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ABSTRACT
                This paper addresses instructional cues and begins
with an attempt to determine the position of cues and to place them
in a theoretical context. This is done by using a theory of school
learning developed by B. S. Bloom (1976). Next, an attempt is made to
define the concept of cues. Cues are a part of the quality of
instruction or the quality of teaching, including both information to
be imparted and directions for providing for adequate absorption and
processing of the information included in the material to be learned.
It appears that the events of instruction, as outlined by R. M.
Gagne, conform to both the requirements of the definition and can be
conceived of as being instructional cues. These events include
gaining attention, informing the learner of the objective,
stimulating recall of prerequisite learning, presenting the stimulus
material, providing learning guidance, eliciting the performance,
providing feedback about performance correctness, assessing the
performance, and enhancing retention and transfer. A brief
description of particular cues and a brief review of some research
findings in this field are presented. (TJH)

TWENTE EDUCATIONAL MEMORANDUM NUMBER 24

THE CONCEPT OF INSTRUCTIONAL CUES

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THE CONCEPT OF INSTRUCTIONAL CUES

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Abstract

In this paper which is about instructional cues, we try in
section one to determine the position of cues and to place
them in a theoretical context. This can be done by using a
theory of school learning developed by Bloom.
In section two we make an attempt to define the concept of
cues. In terms of this definition which is made up of two
parts, it appears that the events of instruction as listed
by Gagné conform to both the requirements of the definition
and can be conceived being instructional cues. (section three).
Further, in section four, a brief description of particular
cues is presented.
Finally, in section five, we give a very brief review of
some research findings in this field.

1. Introduction

In this section we intend to determine the position of instructional cues. We want to place the cues in a clear context by refering to a theory of school learning in which a substantial place is assigned to cues. Such a theory is available and is presented by Bloom in his book Human characteristics and school learning. (Bloom, 1976). In this book an extensive description is given how matters stand as for mastery learning strategy. Results obtained with this strategy for the greater part can be predicted and influenced by a few variables. These variables are the quality of instruction and pupil characteristics like cognitive entry behaviors and affective entry characteristics.

On the ground of this description he has developed a theory of school learning that attempts to explain individual differences in school learning as well as to determine the ways in which such differences may be altered.

The quality of instruction in this theory is determined by the components participation, reinforcement, providing the learner with cues, feedback and correctives.

By participation we mean the extent to which the pupil actively participates or engages in the learning. In the learning process active involvement of the pupil is required.

Reinforcement refers to the extent to which the pupil is rewarded or reinforced in his learning.

Cues have reference to the instruction as to what is to be learned

as well as the directions as to what the learner is to do in the
learning process. In this paper we will particularly go further
into this aspect of cues.

Feedback is used to inform the pupil about what he has learned well
and what he still needs to learn. Corrective procedures are used
for purposes to help the pupil correct the learning.

Looking at this point of the theory we agree with De Klerk (1979)
that the prescriptions are rather peripheral. There are no pre-
scriptions that are more central in nature e.g. directions how
individual pupils absorb and process the learning material.

As stated above instructional cues appear to be a substantial
component in the quality of instruction. In this connection it is
worth noting that Rosenshine and Furst (1971, 1973) in reviewing
on findings in the research on the relationship between classroom
instruction and gain in pupils achievement identified ten variables
as having yielded the most consistent results up to the time of
writing their articles. Three of these variables listed by them
are the use of structuring comments at the start of and during the
lesson, clarity and context covered by the pupils. These variables
can be considered being instructional cues in our view as we will
see in section three.

Fortunately systematic studies and experiments have begun on
these variables which can be numbered among the concept of in-
structional cues.

2. What instructional cues are.

The term cue strikes us somewhat as strange at first sight.
In the world of theater it means a hint or a kind of token
to be given to the actor.

The last years it turns up more and more in educational lite-
rature.

In Brig.s' glossary (Briggs, 1977) e.g. the term cue is
reserved for an indirect prompt given to help the learner
complete a recitation or solve a problem. It is an indirect
form of learning guidance, that is to say one does not go
so far to give simply the missing word or solution to the
pupil. The intention here is that the learner gets some kind
of help in the learning process. But the meaning of the
concept is not yet similar as in our view of cues.

