

The Roamer: an object for re-adapting in the case of adolescents with a cranial trauma

Christian Sarralié
Professor at the CNEFEI

Setting and Subjects of Observation

Characterising an adolescent with a serious cranial trauma leads us to meet with the complexity and diversity. Physical, intellectual, emotional, scholar, family and social, all areas of the person are concerned by the consequences of a trauma. Apart from etiology, a hit on the head, the clinical facts of our subjects are very different one from the other; problems are intricate and often difficult to discriminate. The lesions can affect all the upper body functions and provoke, directly or indirectly, personality problems and problems of relationship with others, as well as an incapacity of the subject to be conscious of or to understand his problems.

Accident, coma, awakening, rehabilitation, readaptation and reinsertion are, from a chronological point of view, the main phases of the itinerary of a person with cranial trauma. After rehabilitation, re adaptation is a first change of perspective. The action of the different professionals is no longer only centred on the diverse functions of the person but also on his social functioning. For the teacher, it means to (re) position the teenager as a pupil. Re adaptation is a process which must allow: to live globally, in a schooling as rich as possible; to offer the experience of confronting the school reality to get the bases of a real project; to explore the breaks and continuities in the person's individuality, especially his cognitive functioning. For our subjects, the school re adaptation takes place in small groups where they are taught for a few hours different subjects.

A Privileged Support

Accessibility

The greatness of intellectual dis-functioning and the loss of knowledge increase the selection criteria of the tasks offered. For the teacher, the range of choice is reduced and it is more difficult to choose. The use of Roamer makes possible a not too abrupt entrance to activities requiring little school knowledge and we can easily grade the difficulty and complexity. The accessibility also concerns the teacher. On the one hand, the Roamer's approach is simple. On the other hand, a minimum of instruction is needed to quickly conceive some exercises (even if we have to keep the illusion that it is enough to trace any sort of figures).

For 5 sessions of forty minutes with a dozen teenagers, we have essentially worked on three tasks:

- Observation and restitution (oral, graphic or procedural) of the demonstration programme the Roamer has in memory and we can activate as soon as it is on: the course of an equilateral triangle, stopping at each summit; giving a short piece of music at the second summit; stopping when tracing the last side.
- Covering a square by the Roamer.
- Covering a double square (two squares with one shared side).

Neutrality

The gap between the former school level of our subjects and their real abilities when they have a serious schooling is big. But this gap might not be detected because of cognitive problems or can be rejected to escape from an unacceptable state. This leads the teenagers to claim a similar level of work to the one they had before the accident or to desire to be at a higher level or to be as before. Without direct references to the school curriculum, Roamer presents a certain neutrality and a way to answer these too precise claims, inaccessible at the moment of returning to school.

Jeremy demands maths exercises of 10th grade, rejecting quickly anything that is far from that. But he is far from being able to solve questions of this level considering his problems. His school files show that he didn't have such a level before his accident. The proposition of activities with the Roamer puts his opposition to one side and leads to sessions taught until the end. And this despite the huge difficulties met by Jeremy because of his problems affecting all his intellectual dimensions: step by step, with the help of a transcription on the board, after forty minutes, he can reproduce the presentation programme but we're not sure that he has got an overall view of it.

Socialisation/ individualisation

The Roamer lends itself to group activities, allowing naturally to differentiate them and individualise them. Its accessibility and neutrality are useful with groups of extreme heterogeneity concerned at the same time the nature of the problem and the school functioning. It is also user- friendly for the dimension of (re) socialisation of re adaptation. Introversions, centring on rehabilitation activities, marks the repair desire characterising these teenagers. But, it also gives the advantage of individual work, that we consider as unavoidable when in rehabilitation with the subjects. The most precise observation, which is required to understand the manifestations of the problems. The dual situation favours confidences and framing of behavioural problems.

Nicholas has a frontal syndrome, which manifests itself through a lack of control of his thought and behaviour. Easily distracted, undisciplined and rebellious, he doesn't respect the rules of group life, is not in a hurry to start a task and stick to it. Roamer presents enough attraction to settle him in a task and to remain with it, it gives the teacher a less direct aspect, with an

adequate climate to tie a quality pedagogic relationship, even if this stays difficult and fragile.

Communication

In re adaptation phase taking on a child is multi- dimensional and in collaboration with many professionals. The activities around Roamer can make this collaboration operational. First because they lead to observations on easily communicable behaviour and around activities understandable by all the members of the team, Roamer activities calling on or interesting for diverse professions. We consider the Roamer generates common tasks, as a common denominator of a synergy for re- adaptation actions.

