With Heart Upon My Sleeve

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for Seymour Papert, with appreciation and gratitude

Abstract

Case study analysis is a central method for those who understand development of mind as a process of self-construction. The credibility of the case method is held suspect, however, because study details often are kept secret "to protect the privacy of the subject." Cynics wonder if it is not to protect the analyst from criticism.

We can resolve this issue directly. I intend to advance micro-genetic analysis of case study materials using public digital and communication facilities to share extensive case study corpora and existing interpretations. I hope as well to develop new interpretations in collaboration with others. I am building a web-resident archive of video and text materials based on three child development corpora created at the dawn of the personal computer era. My ownership of the materials, digital storage cost declines, and maturing internet technologies join in making this initiative possible. In summary, there will be text and video archives, organized around the three existing corpora; web log software will streamline communication with archives users, and wiki based interactions will begin more focused and intense collaborations.

Why should anyone be interested in these particular case studies?

First, the approach is more "anthropological" than experimental or clinical. Like Levi Strauss, I take seriously the concreteness of knowledge in everyday experience.

Second, the studies were Artificial Intelligence inspired explorations of how every day interactions through particular experiences changed what was in a child's mind. The model came from Minsky's famous "frames paper." The cluster of ideas argued that one might look at the details of everyday behavior to characterize what was in the mind and then trace experiences in detail so that when a performance break-though appeared one could represent significant learning as the establishment of a single new link between formerly un-integrated elements into a system of frames. Such an interpretation of Learning Case 2 (the study of Miriam) was advanced in "Computer Experience and Cognitive Development."

Third, LC3 was designed to explore another Minsky claim – that the structure of relations in language follow and reflect the structure of knowledge about objects and the manipulation of objects developed earlier. LC3 traces object knowledge development and language development. Interpretations will proceed separately, after which links and relations between the two streams of development will be examined.

Fourth, the historical context of the studies was novel. The learning of these three children was followed before and through the dawn of the personal computer age. There were no personal computers during LC1 and LC2 – yet the focus was how computing could affect learning. The computer used in LC3 was the TI-99 prototype Logo module development system. Coverage of the computing experience of these children was complete, because no one else had computers then.

The outcomes of these studies to date have been reported in books and articles, all of which are being made available at the web-site, http://www.NLCSA.org

Keywords

learning; case study archives; Artificial Intelligence; MIT Logo Project.

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Common Sense Knowledge and Case Studies of Learning

The roots of my case study initiative were ideas and examples from Artificial Intelligence and Genevan Psychology. Minsky, MIT AI lab founder, focused on understanding the developing control structure of the mind; I followed his lead. Papert said Piaget's most profound work was in his case studies and that Psychology would divide eventually into separate domains of brain science and epistemology, the latter ultimately to be genetic in Piaget's sense. Robert White's case studies in **Lives in Progress** was a long familiar inspiration. An integrating idea was John Flavell's suggestion for a new research endeavor,[i] uniting Piaget's explanatory structuralism with the detailed "Ecological Psychology" idiographic studies of Barker and Wright.

Where Artificial Intelligence laboratories at Stanford and Carnegie Mellon focused on expert knowledge, Minsky argued that common sense knowledge was key to the flexibility and robustness of human intelligence. My focus became "natural learning," which I held were those processes creating common sense knowledge. The MIT Logo Project became my professional and intellectual home for six years, and Papert and Minsky have remained my colleagues since. In that lab, I developed computer learning environments and explored their appeal to my children and their impact on them. We called these environments computer based "micro-worlds."

My interpretation model derived from Minsky's "Frames Paper." He explained the quickness of human thought (despite a 300 mille-second brain cycle time) by the postulated existence of "systems of frames" (large scale data structures in the mind) switching between members of which permits rapid changes of perspective. I suggested that one might look at everyday behavior to characterize what was in a mind and then trace experiences in detail so that when a performance break-through appeared, one could represent learning as the establishment of a new links between formerly unintegrated frame-like elements into a system of frames. Learning Case 2 was so interpreted in "Computer Experience and Cognitive Development."

My case studies began as explorations in "AI-inspired Psychology," focused on using procedure oriented ideas to illuminate the nature of knowledge and its development: most especially, how one can understand such remarkable learning as humans exhibit. I collected and have preserved an enormous amount of material and case study observations. Advances of technology in the past thirty years, copyrights reversion, and my ongoing digitization of materials make it possible to share that archive. I will sketch the range of material, its use in theory development, and access to it.

