

STABILITY AND VARIABILITY OF TEACHING BEHAVIOR: A CASE STUDY*

M. CRAHAY

University of Liège, Belgium

Abstract — The main focus of this case study of a fifth grade teacher observed in 21 lessons is on variability; not the variability of a particular teacher in regard to the average teaching pattern, but the intra-individual variability. The analyses are related to two hypotheses: (1) The teacher's pattern of behavior remains stable whatever he or she is teaching; and (2) The teacher varies his or her behavior according to what is being taught. The data are consistent with the first hypothesis, but not the second one. Although the absolute frequencies of each behavioral category vary a lot across lessons, the content does not appear as a sufficiently explanatory factor. By a factorial analysis of correspondences, the author identified two major kinds of lessons and formulated a new explanatory hypothesis in which teacher planning plays a crucial role.

Most studies on the process of teaching or teacher education are more or less explicitly based on the assumption that each teacher has his or her own personal teaching style. It is assumed that each teacher can be characterized by a behavioral pattern which is stable across time and situations. *Inter-teacher variability is considered the main and often unique source of variability* whereas intra-teacher variability is considered an error of measurement.

This postulate has permeated research on teaching for a long time. In the publications of Anderson (1939), Withall (1949), and Flanders (1970), it was assumed that it is possible to reliably discriminate "good teachers" (those characterized as having an "indirect influence") from "bad teachers" (those characterized as having a "direct influence"). As Dunkin and Biddle (1974) wrote: "There is a tendency for this outlook [that is, research focused on the classroom climate concept] to accompany a commitment that the "good" teacher is one who is democratic, integrative, or learner-centered,

while a "bad" teacher is one who is autocratic, dominative, or teacher-centered" (1974, p. 94).

Similarly, more recent process-product research presupposes the stability of each teacher's style across occasions and that teachers differ greatly among themselves. Moreover, Doyle (1978) has argued that the process-product paradigm constrains investigators to concentrate on dimensions of teacher behavior which are discrete (vs. continuous), ubiquitous (vs. unique), and stable (vs. adjusted to momentary classroom conditions). "The ideal, in other words, takes the form of a set of process-product laws that are context-proof, teacher-proof" (p. 169). But, is this ideal realistic?

Suppose the postulate is reversed and it is assumed that teachers' behaviors fluctuate greatly across occasions, "then estimates of process-product relationships are precarious at best" (Doyle, 1978, p. 169) and the paradigm has to be questioned. Several authors (Good & Grouws, 1975; Shavelson & Dempsey-Atwood, 1976; Bertrand & Leclerc, 1985) have shown

* The help of A. El Kadmiri and B. Hanssen of the University of Liège for data collection and coding, and of G. Pini of the University of Geneva for the statistical analyses, is gratefully acknowledged.

that stability coefficients are generally lower than expected. For example, Bertrand and Leclerc observed 30 secondary school mathematics teachers on 10 different occasions. They "found few reliable variables even though the level of interobserver agreement was high" (p. 196). They "also found that a high frequency [of behaviors] was not a sign of reliability. . ." (p. 196). Similarly, Postlethwaite noticed "that of all observed teacher [behavior] activities in the I.E.A. Classroom Environment Study, 70 percent of the variance is within teacher and only 30 percent between teacher [country after country]. In other words, teachers vary their behavior according to what they are teaching" (1986, p. 14). Perhaps, teachers are more alike than was supposed and less stable than was presumed.

In an earlier study, De Landsheere (1969) discovered that, except for slight quantitative differences, the 25 teachers he observed teaching the same kind of lesson were all characterized by the same behavioral pattern. In each case, the rank order of the nine categories of behavior was the same. This same rank order was observed in other studies of teachers who taught either younger or older pupils and who taught other subject matter (Antoine, 1979; Jacques, 1969; Ninane, 1969). Even teachers from a context as distant as the Ivory Coast have been characterized by the same ordinal pattern (Wannyn, 1978). The results of Bayer's research (1979) go further in challenging the previous assumptions on the sources of teacher variability. He hypothesized that *the behavioral variability of the same teacher in different situations is greater than the variability of various teachers placed in the same situation*. The data gathered by Bayer confirmed his hypothesis. In order to explain these results, it is necessary to change a basic premise of the research paradigm: it is not the teacher who is in control of the situation, but the situation which is in control of the teacher.*

The evidence from these studies is critical for the direction of future research. It can contradict the implicit assumption of earlier works, since it shows that the variability which has usually been attributed to error of measurement is

as great as the "true" variability. Neither is it sufficient to say that "the most important source of error is the variation in teaching practices used in the same class on different occasions" (Bertrand & Leclerc, 1985, p. 187). Instead, the variation of teaching practices used in the same class has to become the focus of our scrutiny. As Berliner (1980) pointed out: "correlational studies will remain rudimentary as long as the 'hows' and the 'whys' of variations in teaching practices continue to be ignored" (quoted by Bertrand & Leclerc, 1985, p. 188).

It is the aim of the case study presented here to investigate the "how" and the "why" of the variation of the teaching practices of a Belgian teacher. Two hypotheses will be initially tested. The first one is inspired by the work of De Landsheere (1969), and is:

The teacher's pattern of behavior remains stable whatever he or she is teaching.

The second one is inspired by both Bayer's (1979) and Postlethwaite's (1986) work, and is:

A teacher varies his or her behavior according to what he or she is teaching.

The hypotheses are not contradictory. Simply stated, teaching behaviors may vary quantitatively within some limits, but the rank order of the frequencies of the categories may remain stable across situations.

The Value of Case Studies

Case studies are often regarded with suspicion in the world of educational scientists. Since the seminal work of Fisher (1925), it has been considered that the demonstration of the lawfulness of a phenomenon requires a large sample of subjects and no generalization should be permitted on the basis of a case study. Case study research could offer the possibility only to try methods, concepts, observational categories and the like to see if they might be useful in exploring an issue.

