence have contributed to a more systematic and comprehensive account of the functioning of the TEO tool and setting. In particular, triangulating the visual and transcribed data with the interpretations of the teacher and the views of the children about the use of TEO would have constituted a considerable asset for delving deeper into the reality of the TEO tool. Due to the conditions of the data collection I was not in a position to carry out these methodological options.

The five dimensions dealing with the chances of an implementation of TEO in Luxembourg’s regular classrooms suggest that TEO affords unique qualities for language learning in a multilingual setting. With TEO teachers can create a space in school where children can speak about what matters to them to someone who matters to them (Britton, 1982), be they peers or adults. The children’s oral stories can be recorded, archived and retrieved at will. I do not know of a comparable tool for documenting lived oral language learning situations that can be as easily manipulated even by preschoolers. TEO then establishes a unique portfolio of oral language learning experiences for individual pupils or groups of children and traces their development along the recorded stories. TEO constitutes a lens for appreciating the richness that is given in the life of each child (McCormick Calkins, 1991). The TEO storying approach allows for negotiating personal, family and cultural values, ties and identities by instantiating children’s entitlement to banality (Clanché, 1988), which is reflected in the endless discussion about the value of the name ‘Misha’. Adults and teachers often lose sight of the importance of such trivial experiences for the development of language learning, but it is necessary to understand
the scale of a child’s life and to give validity to the stuff of children’s worlds (Rosen and Rosen, 1973). The arguments around the banalities of our daily endeavours cannot be taught formally but must be lived through. They can then be reflected upon and imagined differently as within the TEO environment.

I will now discuss some recent changes in educational policy in Luxembourg’s primary schools concerning multilingual language learning situations that might offer some chances for the use of a tool like TEO. The year 2009 has been marked by the introduction in Luxembourg of a competence-based approach to teaching and learning in primary schools. According to the Ministry of Education pupils should confront situations and tasks that allow them to perceive their competences for accomplishing a task, to become aware of their capacities and to develop their self-esteem. Pupils should develop their know-how when facing imposed problems and recognise the gains from work among peers. Teachers are encouraged to choose new didactical methods for diversified teaching and for differentiated learning. Classes in schools are organised according to cycles of learning of two years. New methods of evaluation, such as assessment through portfolio are fostered. Regular contact with parents is recommended, team-teaching is advocated and in-service training is connected to the launching of the competence-based curriculum (MENFP, 2007, 2008, 2009).

These measures seem favourable to an integration of TEO into the curricular work of regular schools. However the official documents continue to split up language learning into clearly separated domains of reading, writing, listening, and speaking. The development and the assessment of pupils’ language competences remain tied to the formal mastery of discrete skills, thus starkly contrasting with my description of the roles and functions of TEO in the lived situation of storying within the TEO team. The portfolio approach advocated by the Ministry could have been the ultimate chance for the integration of TEO as a tool of documentation in the oral language learning processes. But even in pilot
schools where a follow-up of TEO called TiParlo has been put at the disposal of the teachers, children are only occasionally seen at work within the storying paradigm.

