ED 360 851   FL 021 430

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TITLE   Verbal Protocol Data as a Reliable Source of
                Information about Reading Behavior and Cognitive
                Processes: The Case of Reading Arabic as a Foreign
                Language.
PUB DATE   [93]
NOTE   27p.
PUB TYPE   Reports - Research/Technical (143)

EDRS PRICE   MF01/PC02 Plus Postage.
DESCRIPTORS   *Arabic; Behavior Patterns; *Cognitive Processes;
                College Students; Data Collection; Higher Education;
                Introductory Courses; Protocol Analysis; *Reading
                Skills; *Reading Strategies; Research Methodology;
                *Second Languages; *Text Structure; Time Factors
                (Learning); Uncommonly Taught Languages

ABSTRACT

         This study investigated the kinds of knowledge and
strategies beginning second-language readers used when reading texts
to build their own consistent patterns of meaning and experience.
Specifically, it looked at how readers' knowledge grew, where their
ideas originated, and when and how their ideas were used. Subjects
were five college students of Arabic, who were instructed in the
think-aloud procedure and who then read four informative texts with
varying text structures, styles, and subjects, thinking aloud as they
read. Subject comments were categorized by reasoning operation and by
monitoring concerns occurring during reading. Three additional
analyses examined strategies used in meaning development, knowledge
source used in making meaning, and timing of the comment in relation
to the reading experience. Results indicate that subjects' primary
concern during reading was with meanings they were developing, by
using hypothesizing and schemata, formulating and refining ideas,
focusing on specific content, and validating the text-model or
text-world being developed. Behavior patterns differed somewhat at
different points in the reading process, with more questioning and
hypothesizing at the beginning and more knowledge use later.
Behaviors generally focused on awareness rather than use.
Meaning-construction strategies were consistent across texts.
Contains 28 references. (MSE)

VERBAL PROTOCOL DATA AS A RELIABLE SOURCE OF INFORMATION ABOUT READING BEHAVIOR AND COGNITIVE PROCESSES: THE CASE OF READING ARABIC AS A FOREIGN LANGUAGE (AFC)

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TO BE PRESENTED AT THE 1994 ANNUAL MEETING
OF THE AMERCAN EDUCATIONAL RESEARCH ASSOCIATION (AERA)
NEW ORLEANS, LA

Verbal Protocol Data As A Reliable Source Of Information

About Reading Behavior And Cognitive Processes: The Case

Of Reading Arabic As A Foreign Language

Introduction

Reading is a cognitive activity, a process of meaning-in-motion in which understandings are developed and changed throughout the process, reflecting an interaction between the textual and extratextual factor at work in the process.

When readers develop their ideas, they rely on various kinds of knowledge: knowledge about the content, genre, and structure and how these work together in the evolution of the conceptualization of an entire unit of discourse (Iser, 1975; Langer, 1986; Langer, et al., 1990). This approach to the use of knowledge grows out of the constructivist view that language comprehension involves active participation on the part of the reader (Bartlett, 1932; Bransford & Johnson, 1973; Spiro, 1980) and that the meaning that develops is the consequence of a wide range of textual, contextual, and attitudinal forces continually at play in the human mind. This view of language comprehension has been adopted by many contemporary linguists (Fillmore, 1981; Halliday, 1977; van Dijk, 1977) and psychologists (Minsky, 1975; Shank & Abelson, 1977; Rumelhart & Ortony, 1977; Spiro, 1980).

This approach to the use of knowledge is consonant with
the proposition that meaning construction in reading is a
function of the interrelationships among a variety of complex
sources, and leads to the contention that "the act of meaning
construction cannot be described by a linear, or even a
simply recursive model--interpretation and change are deeply
interwoven every step of the way" (Langer, 1986:74).

With respect to the construct of reading comprehension,
it is known that direct assessment of the trait is impossible
since it is a mental operation which is unobservable. Using
think-aloud protocols is a way of getting at the unobservable
behavior of reading comprehension.

Verbal Reports

The concept of introspection, that is, the manner in
which the mind observes its own processes, can be traced at
least to Aristotale and Plato (Boring, 1953). However,
concurrent verbal reports, a popular tool of reading
researchers, had their genesis in the experimental intro-
spection of classical psychology.

The literature of cognitive psychology reports
significant differences in opinion regarding the validity and
reliability of verbal reprots. A think-aloud protocol is
produced when a reader verbalizes his or her thought
processes while completing a given task.