According to Lewin (1935), this mode of thought is characteristic of the Aristotelian

* This statement, inspired by Bayer's ideas, is quite similar to the point of view of Doyle and Ponder (1975).

tradition, in which individuality and lawfulness are considered as antitheses, and has contributed to a limitation of research. Notably, "it makes it appear hopeless to try to understand the real, unique cause of an emotion or the actual structure of a particular individual's personality. It thus reduces one to a treatment of these problems in terms of average. . ." (p. 245). Lewin compares the Galilean mode of thought to the Aristotelian one. From this perspective, "even a particular case is then assumed, without more ado, to be lawful" (p. 246).

More recently, Lawler (1985) argued in favor of Lewin's point of view. He wrote that "the individual case does not merely illustrate the general law; it embodies the general law" (p. 14) and went on as follows: "If mental phenomena are lawful in a strong sense, as physical phenomena are, one can arrive at the general law through detailed interpretation of the particular case" (p. 14).

Data Collection and Coding Procedures

Twenty-one lessons taught by the same teacher (a woman) in the same class (sixth grade) were observed. The verbal interactions between teacher and pupils were audio-taped. Moreover, at the end of each lesson (before the coding operation), the observer had to write a short descriptive report of what had happened. The observer had to describe the way of grouping the pupils and the specific objectives, as well as the successive phases of the lesson (including the description of the different kinds of activities which were occurring, that is discussion, exercises on work sheets, a silent reading of a text, and so on).

The teaching of three types of subject matter was observed. The distribution of the lessons is shown in Table 1.

All the lessons were recorded on a Tuesday or on a Thursday, in the morning (between 10:00 a.m. and 12:00 noon), between January and

Table 1

Sample of Lessons Observed

Subject	Types of lessons	Number of lessons
Mathematics	Computation (MC)	3
	Geometry (MG)	3
	Problem Solving (MP)	3
Lessons (French)	Grammar (FG)	3
	Writing (FW)	3
	Reading (FR)	3
Science initiation (SI)		3

The point of view defended by Hersen and Barlow (1976) is that laws can be demonstrated by replicated case studies. That was also the conclusion of Cronbach (1974).

In other words, by this case study, it is not hoped to establish but only to demonstrate a context-process relationship. If some relationships do appear with consistency, this observation would encourage the replication of similar case studies in order to confirm (or deny) the conclusions of the original research and to establish the regularity of the relationships.

May. In order to neutralize the potential effect of the time of day, the observation was organized in such a way that lessons concerning a particular subject were not grouped on the same period.

The sample consisted of 28 children (15 boys and 13 girls). Average age was 12.06 years; the youngest was 11.02 and the oldest 13.09.

The recording of the first 20 minutes of each lesson was transcribed.* All the verbal behavior of the teacher was coded with the category system created by De Landsheere (1969, 1979).

* Thus, all the lessons had the same duration (20 minutes) and it is worthwhile to analyze the absolute frequencies.

Outline of De Landsheere's System

I. Controlling functions. Within this category, all functions creating favorable conditions for teaching or ordered working are grouped. These functions do not bear on subject matter, or substantive meaning.

II. Impositive functions. This category concerns subject matter only. The teacher is the one who decides upon the choice of subject matter, problems to be solved, and even response content and form.

III. Content developing functions. Basically the teacher responds to data placed in the situation by the pupils.

The teacher amplifies, clarifies, generalizes or summarizes pupils' spontaneous verbal behavior.

IV. Function of personal responses. The teacher is concerned by the pupil's personal experience.

Invites pupil to tell or report about personal experiences.

V. Functions of positive feedback to pupils.

VI. Functions of negative feedback. These functions bear on subject matter only: the pupils are informed of the validity of their answers or problem-solving behavior.

*VII. Functions of concretization.** Since the focus is on verbal interactions, it is not the use of teaching aids that is observed, but the related functions.

VIII. Functions of positive affectivity.†

IX. Functions of negative affectivity.‡

The direction of the interactions was also coded.

TC — when the teacher speaks to the whole class;

TP — when he or she calls upon one specific student; and

TG — when he or she speaks to a subgroup of children.‡

The verbal participation of the children was also coded. Three categories have been defined:

RSP — the child responds (R) to a solicitation (S) that the teacher has addressed personally (P) to him/her;

RSC — the child responds (R) to a solicitation (S) that the teacher has addressed to the class (C) without specifying who had to respond; and

PS — the child spontaneously asks a question or reacts to a teacher's or a pupil's comment without having been solicited.

The Variability of the Teacher's Verbal Behavior

1. The Ordinal Ranking of the Categories

Table 2 presents the frequencies of each category for each lesson. The categories are ranked from the most frequent to the least frequent by lesson. On the basis of these results, it is possible to test the first hypothesis. A rapid examination of this table suggests that the ranking of the nine categories is similar from one lesson to another. For example, the category labeled "Impositive functions" is ranked first in 19 lessons out of 21 and the category "Controlling functions" is ranked second in 17 cases. Two

* Methodologically, this category is a weakness in the system for it is not mutually exclusive with "imposition" and "development." A specific evaluation of the concrete approach at primary school level seemed important enough to justify a double coding.

† Affective functions are evaluations of the pupil's behavior independent of specific subject matter.

‡ The desks were placed in such a way that the children were grouped in fours: two double desks are placed opposite each other. This spatial disposition seems to have been chosen to foster small group work. However, we did not observe any small group activity. Sometimes, the four children seated around the same double desk discussed together and consequently, disturbed the activity of the large group. Therefore, most of the teacher's verbal behaviors directed to a group are controlling ones.