My thesis however argues that TEO can be a unique tool in the development and documentation of oral language competences in any context where the sharing, teaching and learning of additional languages is of interest. Evaluating competences of oral language is in need of dynamic assessment models and procedures like those prevailing in the TEO tool and in the storying approach. The learning of additional languages is actively encouraged inside the European Community and in the global world market. TEO should then make sense to policy makers who must account for the development of multilingual learners in and out of schools. Most teachers however do not have the necessary time and material for a detailed description of whatever could be observed in an interaction (Kendon, 1990), a description that could include TEO for examinations of large units of the communicational stream (Bateson, 1971). This is why teachers prefer traditional tools in the learning process and do not see the importance of technological tools like TEO. Information technology (Computer, Playstation, Internet, Mobile Phone) is only a part of their pupils’ identities outside school activities, which remain based on teaching and transmission. In their private lives the same children engage in actions where they incorporate the technological instruments and make them play a part in the original structure of their own body (Merleau-Ponty, [1962] 2002). Back in school, these intimate links become severed and are not socially organised into powerful learning environments as called for by Bruner (1966, p. 82): ‘A technology requires a counterpart in social organization before it can be used effectively by a society.’ On the contrary, teaching and learning in regular classrooms are individually targeted and organised. Communicative and interactional processes seldom engage the whole network of human and nonhuman actors that preserves the embodied emotional timbres of living human beings.
According to the principles of Activity Theory it can be speculated that the use and the control of the TEO tool by the human actors recreates and reorganises the whole structure of the activity of language learning (Vygotsky, 1981a). My analysis has indicated that the meaning encoded in TEO fosters, transforms and propels thought and language development (Knox and Stevens, 1993) by incorporating the uncertainties, controversies, frustrations and contradictions arising in the incessant dialogues between rehearsed patterns and unplanned situated invention (Streeck, 2009). The roles and functions of TEO outlined in my thesis contribute to creating multiple opportunities for consciously negotiating the potential development of the story and of its underlying language structures. This zone of socio-material performance produces zones of potential development built on creative exploration rather than pedagogic domination (Daniels, 2008a), as can be read in my analysis of the resilience of V’s language learning process. This example also shows that language learning builds on the integration of cognitive and affective elements and presupposes the presence of emotions (Daniels, 2008a). It is ‘refracted through the prism of the child’s emotional experience’ (Vygotsky, 1994a, p. 339) and, as in V’s case, aims at the restoration of meaning in life (Vasilyuk, 1991). Long ago, Vygotsky argued for the concept of drama as necessary for the explanation of psychological development (Vygotsky, 1989). I believe that language learning with TEO allows for respecting Vygotsky’s agenda, as the drama of storying unfolds as a system of interaction in which the pupils participate. My analysis of storying with TEO powerfully illustrates Vygotsky’s claim that successful instruction must bring into the children’s reflective gaze those tasks and actions that would be carried out unreflectively (Daniels, 2008a). In that TEO objectifies the process and the results of the language learning episodes in the display and in the replay, it helps to overcome problems in the production team (Vygotsky, 1978). Within Activity Theory TEO can be studied as a neutral tool contributing to problem solving within oral language learning. As I did not want to focus on
the TEO tool in isolation and as the notions of ‘subject’ and ‘object’ and their relations in Activity Theory required expansion and clarification (Daniels, 2008a), I chose Actor-Network-Theory for analysing the language learning in the TEO team.

The move from Activity Theory to Actor-Network-Theory in the theoretical underpinnings of my thesis reflects my insistence on the value of material tools and of nonhuman actors such as TEO in the networked activities of a team. It is difficult to understand that the children in my study are different with the TEO tool at their hands. Certainly, the children have performed language learning in the regular classroom, but now TEO translates the language learning experience into a different one with new affordances (Latour, 1999). Hence, the teacher must decide to have the responsibilities for action in the learning process shared among the various actors in the network, i.e. the children and the TEO tool. Having set up the TEO situation the teacher must accept that his/her pupils ‘are learning something that is not known. The knowledge that has to be learned is being learned as it is being developed’ (Daniels, 2008a, p. 126). The roles and functions of TEO outlined in my thesis can then be swapped in the TEO team (Latour, 1999). In order to allow for these complex collective procedures to be enacted during language learning situations, teachers must necessarily experience similar networked associations between human and nonhuman actors in their own professional life, as Sarason (1972, p. 123) has made clear: ‘Schools are not created to foster the intellectual and professional growth of teachers. The assumption that teachers can create and maintain those conditions which make school learning and school living stimulating for children, without those same conditions existing for teachers, has no warrant in the history of man.’

Maybe then teachers could come to espouse the view of language learning as a mode of fabrication with bodies, objects or tools such as TEO. They will perhaps adopt the TEO tool-and-result that functions as a material carrier objectifying the futile language
production process of the TEO team. Language learning will then be embedded within and become part of networked action systems by which pupils can create, manipulate, modify and organise their storying process (Kendon, 2004).