Methodology Issues

Kurt Lewin argued[ii] that psychology can become a modern science only as researchers shift their focus from finding cross classificatory correspondences to developing fully explicit explanations for series of events in concrete cases; he recommends less abstraction and more "problem solving." Lewin argued as well for what he called "the pure case," as an ideal of individual study, a corpus with enough information at a sufficiently fine grain to resolve the issues it bears on. My case studies and the archive is in this spirit, aimed to:

- capture detailed information about individuals (in three separate cases)
- convert that corpus to an on-line database
- link related events and model development within the corpus
- offer access to that database of materials and interpretations for scrutiny by colleagues to enable criticism and envigorate development of alternatives.

The first benefit of such openness discriminating between the idiographic focus of the content and idiosyncratic interpretations. Further,case study has been less used than its potential warrants because materials are typically kept private “to protect the privacy of the subjects.” This is a legitimate concern, but secrecy makes the work suspect and inhibits legitimate criticism.[iii] For the method to become credible, **practitioners** need to open their entire corpora for examination by critics, they **need to wear their hearts upon their sleeves**, within constraints that do respect the privacy needs of their subjects. **My objective** in creating the Natural Learning Case Study Archives **is to practice what I preach**, hoping it may be of value to others who have today better opportunities, resources, even better ideas than I have.[iv] Figure 1 sketches the Implementation Structure using available web technology as a content management and collaboration base.

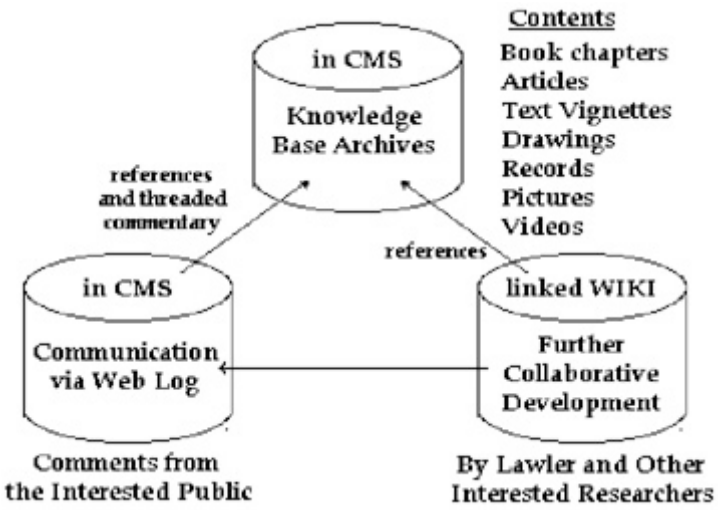

Figure 2. NLCSA implementation as a Content Management System & Wiki

NLCSA: An Internet-Accessible Case Study Archive

The **Natural Learning Case Study Archive** is built around three individual studies, although there is significant overlap of ideas, activity, and observational materials. **Table I** summarizes the studies as individual cases:

Table 1

Learning Cases	LC1 (NL)	LC2 (TIS)	LC3 (IPS)
title	Natural Learning	The Intimate Study	Infant Peggy Study
subject	Rob	Miriam	Peg
ages	6-8 years	5-8 years	18 weeks – 6 years
themes	natural learning; computing’s impact; mathematical ideas	natural learning; computing’s impact; learning arithmetic; Logo geometry; Programming Tictactoe strategies	natural learning; beginning and extension of the object concept; language learning; computing’s impact

books, articles	5 chapters, 2 articles, Logo ideas column	5 chapters, 2 articles, appendices	2 articles, 2 popular articles
text observation	21 protocols;+ TIS	133 vignettes	795 vignettes
video sessions	31 in TIS; also LC3	49 in TIS; also LC3	~225 in IPS
extent digitized	in process, most	in process, most	in process, most

Specific Outcomes of LC1: Natural Learning

Rob adopted computing as a new medium in which he could create things that satisfied his own interests[v] and in which I could make games[vi] that he would enjoy. Tracking his graphical constructions[vii] gave me confidence that I could, because of my access to and involvement with his life, trace his developing objectives in long projects and that a "cognitive anthropology" grounded in detailed case study was appropriate to understand natural learning.

- here will be presented a short video clip connecting LC1 with the well known turtle geometry activities of the Logo Project; specifically, Rob using Logo to create symmetrical inspis, whose angles of turning are prime numbers (from **TIS46**)

< estimated **duration**, with commentary, **5 minutes**.[viii]

Rob's speed of development and the depth and breadth of interests were expanding so rapidly I could not "keep up with him" in all areas, as I believed was essential. My solution to this dilemma was refocusing research on my second child, Miriam. With my wife carrying our third child, Rob and Miriam were in my care during much of 1977. Further, Miriam suffered from allergic asthma, which was relieved by air conditioning and the computer lab, which had reduced use between spring finals and fall startup. Very importantly, to avoid Miriam "displacing" Rob in our times together, I decided to collect data on the activities and development of both. We three plunged into "The Intimate Study" as a research team. While I provided resources, focus, and ideas, they contributed abundant energy, good humor, and their own ideas as data. They had considerable control over our activities.