Table 2

Absolute Frequencies (AF) and Ranking (R) of Each Verbal Behavior Category for Each Lesson

Kind of lesson	Functions																Total	
	Ct Control-ling		I Imposi-tive		D Content developing		P Personal responses		FB ⁺ Positive feedback		FB ⁻ Negative feedback		Cc Concret-ization		A ⁺ Positive affectivity		A ⁻ Negative affectivity	
No.	AF	R	AF	R	AF	R	AF	R	AF	R	AF	R	AF	R	AF	R	AF	R
1	23	2	64	1	11	5	3	7.5	15	3	8	6	3	7.5	2	9	14	4
5	49	2	83	1	16	5	1	9	26	3	12	6.5	20	4	3	8	12	6.5
7	35	2	38	1	17	4	—	9	12	5	9	7	10	6	4	8	19	3
Mean	35.6		61.66		14.6		1.3		17.6		9.6		11		3		15	169.6
2	43	2	105	1	12	6	—	9	29	3	4	7	19	4.5	3	8	19	4.5
10	25	2	27	1	10	5.5	2	9	12	4	10	5.5	8	7	3	8	13	3
11	40	1	37	2	9	4	—	9	7	5	3	6	—	8	2	7	24	3
Mean	36		56.3		10.3		0.6		16		5.6		9		2.6		18.6	155.3
9	14	4	83	1	6	6.5	—	9	18	2	6	6.5	9	5	1	8	17	3
16	25	2	37	1	6	6	—	9	7	4.5	2	7	7	4.5	1	8	12	3
19	32	2	89	1	6	5.5	—	9	13	4	3	7	6	5.5	1	8	14	3
Mean	23.6		69.6		6		—		12.6		3.6		7.3		1		14.3	131.6
6	46	2	56	1	12	6	3	8.5	16	3.5	16	3.5	11	7	3	8.5	13	5
8	35	2	110	1	2	7.5	1	9	34	3	16	4	12	6	2	7.5	15	5
13	47	2	69	1	1	8	—	9	21	3	8	5.5	9	4	2	7	8	5.5
Mean	42.6		78.3		5		1.3		23.6		13.3		10.6		2.3		12	189.3
4	35	1	19	2	13	3.5	1	8.5	7	6	9	5	2	7	1	8.5	13	3.5
15	40	2	74	1	2	7	—	9	30	3	8	6	11	4	1	8	9	5
18	20	2	43	1	4	6	—	8.5	9	4.5	9	4.5	3	7	—	8.5	15	3
Mean	31.6		45.3		6.3		0.3		15.3		8.6		5.03		0.6		12.3	126
12	23	2	32	1	4	6	—	8.5	12	4	10	5	1	7	—	8.5	20	3
20	27	2	80	1	3	7	—	8.5	23	3	17	5	12	6	—	8.5	22	4
21	13	3	65	1	4	5	—	8.5	22	2	6	4	2	7	—	8.5	3	6
Mean	21		59		3.6		—		19		11		5		—		6	115
3	65	2	80	1	5	7	2	8	25	3	7	6	15	5	1	9	18	4
14	28	2	74	1	2	7	—	8	22	4	3	6	12	5	—	8	24	3
17	31	2	57	1	3	7	—	8.5	22	4	7	5	4	6	—	8.5	26	3
Mean	41.3		70.3		3.33		0.66		23		5.6		10.3		0.3		22.6	177.6
General mean	33.14	2	62.94	1.14	7.04	5.79	0.62	8.71	18.19	3.88	8.24	5.71	8.23		1.43	7.48	15.71	4.24
Standard deviation	12.60		23.46		4.86		1.02		8.09		4.31		5.78		1.24		5.71	45.21

statistical procedures were used for testing the accuracy of this impression.

Kendall's coefficient of concordance. This coefficient, W , is recommended by Hays (1963) and Kerlinger (1973, p. 292) when "we want to know the extent to which members of a set of distinct rank orderings of N things tend to be similar" (Hays, 1963, p. 607). Here, $W = 0.8745$.^{*} The concordance between the ranking of the 21 sets is striking.

Friedman test. With this test, we can find out whether there were significant differences among the mean ranks of each category:

$$\chi^2 = 146.91$$

$$DF = 8$$

$$p < .00001.$$

The ranking of the nine categories is highly stable across the 21 lessons observed and the discrepancies between the mean ranks are large enough to conclude that the nine categories of the teacher's verbal behavior organize themselves in a hierarchy which is quite similar no matter what she is teaching. However, the difference between the mean ranks of Development and Negative feedback is not large.

2. Analysis of the Quantitative Variability

The teacher's verbal behavior. Although the ordinal rankings of the nine categories are similar across lessons, large quantitative variations within each category seem to exist. For example, the frequencies of the top ranked "Impositive" function (16 situations out of 20) vary from 19 to 110. Similarly, the frequencies

of "Controlling" and "Positive feedback" vary from 13 to 65 and 7 to 34 respectively. In a period of 20 minutes, the same teacher can emit, on one occasion, five times as much of one kind of behavior as on another occasion. For other categories, the range of variation is even greater: the frequencies of "Negative affectivity" vary from 3 to 36 (12 times as much); "Content developing" varies from 2 to 16 (again 8 times as much).

To observe the strength of the intra-individual variability is not sufficient. It is necessary to explain it, by discovering the sources of the quantitative fluctuations. One possible source is the subject-matter. The statistical procedure adopted is the analysis of variance. The results are presented in Table 3.

The value of the F is relatively high only for two categories:† Content developing and negative feedback. If we look back to the absolute frequencies, it is possible to interpret the results of the analysis of variance as follows:

— The teacher is more likely to clarify and amplify what the pupils say spontaneously when she is teaching computation and geometry than when she is teaching anything else.

— The teacher is more likely to evaluate negatively the pupils' responses when she is teaching French grammar and, to a lesser extent, reading.