I will conclude my thesis and continue my personal trajectory by drawing together the different strands of arguments as related to my interest in the TEO tool and in its roles and functions in the context of learning the French target language. The methodological concepts underlying my research will be briefly revisited. I will also point out how my research has allowed me to understand more profoundly the consequences of the use of TEO in any language learning situations. There will also be a discussion of how my research can contribute to the knowledge about learning the French target language with electronic tools and software like TEO. My continued interest in Vygotsky’s theoretical insights will be exposed and I will argue for the need of incorporating the theoretical concepts of Actor-Network-Theory into educational research. Some questions concerning future research possibilities around and with the TEO tool will also be mentioned.
9 Conclusion or the trajectory continued

All through my thesis I have mentioned dynamic views on learning, language learning and psychological development. In the analysis of the transcription I have characterised language learning and development with TEO as dependent on the multifarious influences of the constantly changing context. Dynamic situations entail big frustrations because they constantly challenge us with the questions of ‘what to do’, ‘why to do’ and ‘how to do’ pertaining to our objectives in life, in learning and in teaching. Ames (1960, p. 223) points out the benefits of frustrations as they represent one of the basic and inescapable characteristics of human life: ‘Due to the fact that nature is a becomingness and therefore always changing, “The best laid plans of mice and men” (...) when applied to reality can never work out as expected. (...) The conditions attending frustration are true opportunities (...) for improvement. The sense of frustration instead of being dodged and avoided must be accepted as a challenge.’ Some parts from my transcription reveal real opportunities for learning and improvement originating in frustration. V and the other two children have been able - with the help of the nonhuman actor TEO - to attend to their moments of frustrations, to discuss them and to propel their own language learning in the TEO team. The children as responsible actors talk about the difficulties and frustrations and hence can maintain the dynamics of the language learning process. They have another attempt at the matter. Studying what becomes (Puzyrey, 1986) is the only effective way of coming close to the real language learning situation. In the process the pupils come to adapt, develop and transform their highly individual voice, which is necessary for conscious language development (Bakhtin, 1981b).

Lived situations as well as dynamic learning and teaching activities are propelled by the use of material and psychological tools. Long into my teenage years the cellar of our house was still replete with the tools of my professional fisher grandfather: fishing rods,
nets, fish traps, oars, long poles, various remnants of boat equipment and even a small jollyboat. These tools provoked us children into play and into intense story making. Very often these stories were continued and eventually finalised at bedtime in a storytelling session between my brother and me just before dozing off. My predilection for the psychological tool of storying as a provider of lived and embodied situations may stem from these particular personal experiences. The tool and the process of storying move people on through the bonding it produces. Storying is the glue that interconnects people by creating webs of significance.

Prior to my study, TEO was developed for recording the voices, utterances and stories of the children resulting from the storying process in the curricular domain of language learning. What exactly are the roles, functions and influences of the TEO tool in the language learning process within the multilingual context of Luxembourg’s classrooms? Within the TEO environment as an instantiation of the storying process the emphasis of my research lies with the activity, the role and the function of TEO because the processes of mind are always changed by the means we introduce to study and to produce them (Van der Veer, 2008). The aim of my research has been to trace the activity of TEO without surrendering to the temptation of breaking up the TEO environment into separate activities. My focus is on the complex interplay of several dynamically coordinated activities (Kaptelinin and Nardi, 2006) as carried out by a team of actors, be they human or nonhuman. As educational settings focus on individual outcomes of the learning processes, there is a danger of losing sight of the importance, of the role and of the function of TEO and of the TEO team’s activity, i.e. of the technical and social features of particular instruments (Ratner, 1997).

I overcame some limitations of Activity Theory by adopting Actor-Network-Theory’s characterisation of material objects or tools as nonhuman actors. The language learning process with TEO qualifies as a team process connecting all the human and nonhuman
actors involved. Language learning is then an event where, during the process of storying, subtle and multiple transformations of the intended and even recorded utterances are achieved in chains of mediations involving all the associated actors (Latour, 1999). The incorporation of TEO in the language learning team transforms the learning activity altogether.