An essential aspect of any learning is that it includes some
parts to be learned or absorbed by the pupil. In the process
of instruction it is very important to communicate to the
pupil which parts of the learning material must be learned
by him.

The method of communicating to the pupil is likely to differ
from teacher to teacher. It is obvious that a good teacher
has a variety of ways of explaining or illustrating what
elements in the learning material are to be learned. Giving
information to the pupil about what is to be learned is one
aspect that could be distinguished in instructional cues.

Besides emphasizing the elements in the learning material
in communicating to the pupil it is on the other hand of
great importance to explain the pupil what he is to do with
some learning material in the learning process. In other
words, this raises the question how one can be helpful in
the learning process of the pupils. The pupil needs a teacher
or instructional material providing for a variety of direc-
tions to help him understand what he is to do in the learning
process with some elements in the learning material. He needs
focused aid in absorbing and digesting the material.

As stated above these directions may come from the teacher
or from the instructional material.

Like teachers may differ as for the variety of available cues
pupils may differ in the extent to which they can learn from
particular cues.

Furthermore it can be stated that the teacher's activities
may determine for a considerable part the pupil's achievement
so far as they evoke particular activities in the pupil which
can lead to learning.

Anyhow these directions -and this is certainly the case for
young learners- come from the external environment. This
notion that instructional cues can be viewed as events in
the external environment that are used for the absorbing and
the processing of the learning material links up very well
with information processing models of memory and learning.

We shall end this section by trying to define the concept of

instructional cues: <u>Cues are a part of the quality of</u>
<u>instruction or the quality of teaching including both</u>
<u>information to be given to the learners as regards to what</u>
<u>is to be learned and the directions for providing the</u>
<u>adequate absorption and processing of the information</u>
<u>included in the learning material.</u>

3. <u>Instructional events conceived as cues</u>.

It can be stated that in our educational system teachers
mostly are working alone with their pupils. The instructional
materials to be used by the pupils are usually selected rather
than developed by the teacher. It can be considered an important
task for the teacher which instructional cues are incorporated
in the learning materials and which are missing. If according
to the teacher, it appears that there are no sufficient cues in
the materials he can plan to supply some important ones by himself.
This means that the teacher is not only a manager of the
instruction but in addition to this he provides for instructional
cues which are not present in the learning material.
Generally speaking, cues inform the pupil what he is going to
learn and how his learning process should proceed. They can be
considered as directions what the pupil is supposed to do during
the learning process.
This concept of instructional cues is rather similar to Gagné's
events of instruction. From what we have stated before it appears

that we conceive events of instruction as cues,

Gagné has listed this in several works (Gagné 1979, 1977),

(Gagné and Briggs 1974).

Thus instructional events or cues in a lesson can be
supplied by the teacher, by the learning material or by the
more experienced learner himself.

In Gagné's work a learning theory is presented which is based
on an information processing model. In his theory he deals with
complex learning processes. The external learning conditions are
of great importance for the internal processes. The external
learning conditions must be created by the teacher or the
learning materials and they must link up to the internal condi-
tions, the learning of the pupil.

These events of instruction are listed below

- gaining attention

- informing the learner of the objective

- stimulating recall of prerequisite learning

- presenting the stimulus material

- providing learning guidance

- eliciting the performance

- providing feedback about performance correctness

- assessing the performance

- enhancing retention and transfer.

In the light of the preceding remarks it sounds plausible that
these events can be regarded being instructional cues,since
they conform to our definition mentioned in section two.

In educational literature for these cues often other terms
are used, but considering the substance they mean the same.
It is not to much to say that we all agree that instruction
is needed when we want the pupil to reach an acceptable level
of performance. There is evidence that most people did not
learn e.g. any algebra by themselves, however clever they
may have been.

A particular level of competence can be realized by combining
the efforts of the pupil, the teacher and the instructional
materials.

Instructional cues or at least some of them sometimes can be
found in instructional materials. In instructional materials
e.g. we can more and more identify objectives presented to the
pupil.

Sometimes some suggestions are given how to read or work through
the material. If the instructional cues are not present at all,
which still occurs, they must be supplied by the teacher or
otherwise. In a simple way it has been demonstrated that these
events of instruction which we consider to be instructional cues,
have empirical evidence (Briggs, 1977).