Specific Outcomes of LC2: The Intimate Study

The breadth of material collected and interpretations offered ranged from the homely, anecdotal "Making Jokes and Learning"[ix] to the detailed and analytical studies of a child's introduction to Logo programming,[x] the intersection of computing experience and everyday life,[xi] multiple descriptions of "the same thing,"[xii] and the development of strategic thinking.[xiii] These were augmented with other data including a Binet test, a Piagetian profile, and school like materials.

- video clip from **TIS04**: Miriam; Piagetian "velocity experiment," (Papert)

< estimated duration three minutes

- video clip from **TIS47**: Miriam; Debugging her "Person" procedure, (Bob)

< estimated duration three minutes; jokes as alternative to analysis

- video clip from **TIS65**; Miriam; Debugging Bob's bugs in "jumping rope"

< duration 3 minutes: programming terminology for describing processes

These videos are available in the Case Study Archives as well as texts, graphics, and the remaining video materials listed in Table I. Though not fully analyzed, some of Rob's work in TIS which was especially valuable was published in the Journal of Mathematical Behavior. That material is in the Case Study Archive, as well as other articles I published in JMB.[xiv] and materials listed in Table I are available also.[xv]

Specific Outcomes of LC3: Infant Peggy Study

Discussing my data collection for the Intimate Study late in 1977, Professor "Mimi" Sinclair[xviii] lauded the effort but thought it would be impossible to complete the analysis to earn a doctorate for the work. Returning the next semester, she reported discussing my project with Piaget, who said he envied Papert for having a student with the taste and energy for such work. After others first raised the idea of studying the development of my infant daughter Peggy,[xvii] I discussed with Sinclair beginning a nonintrusive study of her language development, designed to place it in the context of developing interactions with the physical world (objects, space, animals, and people).[xviii] I wanted to develop, for this idiographic collection, a "spine of observations" to permit calibration of this child's development with the body of developmental studies. Mimi proposed ramifications of the object concept, with a focus on inclusions within cavities of convex objects.[xix] I assembled a collection of toys Peggy then played with on camera, every week, for three years. Begun at 18 weeks, the Infant Peggy Study continued for six years, and ranged from social interaction to playing with blocks, nesting objects, and even computer microworlds, reading, and finger counting. Here are some samples:

Objects focus:

- IPS video clip P53E: infant Peggy putting objects "on top of" and "in" others

< duration, 3 minutes: without such distinctions, can her goals be specific?

- IPS video clip P146F&G: toddler Peggy inserting nesting cups and boxes

< durations, 5 minutes: climax of a long developmental sequence

Language focus:

- IPS video clip P26A1, infant Peggy with Bob

< duration, 2 minutes; vocal interactions with singing

- IPS video clip P65C, infant Peggy with Bob, "bring Hanky" (she does)

< duration, 3 minutes; verbal comprehension or situation analysis

- IPS video clip P104A; toddler Peggy conversation; her control of activities

< duration, 3 minutes; complex thoughts and simple verbalization

Symbol manipulation focus:

• IPS video clip: Paris TV: Miriam and Peg; introduction by Papert et alia.

< duration, 5 minutes of word worlds in French for "English" children

• IPS video clip G11B: child Peggy, addition, with fingers time permiting

< durations, 5 minutes; joining IPS study to Miriam's behavior in LC2

The materials in Table I are now in or being added to the corpus.

LC3 continued despite my leaving MIT to work in New York and then in Paris, at Mitterrand's Centre Monidal L'Informatique. After wonderful years in Paris, my family returned to New England, and Minsky guided me to work with Oliver Selfridge, forming a new AI group in GTE's Fundamental Research Lab.[xx]

Access to the Archives

The web site at NLCSA.org is public. Navigation is straightforward. Though the video material is presented here as samples – small webstreamable Quick Time clips, behind these samples are the full digital videos, stored offline, on multi-terabyte hard drives.[xxi].

References

Lawler, R. *Computer Experience and Cognitive Development*. Chichester, England,and New York: Ellis Horwood, Ltd. and John Wiley Inc., 1985.

Lawler, R., DuBoulay, Hughes, and Macleod. *Cognition and Computers.* Chichester, England, and New York: Ellis Horwood & John Wiley Inc, 1986.