In order to give prominence to the TEO tool in the analysis of its role and function I chose a tool for transcription that visually displayed the utterances of the human actors as well as of the nonhuman actor TEO. In my research I combined the graphical display of the transcription, the transcription itself and the powerful imagery of the video stills for exploring the role and function of TEO in the team language learning. I characterised TEO as an actor in its own right participating in the construction and learning of the French target language. My methodological choices afford an analysis of the role and of the function of TEO in language learning situations in primary school with various possible target languages through considering
- the concrete contents of the storying activity in the TEO team,
- the architectural affordances for the socio-material space to be instantiated by the TEO team (room on the vicinity of the regular classroom, desks, hardware),
- the teacher’s choice of curricular work for learning the target language,
- the students’ family lives impacting on the contents of the episode and of the recordings.

Hence, I come close to the analysis of the role and function of TEO in a real social system, in a real world of social praxis in which the activity of storying with TEO occurs (Ratner, 1997, Van der Veer and Valsiner, 1994).

Personally, my research has brought the insight that language learning as any work is not only propelled by the interaction and the dialogue between human individualities but can also be transformed by a tool or a nonhuman actor, an important point made by Actor-Network-Theory. The association with a tool in a network will boost the transformational
and hence learning potential of the storying activity by extending the chains of mediations (Latour, 1999) that become possible among all the actors. As human intentionality can be stored, accessed and activated through TEO, zones of potential development can be created in the complex and differentiated interplay of human and nonhuman actors, of people and tools. Through working with TEO people can create and change meaning and thus develop as language users and ultimately as human beings.

The TEO tool is part of the ongoing dialogic endeavour in a space that aims at increased awareness and insight in the language learning process as well as in the contents of the storying process; much more than a simple tool, it is really a combination of software and dialogue. TEO allows for sustained engagement in participatory dialogue and hence for learning to learn from human and nonhuman actors. It also fosters human creativity through its being open to the emergence of new ideas in a dialogue (Ravenscroft et al., 2007). Creativity needs the creation and adoption of tools and contexts that support its enactment within a social process of learning and transformation (Vygotsky, 2004).

Hence, the ‘goal of promoting creativity in schools will not be achieved if the construct of creativity remains that of an individualistic capability’ (Daniels, 2008a, p. 146). Creative activity is necessarily open-ended and unfinalised, because the single adequate form for verbally expressing authentic human life is the open-ended dialogue: ‘Life by its very nature is dialogic. To live means to participate in dialogue: to ask questions, to heed, to respond, to agree, and so forth. In this dialogue a person participates wholly and throughout his whole life: with his lips, hands, soul, spirit, with his whole body and deeds’ (Bakhtin, 1984, p. 293). Unfinalised dialogical life allows for adoption or rejection of articulated views, as exemplified in the episode about the name of V’s brother. The affordances of TEO in the dialogic endeavour of a language learning community have been described in my analysis. TEO is a major constituent in the resilience of the
language learning process that I had previously attributed to the motivational efficiency of
the individual and collective storying process.

Hence, the use of Actor-Network-Theory in studies of educational settings and of
language learning situations is promising. My thesis can also be read as an attempt to
apply Actor-Network-Theory to the situation of language learning with electronic tools by
tracing the human and nonhuman actors in their association in the TEO team. As
electronic devices will come to dominate the everyday life of coming generations, it will be
necessary to analyse their meditational role and function of in meaning making.
Technological tools enrich the relationships at the centre of the educational agenda and
must be studied with appropriate methodological instruments that respect their existence,
influence and potential in relational learning episodes.

