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EFFECTS OF AN OBSERVATION TRAINING PROGRAM ON FEEDBACK, STUDY OF SEVERAL CASES

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As frequently pointed out, information given to learners about their performance favourably influences their achievement. This was confirmed in the motor learning area (Bilodeau, 1969) and was also found in several studies dealing with teaching effectiveness (Carreiro da Costa & Piéron, 1992; De Knop, 1983; Phillips & Carlisle, 1983; Piéron & Piron, 1981).

These studies have reinforced the significance of feedback for teachers eager to improve the performance of their pupils.

Consequently, it is easy to understand why several studies focused on the modification of feedback emitted by pre- and in-service teachers (Piéron, 1993; Siedentop, 1981). Let us remember that teachers can increase the rate of feedback, to modify its structure or to make it more specific.

However, the points of view of researchers and teachers converge to a priority: the most important point is to improve the quality of feedback. The appropriateness of feedback characterizes teachers able to improve the performance of their pupils (Carreiro da Costa & Piéron, 1992).

This statement explains that teachers are frequently concerned with the best ways to improve the quality of their interventions. This legitimate concern is also of interest in teacher preparation in which effective means of action are sought.

These means have to be closely associated with the improvement of error identification by teachers (Armstrong, 1986; Hoffman, 1983). As shown by models of feedback emission, error identification results from the comparison between real and expected performances of the learner and is the starting point of the mental processes related to the selection of an appropriate reaction.

The most recent models emphasized two steps in these processes (figure 1):

1) The diagnosis

2) The prescription

Feedback emission would be strongly influenced by experience of the observer and by preactive decisions concerning the planning of her/his pedagogical action (Cloes, Denève & Piéron, 1992). Moreover, the accuracy of an observer shows a strong relationship with his/her experiences in analysis of specific tasks (Harari & Siedentop, 1990; Hoffman, 1983).