A tentative explanation of these tendencies can be proposed. French grammar is a complex combination of arbitrary rules. In this situation, it is not easy to accept the initiatives of the children; their responses have to conform to the rules. When teaching grammar, the responses of the pupils are either correct or not; and since

Table 3

One-Way Analysis of Variance of Each Category of De Landsheere's System Across Kinds of Lessons (Subject-matter)

	Ct	I	D	P	FB ⁺	FB ⁻	Cc	A ⁺	A ⁻	Total
Value of F	1.483	0.457	4.033	— ^a	0.674	3.022	0.551	— ^a	1.504	0.803
Significance	(.254)	(.829)	.015	— ^a	.673	.041	.762	— ^a	.247	.584

^a Not computed because of the high number of i frequencies.

^{*} This coefficient can be transformed into a chi-square, which is interpreted in the same way as the Friedman test. By doing this transformation, we get the value of 149.92 which is, for eight degrees of freedom, highly significant (.00001).

† The probability level is only given for information. We have no intention to generalize the results of this case study and we will only try to identify some tendencies.

(in French) the rules are complex, and the exceptions not so rare, it happens frequently that the children make mistakes. This would explain why the teacher so frequently evaluates the pupils' responses negatively. Similarly, during reading lessons the probability that she will interrupt to correct the child is relatively high. On the other hand, when she is teaching computation or geometry, procedures for finding the results can be proposed by the pupils. These can vary and it is logical for a teacher to discuss the various ways of solving the same operation. In a sense, the teacher is obliged to accept, clarify, and amplify the children's ideas.

The low value of the F computed on the other categories must also draw attention. Although the frequencies of categories such as impositive, controlling or positive feedback vary greatly from one lesson to another, the fluctuations seem unrelated to the topic of the lesson.

The direction of the interactions and the verbal participation of the children. The direction of the interactions as well as the verbal participation of the children were also coded (see above). Here, we will try to examine whether the teacher directs verbal behaviors in various ways according to the content taught. Similarly, we will examine whether the children's verbal participation varies according to the subject-matter. The data are presented in Table 4.

Although most of the time (in 14 lessons out of 21) the teacher directed most of the verbal behavior toward the class, the absolute frequencies of this category vary considerably (from 21 to 191). Similarly, the range of variations of the other variables was relatively large (TP — from 29 to 103; TG — from 4 to 21; RSP — from 3 to 52; RSC — from 8 to 72; PS — from 14 to 58). Are these variations related to the subject-matter? The results of analysis of variance are presented in Table 5.

The values of the F are rather low, especially

Table 4

Absolute Frequencies of TC, TP, TG, and the Three Forms of Student Verbal Participation Across Lessons

Lessons	TC	TP	TG	RSP	RSC	PS
1(MC)	42	94	7	52	12	15
5(MC)	121	76	25	18	63	58
7(MC)	52	70	22	6	29	53
Mean	71.6	80	18	25.3	34.6	42
2(MG)	117	100	17	29	47	35
10(MG)	39	60	11	5	16	35
11(MG)	65	50	10	5	10	41
Mean	73.6	70	12.6	13	24.3	37
9(MP)	91	51	13	7	44	41
16(MP)	49	22	6	3	8	22
19(MP)	112	39	13	3	29	22
Mean	84	37.3	10.6	4.3	27	28.3
6(FG)	82	75	12	17	34	34
8(FG)	113	103	11	22	53	30
13(FG)	89	70	7	34	13	18
Mean	94.6	82.6	10	24.3	33.3	27.3
4(FW)	21	65	10	4	11	40
15(FW)	98	69	8	14	36	35
18(FW)	63	29	10	2	16	21
Mean	60.6	54.3	9.3	6.6	21	32
12(FR)	53	41	8	15	33	14
20(FR)	90	81	13	35	51	32
21(FR)	67	41	4	8	37	16
Mean	70	54.3	8.3	19.3	40.3	20.6
3(IS)	143	55	21	4	72	31
14(IS)	88	59	18	15	44	23
17(IS)	76	54	20	5	48	14
Mean	102.3	56	19.6	8	54.6	22.6
General mean	75.95	65.71	12.66	14.4	33.6	30
Standard deviation	35.10	18.17	5.76	13.37	18.59	12.42

in regard to the variable TC. The variability of the variables TP and TG seems slightly related to the subject taught. Notably, when the data presented in Table 4 are examined, it seems that the teacher interacts more frequently with a child (vs. with the class or a subgroup) when she is teaching French grammar and computation, but this is not confirmed by the statistical indices.

Table 5

One-way Analysis of Variance of TC, TP, TG, and the Children's Three Forms of Verbal Participation Across Kinds of Class

	TC	TP	TG	RSP	RSC	RS	Total
Values of F	0.586	2.290	2.680	1.399	1.190	1.192	0.893
Significance	.736	.094	.060	.282	.366	.365	.526

Although the examination of the absolute frequencies suggests that the pupils respond more frequently to a teacher's personal solicitation (RSP) when she is teaching computation (MC) and grammar (FG) than when she is teaching anything else, the results of the statistical analysis do not confirm the impression: the values of F are really low.* Concerning the other variables considered, the value of the F is also low.

What Have We To Conclude So Far?

To this point, the results are disappointing. Most of the interactive parameters considered here do not seem to vary according to the subject taught by the teacher. However, concerning two variables, content developing and negative feedback, the influence of subject-matter as a contextual variable cannot be disregarded.

Nevertheless, these tentative explanations do not take into account the large quantitative variations of the other parameters. The intra-individual variability of the most important process variables (controlling and impositive functions, positive feedback, and so on) cannot be ignored. There is a need to look for another explanation for the teacher's intra-individual variability.