A relevant activity

Realisation

In re-adaptation, in an ecologic situation, the subject has to do a task proposed in an autonomous way; it is an opportunity to do, to put to the test his functioning and the means acquired to overcome these difficulties. And this know how becomes efficient when the Roamer leaves room for initiative to be used and requires work to be proposed with visible effects.

But realising is also to be aware. The teenagers with cranial trauma must be conscious of his problems and, in all the senses of the word, recognise them to overcome them. He must have the Roamer made actions, the objective being to have the robot execute something, placing him symbolically on the controls, allows him a certain distance favourable to be conscious.

Calculating

Roamer allows calculation activities. It is taken here, not in the sense of operating but by borrowing from Vergnaud, with the inference meaning; an inference which can be qualitative. In the organisation of the behaviour of the subject, these calculations are about goals and sub- goals possibly formed, the rules of actions, the information uptake and the control allowing to read them. These different aspects are often lacking in a teenager with cranial trauma and give the whole of the symptoms gathered under the expression: problems of execution functions.

To work on the characteristics of the thought, we take advantage of two components of the activity with the Roamer: algorithmic and heuristic. The first allows us to put a structured framework, to work on planning and do the actions and their relevance to the goal; to practice repetition. The second one avoids the risk of chronic repetitive tasks and leads to needs identification, to goal formulation and thinking on the activity itself.

Helping

If the relation of help is each time or at the same time for the different functions or modalities usually given, it is characterised first of all, by the fact that it must be measured, that is moderated and estimated. Using the Roamer allows us to observe, therefore to study the changes to organise a situation. It gives the teacher, during the activity, a widespread range of possibilities to intervene and means to carry them out.

The mistake is in the procedure and from this localisation, we get double profit. On the one hand, it gives a less direct aspect to the teacher's interventions relieving the teenagers from rehabilitation situations centred on himself. On the other hand, it allows a de-dramatization of the mistake too often experienced as a painful memory of the consequences of the accident.

Michael shows us that the Roamer is drawing an M in his demonstration programme. Being hemiplegic, he must be redirected on the left; he suffers from Visio-spatial problems. Almost on his own, trying with the Roamer, he manages to correct himself and to give the exact shape of the movement, the use of the machine limiting the interventions of the teacher. A welcome limitation because direct interventions are badly experienced by Michael who then accuses the teacher of undermining him, of thinking of him as no good. Looking at the problems, we note here that the Roamer is, indirectly, an extension to rehabilitation.

Evaluating

Different check ups, medical or neuro-psychological, give information on the problems of the subjects. The school situation shows more or less obviously their signs and how the subject deals with them. The movements of the Roamer can, during perception attacks, bring to the fore the difficulties to take the objects when moving or of visual exploration. Schooling also reveals sometimes behaviour disruptions not noticed beforehand.

Audrey has been mute since coming out of a coma. When she comes to us, it is the only visible problem and in her file, only problems linked to speech are stressed. We communicate with her properly since she understands what we say to her and all reading. We notice, however, she doesn't understand some words orally or when reading, sometimes being unable to produce one in writing. It is the case for the word 'music', necessary to put on the board the Roamer's demonstration programme; she can't find it, despite the clues given. When we make a square, the value of the rotation angle is the problem.

Audrey doesn't resort to geometrical analysis but to eye estimation. After a few failed tries, she puts herself next to the machine to feel the measure of the angle. But she only proceeds by trial and error and the corrections are always of small values (3 or 4 degrees). This type of behaviour has been noted by many researchers for children learning the notion of angles with the Logo

turtle. What surprises us, is the time she spends in this task and this solving behaviour, considering the fact that Audrey was in the 12th grade at the time of the accident.

The elaboration of the programme for the realisation of a square is as long and laborious. we find the signs of perseverance effects when many times Audrey writes: $\hat{1} 4 \Rightarrow 4$. The value of the step (4) is given to the angle despite the earlier and correct demonstration of its value (90). Audrey writes the instructions side after side, tries mistakenly with, it seems, a lot of difficulties to put together what she sees and the objective she is aiming at. It is the same to link the instructions and to produce the global procedure. She then writes on the board: $\hat{1} 16 \Rightarrow 270$, multiplying by four the measures (as she explains to us without noticing her mistake), instead of repeating 4 times the instructions. These observations show characteristic signs of the problems of execution functions, which are not mentioned in any different check ups given to us.