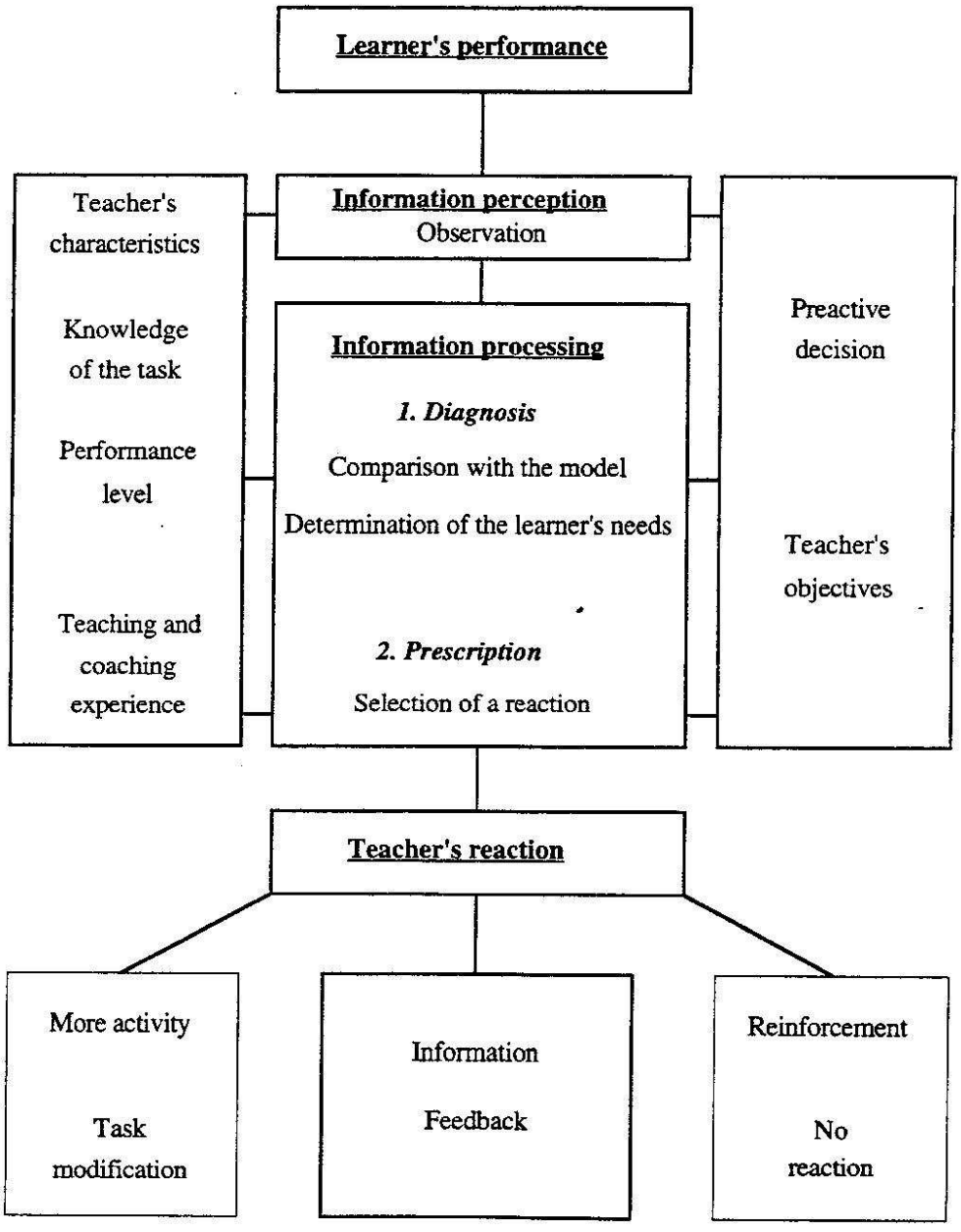

Figure 1 - Feedback model

without paying attention to the improvement of error identification, the first guarantee of its quality.

In error identification training programs, working on a video was the main tool used to improve the target skill. The procedure enables repeated analysis of identical motor performances.

It is also considered that the procedure can help teacher educators to engage their trainee in a reflective practice process. Reflective practice relies on the analysis of teaching skills and on the identification of new teaching strategies. In error identification training, reflective practice would be related to the analysis and refinement of the diagnosis skill.

The main objectives of the study were to: (1) verify if an error identification training program would exert direct effects on the modification of feedback characteristics, and (2) underline the importance of the reflective practice of the teacher on her/his preparation process.

METHODS

Programs aimed at the acquisition of teaching skills have showed that the subjects' characteristics influence strongly the effects of an experimental treatment (Cloes, 1987; Siedentop, 1981). Moreover, subjects involved in these kind of experiment were characterized with different sensibilities in comparison with the objectives of the preparation.

The interindividual variability underlines the interest and necessity of case studies in which each behavioural modification can be interpreted along the subjects' environmental and personal characteristics.

However, case studies are time consuming and limit the generalization of results. Comparison of large samples of experimental and control subjects provide more possibilities to generalize research findings. Frequently it is necessary to make some kind of trade-off between these two research designs.

This study was the first step of a tentative three-years experimental program focusing on error identification training and its effects on feedback. For this reason authors decided to choose an experimental design which was able to match the influence of subjects' personal characteristics and provided the possibility for generalization.

Comparison of groups of two or three subjects was selected. In this design, the effects of various modes of intervention were tested by non parametric statistics (Mann Whitney U tests and Wilcoxon signed rank test; Siegel, 1956). The comparison of two proportions proposed by Glantz (1988) was also used.

The experimental program was organized during a semi-controlled volleyball unit involving seven male physical education majors.

The experimental design comprised five phases: (1) pretest, (2) first observation phase, (3) training phase, (4) second observation phase, and (5) post-test.

1) Pretest. During this phase, subjects were assessed on two aspects. The technical and tactical knowledge was appraised by a 16-item questionnaire needing open and closed answers. The maximum score was 100 points. Validation of the questionnaire was established by comparison of the scores achieved by volleyball specialists and nonspecialists. The error identification skill was measured by the analysis of a video-taped sequence showing 15 rallies performed by intermediate level players during three against three volleyball games on a reduced court. The number of errors identified by the subjects was observed. The relevance of errors was found in comparing the subjects'

answer to the performance analysis of an expert. Validation of this test relied on the comparison of results achieved by volleyball specialists and nonspecialists.

2) First observation phase. This was designed to find out the feedback initial characteristics. It comprised three sessions during which subjects were engaged in a continuous game situation with two opposing teams of three players on a reduced court. One by one, each subject led a part of each session while the others were engaged in the activity. The leading subject had to provide feedback to his peers. The roles were randomly changed every eight minutes until all subjects played the leading role. Every session was video-taped and the feedback were recorded by a wireless microphone. A multidimensional analysis of feedback was completed with an adaptation of the FEED/ULg observation system (Piéron & Delmelle, 1983). Besides the rate of feedback, two dimensions were analysed (table 1):

1) The referent of the feedback, i.e. the content of the message. In that dimension, categories related to general, technical or tactical aspect of performance. Moreover, we noted also the skill associated with the feedback.