Lawler, R. “Making Jokes and One Child’s Learning,” in *Humor, the International Journal of Humor Research*, Vo. 2-3, Mouton de Gruyter, 1989.

Lawler, R. “On the Merits of the Particular Case,” in Lawler and Carley, *Case Studies and Computing*. Norwood, N.J.; Ablex Publishing, 1996.

Lawler, R. “Consider the Particular Case” *Journal of Mathematical Behavior*, 1998

Lewin, Kurt. The Conflict Between Galilean and Aristotelian Modes of Thought in Contemporary Psychology. In *Dynamic Psychology: Selected Essays of Kurt Lewin*, D. Adams and K. Zener (translators.) McGraw-Hill. New York; 1935.

Minsky, M. A Framework for Representing Knowledge, in *The Psychology of Computer Vision*, (P. Winston, ed.), McGraw Hill, 198n.

Minsky, M. *The Society of Mind*, Simon & Schuster, NY, 1986.

White, Robert W. *Lives in Progress*, Harcourt, Brace, NY, 1975.

Acknowledgements

Since my intellectual debts to colleagues are beyond measure, here I will direct your attention to the video sample “enduring colleagues” on the NLCSA web site and ask you to recognize that there are many others to whom I owe gratitude and recognition.

Help creating this corpus came in the first instance from Seymour Papert, who committed to my full time possession the video equipment I used. Not less important was Oliver Selfridge, who supported my first transfer of the LC3 corpus from reel to reel video to VHS format. With the oldest materials, recently I used the services of Rick Thomas, of Queen Creek, Arizona, who rescued videos that otherwise would have been lost. To him, thanks, and a recommendation to any who need video recovery help. (http://obsoletevideoservice.itgo.com/home.html)

Notes:

i. in an Appendix to *The Development Psychology of Jean Piaget*, (1972).

ii. Lewin (1935). The points are discussed in considerably more detail in "On the Merits of the Particular Case," chapter 1 of *Case Study & Computing, Lawler and Carley*, 1996.

iii. For further discussions of privacy see pp. 72-83 of Lawler and Carley, 1996.

iv. Such facilities could also provide an experimental workbench for advanced students to undertake a kind of apprenticeship in case analysis under tutelage of the case database developer.

v. One of his favorites then was a graphics components assembly environment (EEL) based on the children's drawing books by Ed Emberley.

vi. Rob spent a lot of time with "Ready, Aim, Fire," (RAF), in which I had superposed a gun sight and coordinate grid cross-hairs on the turtle geometry domain and a minor variation of Paul Goldenberg's Shoot program. When declared an "ace" after shooting down five planes, Rob made it is goal to get more kills than Baron Von Richtofen.

vii. In "The Development of Objectives," chapter 1 of *Computer Experience and Cognitive Development* (Lawler, 1985)

viii. A report of this work was published in the Journal of Mathematical Behavior, with the title "Extending a Powerful Idea."

ix. Published in the *International Journal of Humor*, 198n.

x. "The Equilibration of Cognitive Structures," chapter 3 in Lawler, 1985.

xi. "The Progressive Construction of Mind," chapter 2 in Lawler, 1985.

xii. "Cognitive Organization," chapter 5 in Lawler, 1985

xiii. "The Articulation of Complementary Roles," chapter 4 in Lawler, 1985.

xiv. "Extending a Powerful Idea," the *Journal of Mathematical Behavior*, date.

xv. This includes my four chapters in *Cognition and Computers*, (Lawler, DuBoulay, Hughes, and Macleod, 1986).

xvi. Hermine Sinclair deZwart, of the Faculty of Psychology and the Science of Education at the University of Geneva was "Piaget's Linguist." At MIT, she was a visiting professor in the Division for Study and Research in Education.

xvii. Meltzoff had recently used infant studies to attack Piaget's claims about the inception of imitation. After discussion with my wife, we agreed at first, but withdrew that agreement when we saw that trying to avoid affecting the results was limiting our interactions with the baby.

xviii. This followed Minsky's position that language was an aspect of human development profoundly affected by prior knowledge developed through interaction with objects and people and that linguistic structures were consequences of that prior knowledge.

xix. This was related to research by Stanback in Paris, in *Bebes et Choses*, 198n.

xx. Minsky said Oliver had the quickest mind of anyone he had ever known, that he had a genius for undertaking deep studies with simple computational models, and that his interest in children's learning was as committed as my own. Minsky was right on all counts, and I had the deep honor to become Selfridge's colleague for the rest of his life. For that work, see "Explorations in Experimental Epistemology, Constructionism 2010."

xxi. If you are engaged in a research project where the higher quality video would be of value to you, please contact me. We will make files available.