My interest in Vygotsky’s theoretical concepts of teaching and learning remains intact
despite my emphasis on the need of Actor-Network-Theory for studying the impact of tools
and objects in the learning and knowledge building process. I continue to give prominence
to Vygotsky’s notion of ‘instruction leading development’ by attributing to TEO the status of
a quasi-human language instructor in its own right. The human potential is developed in
the network of relations between human and nonhuman actors like TEO. The working
order of this TEO team produces the target language. Tools, objects and human bodies
constitute the zone of socio-material performance that is reminiscent of Vygotsky’s zone of
potential or proximal development (ZPD). It is in this zone that emotions and intellect meet
to construct the unfinished learning experience as a dynamic process. I have defined TEO
as a Vygotskian tool-and-result that enables the children to complete their utterances on
their own or to have them completed by other actors, be they human as their peers or
nonhuman as the TEO tool. Vygotskian notions of control and consciousness, but also
responsibility, are enacted in the relational activity of the TEO team. Actor-Network-Theory
and Vygotskian notions complete each other for better understanding the team language production process with TEO or any other tool.

My research is of importance in the domain of Luxembourgish and/or French language learning with the use of electronic tools and in the domain of language learning in general. There is a dearth of empirical research in the domain of language learning at the level of preschool and primary school that encompasses the use of electronic tools like TEO. This is all the more so in the domain of oral language learning in French but also German and Luxembourgish within Luxembourg’s multilingual setting. The TEO environment effectively creates a polyphonic zone for the acceptance of a plurality of languages expressing a multiplicity of subjects, voices and views of the world (Bakhtin, 1984). This is an important point in Luxembourg where the teaching and learning of Luxembourgish is most of the time relegated to the periphery of educational activities at the profit of the learning of German and French. Luxembourgish occupies the position of lingua franca in the TEO team’s learning of the target language French and hence gains in prominence and acceptance in the curriculum. TEO can then purvey supplementary time and place in the curriculum for promoting the national language Luxembourgish, a promotion called for by the Luxembourgish authorities as well as by many foreigners who consider the Luxembourgish language as the tool for cultural and national integration.

My thesis stresses the importance of objects in maintaining and developing zones of potential development in the areas of language learning at the level of preschool and primary school. I emphasise the tool-and-result TEO and oppose it to the ‘simple’ tool for result normally used in educational studies. My study of the role and function of TEO privileges the establishment of zones of socio-material language performances that are used by a team of language learners in their collective endeavour of cumulative talk where they build on each other’s contributions, add information of their own and in a mutually supportive way construct shared knowledge and understanding (Mercer, 2000). The
cumulative talk in the TEO setting turned out to be critical at certain moments and the consideration, incorporation and solicitation of TEO as a nonhuman member of the language production team allowed to overcome the emotional strain resulting from occasional criticism. In an activity-theory-driven and also in an actor-network-theory-driven depiction, human actors should be represented by a socially structured space of possibility or potentiality in which particular positions are taken up (Daniels, 2008a).

My thesis makes an essential point in highlighting that we must consider the integrative language system of verbal behaviour, bodies, gestures and tools as the focus of studies in Luxembourgish and/or French language development and in language learning in general. It is this integrative language system that must be the unit of analysis of the team language production processes as it is the practical counterpart of theoretical considerations on language, language development and language learning espoused by Bakhtin, Voloshinov, Vygotsky, Wittgenstein, McNeill, Kendon among others, that I have used in my thesis. Concepts like dialogism, voice, heteroglossia, polyphony, unfinalisability, open-endedness must be reflected in a proper unit of analysis. The TEO environment can be such a unit. In empirical research on language learning in educational settings the theoretical concepts above are in my opinion all too quickly reduced to accounts of individual performance. Such a choice of severing the individual performance from its social origin is mainly due to the necessity of the individual evaluation of the pupil’s progress in language learning that figures prominently in Western educational settings and curriculums. It is the individual student who has to pass the tests, who has to succeed in the exams or alternatively has to present his or her individual portfolio. It is as if the teachers, authorities and educational settings were deliberately trying to erase all traces of dialogue, communication, interaction and collective endeavour to gain access to the individual merits of each hearer, speaker, reader, writer and learner. This is not to say that TEO in itself cannot constitute a powerful tool for assessment, evaluation and also
auto-evaluation. However, the TEO tool for assessment remains firmly rooted in the collective and dialogical practice of language learning that unifies assessment and learning into a single activity, the goal of which is the development of the learners’ resilient attitudes towards language production (Lantolf and Thorne, 2006). By providing immediate feedback through replay and recurrent contextualisation through the possibility to listen to parts of the story or to the whole story, TEO gives evidence of learning and helps the team to plan future learning.