2) The appropriateness of the feedback, identified as the level of agreement between the content of the message and the characteristics of the learner's performance.

3) Training phase. It changed according to the subjects:

(1) Two control subjects did not receive any kind of training or information (S1 and S2).

Table 1

Dimensions and categories for feedback analysis

Referent	Appropriateness
General	Appropriate
Technical	Uncompleted
Tactical	Inappropriate
	Undetermined

(2) Two subjects (S3 and S4) were involved in a theoretical seminar during which the experimenter described the technical skills and the main strategies used in a three against three volleyball game on a reduced court. The objective of that seminar was to carry out a guided discovery process on the critical elements of the volleyball skills, the most crucial performance errors and their origins. The subjects involved in that instruction formed the first experimental group.

(3) Three subjects formed the second experimental group (S5, S6, and S7). They followed the seminar with the subjects of the previous group and were engaged after that in an individualized training on error identification. Two 45 minutes training sessions were organized for each subject. They used a checklist to observe a specially devised video-tape providing a compilation of 25 rallies of three against three games. Each rally was seen at normal speed and analysed. The observer's analysis was then checked and commented upon by one expert analyst during a slow motion viewing. The subject was encouraged to engage in a reflective practice referring to the correction of observation and diagnosis. A second trial at normal speed was finally given.

4) Second observation phase. It was presented with the same characteristics as the previous one and designed to figure out the feedback final characteristics.

During both observation phases, the intra-observer reliability of feedback analysis was assessed by Bellack's percentage of agreement. It exceeded 83.1% in all aspects of feedback.

5) Post-test session. The same tests were administered to the subjects after the three sessions following the training phase.

The intra-observer reliability was higher than 83.1%, in all aspects of feedback.

RESULTS AND DISCUSSION

Results will be presented in the following order: evolution of the theoretical knowledge, evolution of the error identification, and evolution of the feedback characteristics.

1) Theoretical knowledge

Only one subject (S6) significantly increased his level of theoretical knowledge (table 2). This subject was in the second experimental group and had followed the seminar and the error identification training. At first sight, this result tends to point out the ineffectiveness of treatment conditions to enhance subjects knowledge. The picture was brighter when one considered that four out of five subjects from the experimental group showed an improvement (table 2). Moreover, the evolution tended to be more favourable in the experimental group than in the control group (+ 7.3 vs - 4.3% of possible gain, $U = 2$, $P = .114$).

Involved in a setting which implied reflection centred upon the meaning of the critical elements, these subjects could have acquired knowledge favourable to further emission of feedback. However, the relationship between the knowledge gain and the improvement of other variables should be checked.

Table 2

Evolution of the specific theoretical knowledge evaluation (max. 100)

Groupe	Subjects	Initial level	Percentage of possible gain
Contr.	1	71	+ 6.0
	2	66	– 14.7
Exp. 1	3	52	+ 18.7
	4	59	+ 12.2
Exp. 2	5	51	+ 6.1
	6	65	+ 45.7 *
	7	74	– 46.1

* $p < .05$

2) Error identification

a) Number of identified errors

Without apparent relationship with a low initial level, two subjects of the second experimental group showed the highest increase of the identified error number (table 3). For these subjects (S5 and S7), the training would have exerted an inhibiting influence, particularly when they were not quite sure of their diagnosis. This finding must be put alongside the expected effects of the acquisition of a reflective practice by in-service teachers. Improvement of their self confidence could be dependent upon

the successive decisions taken by these pre-service teachers during their preparation.

Table 3

Evolution of identified errors

Groupe	Subjects	Evolution of the number of identified errors	Percentage of possible gain of identified error relevance
Contr.	1	− 3	+ 22.0
	2	+ 5	+ 24.8
Exp. 1	3	+ 5	+ 7.6
	4	− 3	− 38.2
Exp. 2	5	+ 26	+ 21.1
	6	− 3	+ 81.4 *
	7	+ 8	− 24.3

* $p < .05$

A decrease of the number of identified errors was observed in the last subject of the second experimental group - S6 (table 3). In the post-test, he tended to point out only the errors for which he was certain of his diagnosis. In comparison with the other subjects, this different approach underscored a clear interindividual variability of the sport skill analysis process.