Toward a Typology of Lessons

Here, instead of starting with an a priori hypothesis, an attempt was made to create clusters of lessons on the basis of the interactive dimensions measured here, and then to examine whether the clusters found could be characterized by some specific properties. To do this, the scripts of the formats (Kounin & Gump, 1974) of the lessons were inferred from descriptive reports of the observer. For the clustering of lessons, the "factorial analysis of correspondence" (Benzecri, 1987) was used.

Factorial Analysis of Correspondence (FAC)

This statistical procedure is a tool of multivariate description that can be applied to contingency matrices and provides a way to study the organization of data measured according to two or more nominal parameters.

Three statistical indices are important for the interpretation of the results:

- the percentage of the total inertia† explained by each axis;
- the distance of each variable or each object (lesson) in regard to each axis; and
- the contribution of each variable or each object (lesson) to the definition of the axis.

There were five axes. Table 6 indicates the percentage of the total inertia explained by each.

Table 6

Percentage of the Total Inertia Explained by Each of the Five Axes Generated by the FAC

No. of the axes	% Inertia
1	33.07
2	30.41
3	8.05
4	7.47
5	7.01

The first two axes take into account 63.48% of the total inertia, which is substantial. This justifies focusing the analyses exclusively on the definition of these axes.

For interpretation, only the variables and the lesson of which the relative contribution is equal or superior to 0.20 will be considered.

Table 7 presents the data necessary for the interpretation.

Two groups of lessons can be distinguished on the basis of the analysis of this table. The first includes lessons 19, 03, 21, 17, 09, 14, 15; the second is composed of lessons 04, 10, 01, 06, 07, and 11.

* This finding would be congruent with what we noticed in the previous paragraph: in these lessons, the teacher has more frequent dialogue with a specific child (TP) than in other kinds of lessons. In reality, both results are two facets of the same phenomenon: when she is teaching French grammar and mathematical computation, the teacher solicits more frequently than usual to a specific child (and, then, we observe more TP and RSP than in other lessons).

† The inertia in factorial analysis of correspondences is what the explained variance is in classical factorial analysis.

Table 7

Distance and Relative Contribution of Each Variable and Each Lesson in Regard to the First Axis of FAC

Variables	Distance	Relative contribution	Lesson	Distance	Relative contribution
RSC	-0.268	0.556	19—MP	-0.271	0.519
TC	-0.176	0.718	03—SI	-0.265	0.437
Impositive	-0.155	0.423	21—FR	-0.252	0.406
Positive feedback	-0.124	0.240	17—SI	-0.191	0.339
Concretization	-0.100	0.392	09—MP	-0.186	0.392
Negative affectivity	0.078	0.030	14—SI	-0.163	0.465
Personal responses	0.469	0.085	18—FW	-0.105	0.120
Controlling	0.109	0.119	15—FW	-0.091	0.224
Negative feedback	0.206	0.180	08—FG	-0.085	0.145
PS	0.200	0.222	05—MC	-0.020	0.009
RSP	0.389	0.222	02—MG	-0.007	0.001
Positive affectivity	0.576	0.418	20—FR	0.006	0.001
Content developing	0.543	0.509	12—FR	0.013	0.001
TP	0.206	0.691	16—MP	0.080	0.034
			13—FG	0.134	0.107
			06—FG	0.144	0.382
			07—MC	0.188	0.206
			11—MG	0.207	0.196
			10—MG	0.318	0.538
			01—MC	0.452	0.411
			04—FW	0.548	0.636

These groups of lessons can be put in correspondence with two groups of variables. The first group of lessons corresponds to the following set of variables: TC, RSC, Impositive, and Positive Feedback. The second group of lessons can be characterized by five variables: TP, RSP, PS, Content Developing, and Positive Affectivity.

The first group of lessons reflects a typically traditional teaching style. During these lessons, the teacher addresses most of her verbal behavior toward the whole class (TC), lectures, and frequently asks questions to the whole group without specifying who has to respond. It is supposed that the children who participate verbally know the right answer. This would explain the high level of positive feedback. But another supposition can be made for explaining the links between these variables. The format of these lessons as it appears through the descriptive reports of the observer is more like a collective discussion than like the supervision of a small group. In order to maintain the momentum or a continuous signal system (Doyle & Ponder, 1975; Kounin & Gump, 1974), she asks simple (or low level) questions in order to maximize the probability of right answers and to reduce the risk of having complicated answers

to evaluate. In this way, she creates the conditions for giving frequent positive feedback. Qualitative examination of the protocols seems to confirm this second supposition, which is not incompatible with the previous one.

What were the topics of those lessons? Three of them were scientific initiations; two others, mathematics problem activities. The two remaining ones were focused on French (reading in one case and writing in the other).

The second group of lessons reflects another interactive pattern in which a specific child is the interlocutor of the teacher. Her verbal behaviors are frequently oriented toward a particular pupil (TP). She frequently develops (i.e., accepts, clarifies, and amplifies) what a child says. Moreover, she expresses more positive affect than usual. The verbal participation of the children is quite different in comparison to the other group of lessons: they participate spontaneously or in response to personal solicitation.

There were four lessons of mathematics (two concerning computation and two concerning geometry) and two lessons of French (one about writing, the other about grammar).