In short, the analysis in my thesis of the role and function of TEO as a nonhuman actor in the TEO language learning team is important for positing linguistic communication as a social activity, as a creative bodily art, enacted and produced between people and nonhuman actors in the meaningful matter of sound and/or gesture (Jones, 2008). In this way I uncover the distinctive dynamic and emergence of the concrete instances of human communicative intercourse and of the team language learning performances.

I conclude with hints at future research possibilities and research needs as relating to the implementation and the use of TEO in language learning situations in preschool and primary classrooms in Luxembourg and elsewhere.

Staying close to the needs and possibilities of regular classrooms, it would be interesting to focus on the question to what extent TEO encourages children to learn vocabulary and language structures through telling stories in collaboration with more knowledgeable peers. Do the children simply practise the vocabulary and structures learned in their normal classes when they use TEO? Research that would be carried out over longer stretches of time could find out if there are language structures and vocabulary used by children in the TEO setting that differ from the curricular requirements or even going beyond them. In particular, do sentence structures become more complex over time? Does the practice of breaking up sentences with TEO change and develop over time? Is there a cross-fertilisation between oral and written modes of discourse? Do
stories in the oral and also in the written mode become more complex over time? As for the modalities of the oral stories recorded, what are the changes occurring at the level of semantics, vocabulary, syntax, length, expression, intonation, pronunciation and extent of the dialogues? Do the roles and the functions of TEO change over time? Does the assistance provided by the human actors and/or the nonhuman actor TEO change over time? To what extent is the ratio between Luxembourgish and the target languages in the TEO team distributed and changed over time?

A particular topic for research with TEO should concern the area of code-switching or translanguaging. In the empirical data of my thesis the children often spoke about the story in Luxembourgish and proposed the sentences to be recorded in the French target language in the Luxembourgish language at first. They then often asked their peers for translations either explicitly or implicitly. Do the children switch between Luxembourgish and French more naturally as they become older and more used to the work with TEO? Are they discussing features of the story in Luxembourgish but speaking in French when it comes to the actual sentences used in the story? What exactly distinguishes the discourse of the story to be recorded in French from the meta-discourse of the story that is spoken in Luxembourgish?

Understanding attitudes and beliefs about all kinds of language learning is a well researched area. Research about the use of TEO could contribute to it as it is directly linked with the concrete production of oral language in the French, German or even Luxembourgish target language figuring in the Luxembourgish curriculum.

Life-long learning as well is continuously a matter for research in language learning and development. It could be interesting to ask the question in what ways the work with TEO can contribute to fostering the phenomenon of resilience in learner independence and autonomy within the collective team effort of storying.
Interesting research could also be carried out about the content of the stories recorded with TEO. What kind of content is recorded and how do the contents develop over time? Do the stories move from questions and answers around topics close to the classroom agenda to more complex and coherent fiction? Are topics the same in different languages? What positions and identities are voiced and expressed by the children in the stories recorded with TEO? In what ways do the TEO stories differ from stories in curricular or classroom materials? Is there an impact of storying on children’s motivation, attitudes and achievements in language learning? How do children plan stories? Will there be a written or an oral storyline agreed upon? What are the resources that the children use when working with TEO: gestures, mime, voices, background noise and dictionary? To what extent do the resources change over time? What is the influence of modern digital media on the stories recorded with TEO? Can digital media like photo and video be integrated into TEO for promoting links with the daily experiences of the language learners? Can a language portfolio and a language profile be created for each group of learners as well as for the individual learner on the basis of the TEO recordings?

As TEO is powerful in organising zones of socio-material performance, it would be particularly interesting to research the body behaviour and the gestures occurring in the material space of the TEO team. The influence of the gestures on the continuation or collapse of the ongoing dialogue in the language learning process need to be researched. The same goes with the influence of other material actors such as hardware, desks, chairs and bodies on the performing and learning of languages.