No significant correlation was found between the number of identified errors and achievement to the specific knowledge test ($r = .298$; $p = .516$). The larger increase is the number of identified errors in the second experimental group which would be associated with the video training. Subjects were trained to remember and list performance errors that they had seen. These abilities were considered by Drummond (1987) as factors influencing the error identification process.

b) Relevance of identified errors

Only one subject in the video training group significantly improved his ratio of relevant identified errors ($z = 3.915$; $p = .001$) (table 3).

The decline observed by subjects 4 and 7 and the progress of the control subjects did not support the effectiveness of the experimental program (table 3). This finding disagrees with the conclusions of Gangstead & Beveridge (1984). These authors proposed a program longer than the one conducted in this research (36 hours).

However, several arguments tend to temper the initial pessimism of our results. Video trained subjects tended to identify more relevant errors than other subjects (37.7 vs 22.2) ($U = 2$; $p = .114$). While their initial level was comparable to that of the other groups ($U = 0$; $p = .64$), the number of relevant errors identified by subjects 5 and 6 increased four to five times more ($U = 0$; $p = 0.067$).

Subjects 4 and 7 decreased the level of relevance of the identified errors. This was probably due to external events occurring around their post-test. These subjects completed their post-test immediately before passing a sport skill examination. The report of the administrator of the test sessions pointed out that some stress associated with the imminence of the examination could have disturbed the subjects' concentration, causing them to make several errors in their sport skill analysis. This may explain the initial relatively unfavourable results. This underlines also the influence of environmental conditions on the mental processes associated with error identification. These kinds of factors should be considered in the study of sport skill analysis processes as well as in the study of feedback variability.

Results concerning the relevance of the identified errors stressed the importance of the theoretical knowledge as prerequisite for the quality of the error identification process. The improvement of the identified error relevance observed by subjects of the second experimental group

showed a correlation close to the level of confidence with their theoretical knowledge achievement ($r = .993$; $p = .078$). The significant correlation observed between the level of theoretical knowledge and the ratio of identified errors relevance reinforced that opinion, confirming the results of Harari & Siedentop (1990).

3) Feedback characteristics

We will envisage successively the evolution of the amount of feedback, its specificity and the evolution of its appropriateness.

a) Amount of feedback

Few statistically significant modifications were observed between the observation phases (table 4). Only subject 5, a member of the video training group, increased his feedback frequency (table 4). Characterized by a high initial number of emitted feedback, his progress is particularly noteworthy. After the post-test, the same subject presented the highest increase in identified errors. The video training probably helped him to improve his ability to express his observations. That relationship was not shown in other subjects ($r = .395$; $p = .463$).

The experimental program favoured a slight increase in the feedback amount as shown by the different evolutions observed between control and both experimental groups (-23.8 vs + 4.5) ($U = 0$; $p = .047$). Two factors could explain these divergent evolutions:

1. Due to the absence of any information during the unit, it is probable that they had lost their motivation. This could be confirmed by two observations: (1) they were increasingly late to the teaching sessions, and (2) they decreased the intensity of their work. This observation points out the importance of personal involvement in the teaching process and the harmful influence of the lack of follow up in teacher reflective practices.

Table 4

Evolution of the number of feedback emitted by session

Groupe	Subjects	First observation phase	Second observation phase	Evolution	Statistical significance
Contr.	1	51.0	31.3	– 19.7	U = 0, p = .05
	2	84.0	56.0	– 28.0	n.s.
Exp. 1	3	36.0	32.7	– 3.3	n.s.
	4	28.7	39.0	+ 10.3	n.s.
Exp. 2	5	34.3	46.3	+ 12.0	U = 0, p = .05
	6	30.3	32.7	+ 2.4	n.s.
	7	23.7	25.0	+ 1.3	n.s.

2. Most subjects in the experimental group probably benefited from the cognitive learning embedded in their active participation in the seminar. This finding shows again the importance of the prerequisite level of the specific knowledge.

b) Feedback specificity

The ratio of technical and tactical feedback increased noticeably by all subjects (table 5). The highest changes were observed in the video training group. Moreover, subjects 5 and 7 showed statistically significant progress (U = 0; p = .05) (table 5).