Table 8 presents the distance and the relative

Table 8

Distance and Relative Contribution of Each Variable and Each Lesson in Regard to the Second Axis

Variables	Distance	Relative contribution	Lesson	Distance	Relative contribution
RSP	-0.707	0.718	20—FR	-0.207	0.565
Impositive	-0.124	0.272	01—MC	-0.515	0.534
Positive feedback	-0.126	0.249	08—FG	-0.154	0.470
TP	-0.092	0.137	13—FG	-0.269	0.430
Personal responses	-0.049	0.001	02—MG	-0.105	0.305
Negative feedback	-0.011	0.001	21—FR	-0.129	0.106
RSC	0.008	0.001	14—SI	-0.070	0.086
Concretization	0.035	0.005	12—FR	-0.067	0.041
TC	0.050	0.058	15—FW	-0.032	0.027
Positive affectivity	0.271	0.093	17—SI	0.019	0.003
Negative affectivity	0.171	0.144	06—FG	0.040	0.029
Content developing	0.386	0.257	09—MP	0.055	0.034
Controlling	0.165	0.273	19—MP	0.072	0.036
PS	0.335	0.621	05—MC	0.094	0.194
			03—SI	0.117	0.089
			10—MG	0.208	0.229
			04—FW	0.328	0.228
			11—MG	0.310	0.442
			16—MP	0.325	0.556
			18—FW	0.154	0.258
			07—MC	0.328	0.625

contribution of each variable and each lesson in regard to the second axis.

Few variables have a sufficiently high relative contribution to be considered in the interpretation of the second axis. This one is clearly polarized by two different forms of children's verbal participation: RSP, on the one hand; PS, on the other hand. Four other variables have also to be included in the analysis. Impositive function and positive feedback on the negative side; controlling function and content developing on the positive side. But the role that they play in the definition of this second axis is secondary, since their relative contributions do not go beyond 0.28.

Five lessons appear to be located on the negative side of the axis; two geometry lessons (01 and 02), three lessons concerning mother language (two about grammar, 08 and 13; one about reading, 20). On the positive side, there are three lessons with a high relative contribution on this axis (superior to 0.44) and three others with a lower loading on this axis (between 0.22 and 0.25). The first three lessons are focused on mathematics (07—MC; 16—MP; 11—MG). Among the three others, there is one mathematics lesson (10—MG) and two French lessons (18—FW, 04—FW).

It is important to notice that four of the six lessons which are located on the positive side of the first axis are also located on the positive side of the second axis. The overlap between the two axes is documented in Table 9.

Table 9

Overlap of the Lessons on the Two Axes

First axis	Second axis		
	Negative side	Intermediate	Positive side
Negative side		03-09-14-15-17-19-21	
Intermediate	02-08-13-20	05-12	16-18
Positive side	01	06	04-07-10-11

A group of seven lessons (03, 09, 14, 15, 17, 19, 21) clearly corresponds to the negative pole of the first axis, with the following group of variables: TC, RSC, impositive functions and positive feedback. A logical explanation of the links between these variables was proposed above.

Four other lessons (02, 08, 13, and 20) are quite similar to the seven mentioned above, although the FAC place them at the middle of

the first axis and on the negative side of the second one.

The similarity between these four lessons and the seven of the first group is apparent in Table 10, in which the average frequencies of both groups of lessons are compared.

Most of the categories have similar means. However, it appears that the lessons of the second group are characterized by three times the RSP of the seven lessons of the first group. It is on this basis that the F.A.C. differentiates two groups of lessons. But it is also worthwhile to notice two other differences: the lessons of the second group are also characterized by more than twice the negative feedback and 1.68 times the TP of the seven lessons of the first group. It is worth noting that two of the three grammar lessons are included in this group.

The six lessons which were on the positive side of the first axis are separated in three groups by the second axis. Four of these lessons (04, 07, 10, 11) are characterized by a high frequency of children's spontaneous participation (more than 34) and by a low frequency of personally solicited participation (less than 7), whereas lesson 01 is characterized by a low frequency of children's spontaneous participation ($n = 15$) and by a high frequency of personally solicited participation ($n = 52$). Lesson 06 is more similar to lessons 04, 07, 10, and 11 than to lesson 01. As shown by Table 11, the frequency of PS is high ($n = 34$) and RSP is rather low ($n = 17$). But this lesson is quite unusual in the ratio of TC/TP. The frequency of TC is 5.46 times the frequency of TP. All these six lessons are characterized by

- a high frequency of "content developing functions" (mean = 12),
- a relatively high rate of positive affectivity (mean = 2.5),
- a low level of impositive functions (mean = 46.33; thus the half of the second group of lessons),
- a high level of teaching behaviors oriented toward an individual pupil (mean = 59).

According to the descriptive report of the observer, these lessons were also characterized by a specific scenario. It begins with a presentation or a recall of some notions. Then, the teacher distributes printed exercises. A period of seatwork follows during which the teacher goes to the desk, and responds to the pupils'

Table 10

Average Frequencies of Two Groups of Lessons

Lessons	Functions									
	Controlling	Impositive	Content developing	Personal responses	Positive feedback	Negative feedback	Concretization	Positive affectivity	Negative affectivity	TP RSP RSC PS
09, 19, 15 21, 03, 14, 11	31.8	74.6	4	0.28	21.71	5.71	8.43	0.57	15.8	96.4 52.6 10 44.3 26
02, 08, 13 20	38.2	91	4.5	0.25	26.75	11.25	13	1.75	16	102.2 88.5 30 41 28.7

Table 11
Absolute Frequencies of the 14 Variables Included in the FAC: Lessons Composing the Second Axis

Lessons	Controlling	Impositive	Content developing	Personal responses	Positive feedback	Negative feedback	Concretization	Positive affectivity	Negative affectivity	TC	TP	RSP	RSC	PS
04	35	19	13	1	7	9	2	1	13	21	65	4	11	40
07	35	38	17	0	12	9	10	4	19	52	70	6	29	53
10	25	27	10	2	12	10	8	3	13	39	60	5	16	35
11	40	37	9	0	7	3	0	2	24	65	50	5	10	41
01	23	64	11	3	15	8	3	2	14	42	94	52	12	15
06	46	56	12	3	16	16	11	3	13	82	15	17	34	34

questions. At the end of the lesson, the teacher asks the pupils to look at the blackboard and corrects the exercises. During these lessons, the grouping varies a lot: large group during the first phase, seatwork during the second one and large group during the last one. Four lessons of mathematics (two of geometry and two of computation) and two lessons of French (writing and grammar) were organized in terms of this scenario.