In a widely cited critique of the method, Nisbett and Wilson (1977) content that all verbal report data are highly suspect since, according to them, people have little or no access to their higher order cognitive processes.

Others believed that verbal reports might be appropriate under certain conditions. These researchers maintained that such data were useful in exploratory studies and as means of identifying hypotheses which could then be examined in subsequent research (Kanfer, 1968), or as one of several data bases providing convergent validity for a given research questions (Aweiss, 1993b; Sternberg, 1985). However, they cautioned against viewing verbal reports as substitutes for the events which they describe.

Still other researcher in the field (Afflerbach and Johnston, 1984; among others) share a perspective most cogently expressed by Ericsson and Simon who said that "verbal reports, elicited with care and interpreted with full understanding of the circumstances under which they were obtained, are a valuable and thoroughly reliable source of information about cognitive processes" (180:247). Specifically, Ericsson and Simon (1980) stressed the importance of minimizing: (a) the additional cognitive demands imposed by the directions to verbalize and (b) the amount of time between the utilization of a strategy and its report. When the two guidelines are implemented, it is less likely that the act of verbalizing will substantially alter

the subject's normal thought processes and more likely that
the verbal reports will accurately reflect those processes.
In short, the validity of the verbalizations will be
enhanced.

Verbal reports or think-aloud protocols have been used
in many L1 and L2 research studies as a method of getting at
the mental processes that language learners use (Afflerbach &
Johnston, 1985; Bereiter & Bird, 1985; Block, 1986; Cohen,
1987; Cohen & Hosenfeld, 1981; Ericson & Simon, 1984; Langer,
1986; Sarig, 1987; among others).

Despite having some reservation about the think aloud
procedure--would slow down the reading process and provide an
incomplete picture of strategy actitivty--Bereiter and Bird
(1985) concluded that it is a useful technique, especially
when the focus is the identification of strategies to teach.
Likewise, after using the procedure in a reading experiment,
Johnston and Afflerbach (1985:229) concluded that the think
aloud procedure "elicited...largely veridical indications of
the process".

In summary, studies that utilized introspective
approaches were desinged to gain insight into various aspects
of the reading process. While the results of these studies
are not conclusive, they do suggest that under certain
conditions, introspective approaches can be a viable means of
studying the reading process.

The Study

The research investigated in this paper is part of a larger investigation that looked into the reading behavior and cognitive processes of foregin language learners.

Subjects: The participants for this study were beginning American learners of Arabic as a foreign language (AFL) enrolled at a large midwestern state university.

Materials: Materials for the study consisted of four short texts (150-175) informative texts adapted from the EMSA textbook (Peter Abboud & Ernest McCarus, Eds.). The passages are written in a variety of styles (text structures) about different subjects.

Procedure: The five subjects (2 males and 3 females) who voluntraily took part in the think aloud procedure were individually briefed and trained. The training session lasted between 13-30 minutes and included a sequence of direct explanations, coahing, and modeling. The subjects were instructed to "say out loud everything that comes to mind as you try to read and comprehend the text." The experimenter first provided an example and modeled thinking aloud. The subjects were then individually asked to think aloud about a short passage, and the experimenter provided feedback and in some cases more modeling. Subjects practiced thinking aloud on two more short passages. No additional practice was needed. During the actual experiment, The readers were not cued at predetermined points. Once they had received their

initial instruction encouraging them to express the processes
tehy use while reading, they were not prompted to verbalize
their thinking processes.

Analysis of Meaning Construction

The purpose of this analysis was to explore the kinds of
knowledge and strategies readers used when contemplating
written texts to build their own consistent patterns of
meaning and experience. In particular, this analysis
investigated how foreign language readers' knowledge grew,
where their ideas originated, and when and how their ideas
were used.

The on-line protocols gathered for the present study,
provide the most direct look at such processes. By their very
nature, such analyses enable the researcher to look through
what readers say in order to describe the underlying patterns
of foreign language readers' behavior.

To permit the codification and analysis of subjects' on-
line attempts to construct meaning when they read, a detailed
system, adapted from Langer's (1986) Analysis of Meaning
Construction was used. The system describes the knowledge
sources, specific strategies, and general approaches readers
use to develop their interpretation of the text. Each comment
was categorized along two major dimensions:on the reasoning
operations, and on the monitoring concerns that occur during
the reading activity. An additional three analyses examined

(1) the strategies used in meaning development, (2) the

knowledge source used in making meaning, and (3) the time in

the reading experience when that particular comment occurred.