Table 5

Evolution of the ratio of specific feedback (%)

Groupe	Subjects	First observation phase	Second observation phase	Evolution	Statistical significance
Contr.	1	56.2	66.0	+ 9.8	U = 0, p = .05
	2	49.6	59.5	+ 9.9	n.s.
Exp. 1	3	70.8	81.6	+ 10.8	n.s.
	4	62.8	69.2	+ 6.4	n.s.
Exp. 2	5	43.7	70.5	+ 26.8	U = 0, p = .05
	6	72.5	85.7	+ 13.2	n.s.
	7	53.5	76.0	+ 22.5	U = 0, p = .05

Considering the poor post-test results of subjects 4 and 7, it was impossible to relate the feedback modifications to the changes in error identification process or to the evolution in specific knowledge. However, the combination of the seminar with the video training seemed to exert a favourable influence on the content of the messages delivered by the subjects. Improvement in the teachers' theoretical and practical framework could bring them to increase the amount of specific feedback. This can be considered as a favourable element as the role of such feedback is well known in cognitive and motor learning.

c) Feedback appropriateness

Only subjects 4, 5 and 7 improved their feedback's appropriateness (table 6). Even if their progress did not reach statistical significance, it is worthy to note that two of them were in the second experimental group.

Table 6

Evolution of the ratio of appropriate feedback (%)

Groupe	Subjects	First observation phase	Second observation phase	Evolution	Statistical significance
Contr.	1	79.9	68.9	− 11.0	U = 0, p = .05
	2	57.6	56.3	− 1.3	n.s.
Exp. 1	3	75.3	70.7	− 4.6	n.s.
	4	71.1	76.9	+ 5.8	U = 0, p = .05
Exp. 2	5	77.6	80.6	+ 3.0	n.s.
	6	77.5	71.4	− 6.1	n.s.
	7	66.2	73.4	+ 7.2	n.s.

The evolution of the feedback's appropriateness is quite surprising. As most of the subjects have improved the quality of the error identification process, it was expected to observe a parallel improvement in feedback appropriateness. Findings did not confirm this hypothesis. Subjects seemed to be able to correctly identify the performance errors but were unable to emit appropriate feedback from their task analysis.

Two factors could be proposed to explain this phenomenon:

(1) In teacher preparation, there was often a gap between behaviour modification related to experimental conditions and their effects observed in live settings. Such a lack of transfer, was pointed out in a recent experiment on error identification video training (Eckrich, 1993).

(2) As pointed out in Armstrong & Imwold's model (1982), feedback emission processes should be characterized by the existence of two sub-processes, diagnosis and prescription. An improvement in the first did not automatically bring an improvement in the second.

In the feedback emission model presented above (figure 1), the transition between both sub-processes should be located in the information processing stage, between diagnosis (2) and determination of learners' needs (3).

Following these propositions, two factors could be put forward to enhance the effectiveness and transferability of error identification and the feedback training program:

(1) A longer training period aiming at error identification;

(2) Specific training to emit feedback from error identification with an emphasis on the natural link between diagnosis and prescription.

CONCLUSIONS

The objectives of the study were to figure out the effectiveness of an error identification training, to verify its repercussions on the characteristics of feedback emitted in live situation by the subjects, and to underline the influence of a reflective practice on teachers' preparation. It appeared that:

(1) Error identification video training led to substantial improvement of quantitative and qualitative aspects of sport skill analysis processes;

(2) Observed improvements of the sport skill analysis processes presented interindividual variability related to the characteristics of the subjects and to the environmental conditions;

(3) The specific knowledge was a prerequisite to the error identification;

(4) The involvement of the subjects in their preparation program influenced the effectiveness of the program. This underlines the influence of a guided reflective practice;

(5) The repercussions of the experimental program on the characteristics of the feedback message in a live situation did not confirm the hypothesis set forth in the study;

(6) Weak results received by two experimental subjects at the post-test did not support the hypothetical link between the error identification and the feedback message.

Among the practical implications that could be identified from our results, let us point out that:

(1) In teacher preparation, reflective practice would bring several assets. Based on the active involvement in their preparation, trainees would develop a better awareness and a higher integration of the useful pedagogical knowledge. As it was shown in teacher preparation (Siedentop, 1981), their personal implication would also improve the program effectiveness. What one wants, one does!. Reflective practice could be systematically used to select target behaviour modification objectives;

(2) All preservice teachers are not equally able to be directly engaged in a reflective process. Some of them need help to analyse their pedagogical decisions, behaviours and strategies. Reflective practice should be proposed after a specific training to familiarize trainees;

(3) Some personal characteristics are better adapted to the reflective practice than others. Individuals with a creative personality could be easier to be introduced to reflective practice;

(4) Teachers are not used to being involved in reflective practice. Teacher educators should encourage them to exploit the advantages of these procedure.

In teaching, feedback results from a global process needing diagnosis and communication skills. We cannot hope to develop an effective program

to improve its quality without bringing together these two main components.

The references are compilated at the end of the proceedings.