Again, according to the descriptive report of the observer, all the lessons of the first group (03, 09, 14, 15, 17, 19, 21) as well as these ones of the second group (02, 08, 13, 20) were characterized by use of the large group.

Only four lessons (05, 12, 16, 18) do not find a clear position in regard to the structure defined by the two axes. According to the report of the observer, only one of these lessons (16) was characterized by changes in the grouping.

Conclusion

The main focus of this case study of the behavior of a teacher observed in 21 lessons is on variability; not the variability of a particular teacher in regard to the average teaching pattern, but the intra-teacher variability.

1. *The behaviors of any teacher present altogether some stability and some variability.* Bellack and his collaborators (1966) put the emphasis on the stability of teaching practices. What they concluded about senior high school lessons on international trade in 1960 was confirmed by several studies (Dunkin, 1986). Interaction in the classroom is like a game in which the players follow a specific set of rules. Certainly, some deviations are possible, but according to Bellack, they "are infrequent and relatively minor in comparison to the general system of expectations" (1966, p. 322).

2. On the other hand, evidence drawn from the studies of Good and Grouws (1975), Shavelson and Dempsey-Atwood (1976), Bertrand Leclerc (1985) and, mainly, of Bayer (1979) demonstrate that the behavioral variability of the same teacher on various occasions is greater than the variability of various teachers placed in the same situation. Most of the authors con-

cerned by the intra-individual variability phenomenon assumed that *the observed variations are neither the fruit of the teacher's impulse nor a game of chance; they are determined by contextual variables*. The content taught by the teacher could be one of these contextual variables.

Two hypotheses were formulated on the basis of these assumptions:

H.1 — the teacher's pattern of behavior remains stable whatever he or she is teaching.

H.2 — the teacher varies his or her behavior according to what he or she is teaching.

First, it appears that the data gathered are congruent with the first hypothesis. Whatever is being taught, the rank order of the nine functions identified by De Landsheere remains quite similar. On the other hand, the various analyses suggest caution with the second hypothesis: only some teaching behaviors (content developing, negative feedback) seem to vary according to the subject-matter taught. Other aspects of teaching — and especially the four most frequent ones (controlling and impositive functions, positive feedback, and negative affectivity) — seem not to vary in relation to the content of the lessons. Therefore, an alternative explanation of the teacher's variability was sought.

A factorial analysis of correspondences led to the identification of two major kinds of lessons as shown in Figure 1.

— In the first kind, the teacher lectures a great deal of the time. Probably, the questions asked are low level ones and most of the pupils' answers are correct since, in lessons of this type, the teacher gives a lot of simple positive feedback.

— The second kind of lesson is characterized by a high frequency of content developing functions, a relatively high rate of positive affectivity, a low level of impositive function and frequent teaching behaviors oriented toward a specific pupil (TP).

Each kind of lesson can be subdivided into two, according to the way the children participate in the lesson.

All the lessons of the second kind are characterized by a typical scenario: the lesson begins with a collective presentation or recall of some notions; then the teacher distributes exercises printed on sheets and organizes seatwork; finally, the teacher makes a collective correction of the exercises. On the other hand, the lessons of the first kind are mainly organized as a collective flow of activities: no individual exercises on sheets are planned.

The teacher's plan for presenting the content seems to be a more influential parameter than the content itself. Obviously, this is only a supposition, but it is the aim of any exploratory study to study the formulation of new hypotheses.

One may suppose that, for the lessons of the

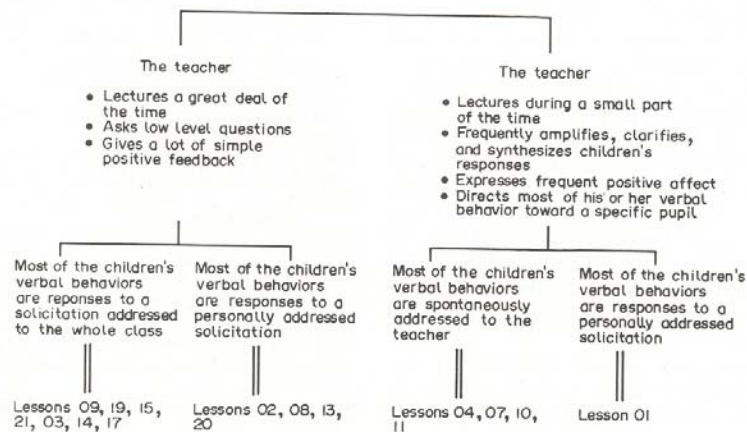


Figure 1. Pattern of teacher's and children's behavior in two main types of lessons.

first kind, the teacher had planned a collective discussion. This pre-instructional decision would have placed her in a situation (created by herself) which induced a high level of impositive functions (including low level questioning) and positive feedback. To explain the link between the planning decision and the interactive pattern, the notion of "format of lessons" proposed by Kounin and Gump (1974) is invoked.

When the teacher plans a collective discussion, he or she is confronted with the task of maintaining a "good" momentum or of organizing a continuous flow of verbal exchanges. One way to do this is to ask simple questions in order to maximize the probability of correct answers and to reduce the risk of having to give corrective feedback. Simple positive feedback arrives, in this situation, as a natural consequence. Pre-instructional decisions do not determine completely the teacher behavior. During the active phase of the teaching process, the teacher is confronted by alternatives; to control the children's verbal participation either by designating who has to respond (as in lesson 02, 09, 13, 20) or by addressing questions to the whole group without specifying who has to respond and accepting the answer of the most rapid pupil (as in lessons 03, 09, 14, 15, 17, 19, 21).