Support to the importance of instructional cues for the learning
process also comes from biological approaches to learning and
thinking (Vester, 1975).

Support to some instructional cues is also given by DeLozier
(1979). In this paper he discusses that effective teachers are
persuasive. To be persuasive teachers must first understand how

to gain and maintain pupil's attention and how to communicate

their messages in ways that pupils comprehend.

Before we give a description of each instructional cue we

think that these cues are commonly curing in classrooms

characterized by good teaching. Of course this is only a

conjecture that still has to be proved.

4. Description of cues.

1. Gaining attention.

A variety of techniques is available to gain, focus and

maintain attention. It is obvious that these techniques

need to vary with the age of the learner. Gaining attention

is quite different with young children than with secon ary

school pupils.

Gaining, focussing and maintaining attentior can be viewed

as a prerequisite for effective communication in the instruc-

tional process.

A pupils' attention can be regarded as the result of external

stimulus factors and individual factors. In this paper we can

better leave these personal factors out of consideration,

because they are rather difficult to be altered,

DeLoziĕr (1979) summarizes principles of gaining attention

which emerge from external factors. The larger an object is,

the greater its attention value. Static objects attract less

attention than objects in motion. The attention value seems to

be greater when the strength or intensity of a stiumulus
is greater. Attention is attracted by novel objects and
ideas. A behavior which surprises pupils will gain their
attention. The same is true when giving information and
raising a conceptual conflict. And finally can be mentioned
that multiple sensory messages produce greater attention
than messages appealing to only one sense mode. This point
is also strongly endorsed by the biological approach to the
research on learning (Vester, 1975).

When instructing a teacher wants to gain attention in order
to direct the pupil's activity toward a particular objective.
It is true that this cue does not state what information from
the material the pupil must learn, but it makes him ready to
start the learning process. It is a necessary step in instruc-
tion before learning can begin. This prerequisite for effectiye
communication may facilitate pupil learning.

2. Informing the learner of the objective.

In the research literature suggestions can be found that giving
pupils knowledge of the learning objectives is related positively
to achievement. It facilitates learning, thus it is an instruc-
tional cue.

In practice it may be rather difficult to separate well gaining
attention and informing the pupils of the objective Often both
cues go together in a single statement by the teacher   is
desirable that in school and certainly at the secondary level,

the teacher who raises some content matter must show the
value of that learning to the pupils. It is not unusual
that pupils do not understand the importance of some
topics or objectives in the curriculum. This means that in
instruction one must stress the value of the topics of a
subject matter and show how they can be used. However, in
teaching practice this is not always possible.

Even a great many of pupils can have misconceptions of what
a subject is all about. The detail in which objectives should
be given to the pupils can be a point of consideration. It is
obvious that also this instructional cue needs to vary in
detail with the age and experience of the pupil.

Briggs (1977) summarizes some techniques which can be applied
to make objectives clear to the pupil.

- The pupil r .:: underst_ d the language in which the objective
  is formulated.
- The teacher must demonstrate how to perform the objective.
- It is advisable to give practice tests which are parallel
  forms of the evaluation test.
- If the objective consists of more components the teacher should
  stress this and show how they contribute to the total objective.
- Explain the pupils what they are expected to do after the
  objective has been attained.
- It is not wise to hide objectives. It is not advisable to keep
  the pupils guessing what will be asked in the test.
- Communicate the objective in a variety of ways to the pupils

to make the chance for understanding it greater.

- If possible try to show the value of the objective for
later goals the pupils want to achieve.

4.3. Stimulating recall of prerequisite learning.

Stimulating recall of prior learning facilitates new learning.
For this reason this should be considered to be important in
this context. When the subject matter is organized hierarchi-
cally, stimulating recall is nearly always a necessary step.
The task of the teacher is to inform the pupils that each
new learning of the material requires the use of some prior
learning. By stressing this condition and by consistent use
of this cue may be the teacher can provide for a kind of habit
in the pupil to do this for himself. For the pupil this
possibly can result in developing his own learning strategies.
It seems obvious that this instructional cue is appropriate for
intellectual skills in which complex skills are built upon more
simple skills.