The major categories examined in the Analysis of Meaning

Construction are summarized in Figure 4).

Figure 4
Analysis Of Meaning Construction

Reasoning Operations
  Questioning
  Hypothesizing
  Assuming
  Using Schemata
  Making Metacomments
  Citing Evidence
  Validating

Monitoring
(awareness and use)
  Task goals
  Task Subgoals
  Genre/Discourse Structure
  Mechanics
  Lexicon
  Statements of Meaning
  Refinements of Meaning

Strategies
  Generating Ideas
  Formulating Ideas
  Revising
  Evaluating

Time
  Before
  During
  After

Knowledge   Source
  Genre
  Content
  Text

The analyses were concerned with how readers make
meaning, as this was revealed in their think-aloud comments
about their behavior while reading.

Patterns of Reasoning Operations

One aspect of readers' strategic behavior investigated
in this study, is the pattern of reasoning that is involved
in meaning construction. During the process of independent
reading, readers ask questions, make assumptions about what
they and others know, use information or ideas drawn from
their general schematic knowledge, generate hypotheses, give
evidence for and seek validation of their ideas. The
following is a sample of the thoughtful reasoning behaviors
involved in the construction of meaning in the four
experimental texts used in this study. The categories as well
as the explanation that follow each of the reasoning
operations were adapted from the original system of meaning
construction developed by Langer (1986). The examples cited
reflect comments made by the subjects in this study (Figure
5). Readers' communication units--remarks and comments--(193
in all) were transcribed and tabulated (by the researcher and
an assistant) into 13 major categories and subcategories (see
Figure 5).

Figure 5
Reasoning Operations in Reading

Questioning- uncertainties and incomplete ideas that the reader has at any point in reading--related to the genre, content, or text (no specified guess or expectation). "why is he telling the president about his teacher?" "What's it saying about the summer?"

Hypothesizing 1 Present- plans or expectations the reader makes about what information will be presented at that point in time."So, he is learning how to teach and he is writing to the president of U of Kuwait," "Perhaps this means taught, so he must have taught the Middle Eastern stuff."

(H) Hypothesizing 2 Future- plans the reader makes about what will be "said" in succeeding portions of the text. "I think he will go back to or travel to Jerusalem."

(H) Hypothesizing 3 Past - plans the reader makes about what might now be "said" or "understood" in preceding portions of the text. "May be it meant something like "speak, I speak."

(A) Assuming- meanings the reader assumes need no further explanations or elaborations. "Right, I thought it was about Egypt," "It doesn't seem to be an important thing,""There is nothing to think about."

(S) Using Schemata- the ideas being developed or explained based on genre, content, or text. "Oh, that's in upper Egypt," "that's similar to what we have in the states."

(SP) Using Schemata Personalized- personal experience drawn upon by the reader. "Ya, I've seen it, it's large," "I know that famous saying historically."

(SE) Using Schemata Evaluated- evaluations and judgments being made about what is being read. "It's the capital of Egypt, I know that," "He's visiting Jerusalem, that's pleasant."

(SL) Making Schematic Links- concept links being made by the reader. "He met me in the rain, that's strange. I thought it doesn't rain there in summer," "didn't he say he was Egyptian."

(MC) Making Metacomments Content- comments about the reader's use or non-use of particular content information. "that's not a clear letter," "Ah, there it is, I didn't read the whole sentence."

(MT) Making Metacomments Text- comment about the reader's use or non-use of particular surface features of the text itself. "This is difficult, I can't read it," "the English word is more difficult than the Arabic word."

(E) Citing Evidence- the information the reader presents, the explanations provided, or the evidence developed to answer a question or carry out a hypothesis. "he's looking for a job," "such an industrious student, this guy."

Validating- information (implied or direct) that the plan

was fulfilled or a decision made. "Oh, Herodotus, that's the

Greek guy," "I see, that's how it works there."