In planning to include seatwork in the lesson, the teacher creates a situation in which he or she is not confronted with the task of maintaining the momentum at a level of acceptability by oral behaviors. The flow of activities is pre-organized by the series of exercises printed on the sheet. The teacher is, then, free to walk through the desks and to wait for the questions of the children. When these arrive, the children's spontaneous participation is high as in lessons 04, 07, 10, and 11, and the teacher has the opportunity to interact individually with pupils and to amplify or clarify their ideas. Moreover, these individualized interactions have a character of privacy which facilitates the expression of positive affectivity. When no question arises spontaneously, the teacher may ask questions personally addressed to a pupil as in lesson 01.

Thus, according to this exploratory case study, it would be the teacher's pre-instructional decision concerning the grouping of the pupils which would mainly influence the interaction process. But this is only a hypothesis

which has to be verified by other studies.

References

- Anderson, H. H. (1939). The measurement of domination and socially integrative behavior in teachers' contacts with children. *Child Development*, 10, 73-89. Reprinted in E. J. Amidon & J. B. Hough (Eds.), *Interaction Analysis Theory, Research and Application*. Reading, MA: Addison-Wesley (1967).
- Antoine, J. (1979). *How preschool teachers teach*. Unpublished dissertation, University of Liège.
- Bayer, E. (1979). Sources of variances of Flanders' influence index. *Scientia Paedagogica Experimentalis*, 3, 5-21.
- Bellack, A. A., Hyman, R. T., Smith, F. L., & Kliebard, H. M. (1966). *The language of the classroom*. New York: Teachers College Press.
- Benzecri, J. P. (1987). Studying instruction in the elementary classroom. In R. Dreeben & J. A. Thomas (Eds.), *Issues in microanalysis*. Cambridge, MA: Ballinger.
- Bertrand, R., & Leclercq, M. (1985). Reliability of observational data on teaching practices in secondary school mathematics. *Teaching and Teacher Education*, 1, 187-198.
- Cibois, P. (1983). *Factorial Analysis*. Paris: P.U.F., "Que sais-je" No. 2095.
- Cronbach, L. J. (1974, September). *Beyond the two disciplines of scientific psychology*. Paper presented to the annual meeting of the American Psychological Association.
- De Landsheere, G. (1969). *How teachers teach: Analysis of verbal interaction in classroom*. Direction générale de l'Organisation des Etudes, Collection "Pédagogie et Recherche", No. 1, Bruxelles.
- De Landsheere, G., & Delchambre, A. (1979). *The non-verbal behavior of teacher. How teachers teach II*. Bruxelles: Labor; Paris: Nathan.
- Doyle, W. (1978). Paradigms for research on teacher effectiveness. In L. S. Shulman (Ed.), *Review of Research in Education*. (Vol. 5). Itasca, Illinois: Peacock.
- Doyle, W., & Ponder, G. A. (1975). Classroom ecology: Some concerns about a neglected dimension of research on teaching. *Contemporary Education*, 46, 183-188.
- Dunkin, M. J. (1986). Concepts and models in the study of teaching. In M. Crahay & D. Lafontaine (Eds.), *The art and the science of teaching*. Bruxelles: Labor, "Education 2000."
- Dunkin, M. J., & Biddle, B. J. (1974). *The study of teaching*. New York: Holt, Rinehart & Winston.
- Fisher, R. A. (1925). *Statistical methods for research workers*. Edinburgh: Oliver & Boyd.
- Flanders, N. A. (1970). *Analysing teacher behavior*. Reading, MA: Addison-Wesley.
- Frick, T., & Semmel, M. I. (1978). Observer agreement and reliabilities of classroom observational measures. *Review of Educational Research*, 48, 157-184.
- Good, T. L., & Grouws, D. A. (1975). Teacher rapport: Some stability data. *Journal of Educational Psychology*, 67, 179-182.
- Hays, W. (1963). *Statistics*. New York: Holt, Rinehart & Winston.
- Hersen, M., & Barlow, D. H. (1976). *Single case experimental designs: Strategies for studying behavioral change*.

- New York: Pergamon Press.
- Jacques, G. (1969). *The teaching of geography in first grade of high school*. Unpublished dissertation, University of Liège.
- Kerlinger, F. N. (1973). *Foundations of behavioral research*. New York: Holt, Rinehart & Winston.
- Kounin, J. S., & Gump, P. V. (1974). Signal systems of lesson settings and the task related behavior of preschool children. *Journal of Educational Psychology*, 66, 554-562.
- Lawler, R. W. (1985). *Computer experience and cognitive development: a child's learning in a computer culture*. New York: John Wiley.
- Lewin, K. (1935). The conflict between Aristotelian and Galilean modes of thought in contemporary psychology. In K. Lewin (Ed.), *A dynamic theory of personality: selected papers* (trans. by Adams & Zemer). New York & London: McGraw-Hill.
- Ninane, A. M. (1969). *An attempt to applicate Bloom's taxonomy to the analysis of teaching behavior*. Unpublished dissertation, University of Liège.
- Postlethwaite, T. N. (1985, June). Teacher effectiveness research. Paper presented at the University of Bangkok, Thailand.
- Shavelson, R., & Dempsey-Atwood, N. (1976). Generalizability of measures of teaching behavior. *Review of Educational Research*, 46, 553-611.
- Wannyn, M. Th. (1978). *Teaching behaviors of Ivory Coast's teachers*. Unpublished research report, University of Liège.
- Webb, N. W. (1982, April). *Generalizability of classroom processes: Taking into account the correlations among observations*. Paper presented at the annual meeting of the American Educational Research Association, New York.
- Withall, J. A. (1949). The development of a technique for the measurement of socialemotional climate in classrooms. *Journal of Experimental Education*, 17, 347-361. Reprinted in E. J. Amidon & J. B. Hough (Eds.), *Interaction analysis: Theory, research and application*. Reading, MA: Addison-Wesley (1967).

Received 10 December 1987 ☐