In the future, the use of an electronic platform featuring stories recorded with TEO could impact on the exchange and use of stories recorded by children from other classrooms, countries or private settings. Research on the use of this platform could inform about the extent that the platform and the work with TEO contribute to language teaching and learning in all the languages of the curriculum, about the link between home
and school activities involving TEO, about how the stories created at home differ from stories created in schools (e.g. collaborative work with other people, content, structure, authenticity, length, complexity, resources used), about parents’ and teachers’ attitudes concerning the work with the platform and the TEO tool and about the concrete use of TEO within the platform.

The implementation and the use of a TEO platform could also be a moment for researching teacher development in the area of language learning and teaching with TEO in all the languages of the curriculum. To what extent can a learning platform (including the TEO tool or similar tools) be beneficial for initial and in-service teacher training? What types of information do students, teachers, parents download or upload and what differentiates these types of users? How does the work with the platform and the tool improve teachers’ understanding of learning and teaching methods? Research should also focus on the institutionalisation of the TEO setting. In particular, what institutional measures must be taken by teachers for ensuring the promotion of the phenomenon of resilience in language learner’s attitudes and performances?

Other under-researched areas that could profit from wider research on the use of TEO involve language as a mediating tool in computer-assisted language learning as well as reasons for children’s motivation to learn languages with electronic technologies.

Cross-cultural and cross-national research could be done through a comparative study of the use of TEO and of the resulting stories in different countries.

I conclude my thesis by re-emphasising my preoccupation as a teacher when it comes to launch and sustain the learning efforts of the pupils under my responsibility with a focus on language learning processes in all the target languages of the curriculum. I am referring to dimensions of learning that keep the discourse in language learning alive and have all the pupils of a classroom participating in the ongoing dialogue of the learning and
language performance. The data in my thesis have revealed that the TEO tool can create an environment that sustains pupils’ involvement and resilience in the particular language learning process. In effect, V’s language behaviour has displayed to us from the beginning until the end of the transcription that ‘it is the ownership of words that gives one confidence. I must want the word, enjoy the word and use the word to own it. When the new word becomes synonymous in my head as well as externally, then I can think with it’ (Demientieff, 1993, p. 197). TEO is powerful for establishing ownership of words, hence a particular voice, as it allows resistance to others’ suggestions or aggressions by joining the fragile language learner in the process of production as I have shown in my analysis. Hence, the zone of potential development created by TEO as a nonhuman actor together with the human actors during the learning episode becomes, for the learning individual, not only a zone of communication, of cooperation and of identification but at the same time a zone of contestation and of resistance. Finally, TEO allows to address the language learner not only as someone who can do by means of language (Austin, 1962) but as someone who can be through his/her speech and through his/her work (Litowitz, 1993), i.e. as someone who strives to complete his/her yet-unrealised potential (Kozulin, 1990).

I will continue to work on the importance of objects, tools and nonhuman actors like TEO in the establishment of the collaborative team effort that involves and maintains the pupils in the dialogical process of language learning. It is important to study how we become different in the association with nonhuman actors or electronic tools like TEO when we perform language learning activities in a team, when agency, speech and responsibility are circulating and are swapped in a certain order between the members of the association (Latour, 1999). The TEO setting allows for a cooperative performance in a team of human and nonhuman actors where action is slightly overtaken by what it acts upon and where transfers of information never occur except through subtle and multiple transformations. No one, and nothing at all, is then in command (Latour, 1999). Latour’s
(1999) account gives us an explanation of the surprise that we can detect on V’s face as
she records her brother’s name ‘Misha’ against all odds: V is surprised but also ravished
by what she does in the same way as everyone of us is sometimes surprised and ravished
by what we do, even if we believe we have complete mastery. The TEO team unites the
subject (i.e. the human actors) and the object (i.e. the TEO tool) in the labour of
transcending its actual competences in language learning and of surprising itself by new
performances.
10 Bibliography


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