General Patterns

When foreign language learners read, the focus of their

attention is almost equally divided between hypothesizing and

using schemata, that together, make up more than half of

their reasoning operations (Table 28). Other mental

operations take place but in lesser frequency. Across the

reading texts in the present study, 56 (29%) of readers'

remarks (communication units) involved the direct use of

hypothesizing--present hypothesizing accounting for 87% of

their remarks within that category. 45 (23.6%) of subjects'

comments involved using schemata. The remaining comments were

split primarily among making metacomments 35 (18%),

questioning 29 (15.2%). The reading protocols also showed

less concern citing evidence in support of interpretations

being formulated 6 (2.8%) and more with validating previous

interpretations 22 (11.4 %).

Table 28
Reasoning Operations

Number & % of Remarks/Comments (Communication Units)

Hypothesizing	56 (29%)
Using Schemata	45 (23.6%)
Metacomments	35 (18%)
Questioning	29 (15.2%)
Citing Evidence	06 (2.8%)
Validating	22 (11.4%)

Total	193 (100%)

Changes in Reasoning Over Time

Being both a dynamic and changing process, one would expect to find different patterns of behavior at different points during independent reading. In this analysis, the sequential coding of each comment in the protocols, permitted a closer look at how these processes change in the course of a single reading. Each protocol was divided into three segments: comments before the task began, comments during the reading activity, and comments after the last word was read.

BEFORE: Three of the five subjects who participated in the
think aloud procedure in this study, began their reading
tasks simply plunging in, without any preparatory
hypothesizing about the passage, i.e., without any reasoning
or mental operations. The other two subjects were more
reflective, even before the reading task. Before reading, all
four (3.7%) comments reflected hypothesizing about what the
text would be about. No other reasoning operations were
evident in the protocols.

DURING: Considerable consistency in the reasoning operations
that occur from one segment to the next, with direct use of
schemata and hypothesizing dominating. Questioning operations
reflecting uncertainties and incomplete ideas that the reader
has at any point in reading were also used more during the
early stages of reading and became scarce toward the end.

AFTER: After they had completed reading a text, all subjects
engaged in the mental activity of validating or reaffirming
the accuracy of information in the text (75%). In addition,
two subjects made comments reflecting their focus on their
own experience (using schemata personalized).

Monitoring Behaviors in Reading

The process of reading involves a variety of self-
regulatory mechanisms which monitor meaning construction.
Langer (1986:83) argues that "monitoring behaviors serve as a
"third eye" to see that meanings make sense and to flag

problems when messages become confused". Comprehension
monitoring, employed by the readers in the process, serve a
dual purpose. Firstly, when necessary, they help readers
become aware of the cognitive activities involved in the
process, and secondly, such mental activities help in the
development, refinement, and organization of readers' ideas.
It is thus safe to argue that the ability to monitor one's
comprehension, the ability to detect comprehension
breakdowns, and consequently utilize appropriate fix-up
strategies, are important aspects of every reading
experience.

Monitoring strategies were examined in terms of
different concerns of the reader: These categories, with
examples of their use, are illustrated in Figure 6.

Figure 6
Monitoring Behaviors in Reading

I- Awareness of Own approaches:

a) aware of task goals/demands."I'll read it again," "So, let's just review," It's the vocabulary that I basically need, I got the conjugation down."

b) Aware of subgoals: I don't know how to get to this word's meaning."

c) Aware of genre/discourse: "that's someone talking about the Nile," "now we go to the letter which is written in a month which I don't know," "peace be with you, that's a greeting. Let's see, this is a letter."

d) Aware of grammatical routines and mechanical features: "this must be the past tense of something," "So, that's whatever that called, tense, ah, it is called "passive," "I don't know what to do with this sentence."

e) Aware of available or unavailable lexical repertoire: "I didn't know what that word means," "it's a term like "while" or something," "I don't understand this, anyway."

f) aware of statements of meaning: I don't know what to do with this paragraph."

g) aware of refinements of meaning:"It's the capital of Egypt, I know that," "Ah, got that one," "ya, it's the Middle East, Jerusalem is in the Middle East."

II- Uses self-regulating mechanisms

a) formulates task/topic goals:"I'll try to translate this."

b) formulates subgoals:"ok, I'm confused. Let's go to some background information," "I don't know some words here, I'll look up the vocabulary."

c) uses genre/discourse features: No examples.

d) uses grammatical routines or mechanical features: No examples.

e) makes lexical choices: No examples.

f) states meaning:"he wants to visit Jerusalem," ""so he's decided to take the trip."

g) refines meaning:"oh, hold on, may be there are two dams," "I don't get it quite well, I"ll keep reading."