Questions and remarks

An activity in itself

we are saying first that the activity led with the Roamer is an activity in itself. we mean here that we don't want it to link to a particular field of a school subject nor to connect it to the field of cognitive ability to educate. Roamer allows the reference to S. Papert (1981) and its use to the Logo language in its turtle geometry. If it comes close to turtle geometry for differential geometries it is specific in its style by qualifying IT geometry, which is based on calculations. But his model of thought, modular and procedural, is not ours, which gives calculation the highest definite sense and which is linked more to the conceptual aspect implemented in the behaviours of the subject.

Roamer is a tool, which enables the working of different mathematical notions, such as number, measures or figures. But many works have shown that articulation, generalisation and school mathematics transfer phenomena were far from being discovered. Let's remember that Papert himself wrote that the effects of the work in geometry turtle are essentially relational and affective. The Roamer gives the activity a first and essential quality in re-adaptation: it is stimulating.

Arguments to discuss

We link our thoughts on Roamer to the work of S. Papert. Writing a procedure borrows from natural language and its realisation by Roamer presents with the writer, a corporal link, which is relevant with what he feel in his own body. We join D. Barataud (1990) who warns against the idea of a perfect isomorphism between the movements and the language translation in geometry turtle and the mother- tongue and corporal real life experience. It is the same if we compare how to trace a figure with a pencil and the Roamer's realisation. The French language has semantics far larger and more blurred than the programming language used. Contrary to Roamer, a person can turn while going forward; tracing a square with a pencil is rarely continuous and not always the same. These differences get worse when a comparison is done

with subjects who don't have the integrity of controls and the perception of their body, and have phasique and praxic problems.

Adaptations to make

If we can straight away think of adaptations aiming at the handiness of the instrument for people with motor, sensorial or physical deficiencies and of the improvement of its reliability to trace figures with large dimensions, it is above all the support of the programming, which calls for discussion. In fact, on the machine we can't see the typed procedure and the correction of a mistake is limited to the last instruction. Without tackling the question of adaptation on the Roamer itself, pairing it with a computer and programming software is essential to start with more difficult programmes with pupils with brain deficiencies.

An object to re-adapt with

Roamer means wanderer. This meaning is more relevant for our subjects forced to go here and there in the mysteries of the cognitive functioning to discover the characteristics of relative novelty given by cerebral deficiencies. The Roamer, project manager of this exploration, is also an investigation instrument. A real instrument if we go back to the Latin etymology of this word, meaning tool and resource.

These few resources lead us to put forward the hypothesis that Roamer is a judicious tool to lead re-adaptation work and to make the process dynamic. Just like Papert made of his turtle an object-to-think-with, we make Roamer an object-to-adapt-with.

Thanks to Christophe Noel, specialised teacher at CMPA in Neufmoutiers-en-Brice, who took part in this project.

Indicative bibliography suggested by the authors

BARATAUD (D.), 'Logo. Espoirs et (des)illusions', Les cahiers de Beaumont, no. 50, p.37- 40, june 1990.

BEAU DE MOULIN (S.), Tortue de sol et apprentissage de symbols en grande section de maternelle, Colloque « l'enfant et l'ordinateur », Rouen, 1985.

BOUSSET (G.), L'informatique à l'école, L'éducateur, Puf, 1983.

BOULE (François), L'informatique, l'enfant, l'école, Colin- Bourelier, 1988.

COHADON (F.) et al, Les traumatisés craniens: de l'accident à la réinsertion, Aernette, Vélizy- Villacoublay, 1988.

COMBES- TRITHARD (F.), Enregistrer, lire, programmer a l'école maternelle, Colin- Bourelier, 1984.

EIMERL (K.), L'informatique éducative. Cheminements dans l'apprentissage, Armand Colin, Paris, 1993.

Greff (E.), Le « jeu de l'enfant- robot » : une démarche et une réflexion en vue du développement de la pensée algorithmique chez les très jeunes enfants, thèse de doctorate de l'université Paris7, 1996.

Papert (S.), Jaillissement de l'esprit. Ordinateurs et apprentissage, Flammarion, Paris, 1981.

REGINNI (H.), Logo, des ailes pour l'esprit. Cedic, Nathan, 1983.

SARRALIE (C.), Réadaptation scolaire en mathématiques d'adolescents traumatisés crâniens, thèses en sciences de l'éducation, Université Paris V, 2002.

VERGNAUD (G.), « La théorie des champs conceptuels », Recherche en didactique des mathématiques, vol. no. 2-3, p. 133-170, 1990.