GENERAL PATTERNS

By the nature of the protocol data gathered, all of the comments recorded represent some degree of self-awareness or monitoring of what one is doing while reading. Generally speaking, foreign language readers' comments reflecting awareness of one or another idea or strategy exceeded those reflecting use by about sixfold (85% to 15%). In the former, the reader is more consciously aware of the choices available to choose among these alternatives in a strategic

way. In the latter, there is monitoring of what is being
done.

Strategies Used in Reading

In the process of meaning development, foreign language
readers, like all other readers, use a a variety of broad
strategies. Strategies are deliberate, cognitive actions that
can be accessed for a conscious report (Paris, Lipson, &
Wixson, 1983). Most researchers argue that the strategies and
the phases or stages of their use, are interrelated and
recursive rather than representing a linear sequence (Flower
& Hayes, 1980; Spiro, 1980). Four broad strategies were
identified in the protocols of the present study (Figure 7)

Figure 7
Strategies Used in Reading

---

1 (G) generating ideas--becoming aware of relevant ideas and
experience.

2 (RF) Formulating and refining meaning--drawing on personal
experience, linking concepts or propositions, and
paraphrasing, and summarizing.

3 (EM) Evaluating meaning--reacting, and monitoring the
development of meaning.

4 (RV) Revising--knowing meaning has broken down, and taking
appropriate measures.

Remarks focusing on formulating meaning occurred most
frequently (63%), followed by revising (22%), evaluating
(10%), and generating (5%).

Knowledge Sources

Following Langer s (1986) system of meaning
construction, three knowledge sources were identified
(Figure 8): knowledge of genre, knowledge of the content or
ideas themselves, and knowledge drawn from linguistic
material of the text.

Figure 8
Knowledge Sources

(G) genre--reference to the specific genre and the

   organizational structure and presentation of ideas

   peculiar to that genre (5%).

(C) content--reference to the topic itself (75%).

(T) text--reference to the linguistic material contained in

   the text--syntax, vocabulary, cohesive ties from the text

   and reworded it (20%).

These sources simultaneously impact the reader's

dev. loping understanding. Genre expectations about both

content and text, which are capable of shaping the reader's

perception from the beginning of the reading, accounted for

the least number of communication units or comments (5%). The

greatest proportion of comments fell into the content

category (75%), with the remaining (20%) reflecting concern

with text.

Summary

The data presented in this analysis, supplemented by the

qualitative analysis of readers' recall protocols, provide

our most direct look at the processes underlying foreign

language learner's reading performance.

In their reading, the primary concern of subjects was
with the meanings they were developing. Across the various
dimensions of the analysis, this emerged in their focus on
hypothesizing, using schemata, formulating and refining
ideas, focusing on specific content, and validating of the
text-model or the text-world that was being developed.

In general, patterns of behavior were somewhat different
at different points in the reading process--with more
questioning and hypothesizing at the beginning, and more
using of what they knew or were learning being reported at
later points in time.

The general approaches of behaviors during meaning
construction were were predominantly focused on awareness
rather than use. In general, readers' comments focused on
thoughts about awareness--about the options they might have
available, rather than on what they were actually doing.
beginning foreign language readers were more likely to
reflect forward or back on the ideas in the text as well as
their own ideas than they were to simply provide running
comments and remarks.

Though the particular emphasis varied from text to text,
the strategies taken by individual readers in constructing
meaning (their developing text-worlds or text models) were
consistent across texts. Most comments reflected concern with
formulating and refining meaning rather than generating
ideas. Generating ideas, by definition, is a limited category

due to the nature of the reading task. The reader, unlike the
writer, does not have to provide new material but rather
focuses more on adapting the developing understandings to fit
the author's message.

As they construct meanings, foreign language readers
rely on a variety of strategies and approaches, most of which
seem to be useful and used across a variety of specific
texts.

The analysis of beginning foreign language readers'
behaviors while reading leads to the conclusions that the
behaviors are varied and complex and that they change
slightly with text and topic.

The data reported in this section provide strong
evidence that in reconstructing text meaning, even beginning
foreign language readers employ reasoning and mental
operations, monitor their comprehension, and draw upon
different sources of knowledge. The reasoning operations and
the strategies are of particular interest in that they may be
the focus of instructional interventions. Readers may be
trained in the different aspects of mental and reasoning
operations as well as other prereading activities that may
foster comprehension.

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