4.4. Presenting the stimulus material.

By stimulus material we mean the content which the pupils
are expected to learn. In transmitting, the content can be
approached in various ways by the teacher.
In case of organized information which has to be learned by
the pupils there are many forms in which it can be presented.
To aid pupils' learning the teacher can help him by organizing

the information in a meaningful way. Often this is called structuring in educational literature. This structuring can be done e.g. by presenting an outline or an advance organizer. We all know from research literature that a presentation which is too long can obstruct the learning process of many pupils. Fortunately there are some techniques available to facilitate learning even when presentations of the material are quite long. Within this scope we aim at reviews or summaries during the presentation or lecturing. Providing for pupil responding is also an aid for learning. Furthermore providing the pupils with a variety of examples may be very helpful especially in concept and rule learning.

4.5. Providing learning guidance.

Teachers can vary also in applying direct or indirect guidance in instructing their pupils. Roughly speaking there are two forms of guidance with all kinds of variations. When a teacher gives a definition or a rule, followed by some examples this is called deductive. After this the pupil is asked to classify examples and non examples. An opposite form is called inductive where the teacher tries e.g. by questioning to lead the pupils to discover the difference between two different points. Present-day knowledge does not allow a conclusion as for which form of guidance is the best. Guidance can also be considered from the standpoint of the degree of prompting. This is a direct form of guidance where the teacher provides the pupil with a strong hint for instance how

to solve a problem.

For the different types of learning outcomes there are specific forms of providing learning guidance. As for problem solving e.g. the teacher can present minimum cues needed to lead the pupil to select and use applicable rules.

4.6. Eliciting the performance.

After a certain period of interaction with the teacher and the instructional material used in the school it is a good point to know if learning has taken place. The function of this demonstration is to estimate whether the pupil has reached sufficient mastery so that he can go on to learn next competencies. Both for the teacher and the pupils it is necessary to check if there is progress in learning.

Also supplementing instruction can be given when needed.

It is possible to realize this aim by using some techniques derived from learning psychology. One knows that not everything what is instructed is retained well. Usually skills are retained better than historical dates. If the teacher whishes that information-type objectives will result in more long term retention. he must review the information reasonably often.

Furthermore it is important and a good habit to require that the learned material is generalizable.

When a pupil has mastered to solve quadratic equations, he has acquired the capability to solve a lot of problems of this kind. This phenomenon is called generalization.

As for the retention of skills this can be reached by
learning to generalize them soon after the first time they
have been learned. To realize this the teacher can incorporate
generalizing experiences in his instruction after he has taught
and demonstrated the skill. By doing so he can promote transfer.

As for providing feedback and performance assesment we can be
very short. Of course it can be stated that feedback given by
the teacher is an essential part in the theory of school learning.
The pupil wants   and has the right to know whether his performance
was successful. This is a good condition for the learning process.
When the teacher asks for a performance and gives feedback to the
pupil after his response this combination can be called performance
assessment.

5. Some research findings on instructional cues.

In the last few years and particulary in the last decade research
activities on what we now call instructional cues have started.
The flow of publications is increasing gradually. It is not in
the scope of this paper to give an extensive review of the recent
research that has been done in this field.(We intend to do this
in another paper). Nevertheless we can say some words about it
and restrict ourselves to a few findings.
Most research on cues that has been reported refers to cues
as a rather broad category. The composition of the categories in

different studies may vary. This fact makes it very difficult
to draw general conclusions about the impact of particular cues
on pupils' achievement. Within this approach we will very short
discuss some findings on cues variables relating to structuring,
content organization, and content coverage.

An exception to this approach were different instructional cues
are taken together in one category, is the research on the
influence of explicitly stated objectives on achievement.

Once again we state that this is only a brief review narrowed down
to some research findings.

5.1. Bloom's review.

In his chapter about the quality of instruction Bloom (1976)
deals among others with the relation between the cues provided
to a class and the achievement of the pupils.

He summarizes a great many of studies which made use of corre-
lations between the quality of the cues and the final learning
level of groups of pupils. Bloom reports that this correlation
is about .38.

The median correlation between the quality of the cues and the
gains in achievement of groups of pupils was .53.

It can be estimated that about 14% of the variance in the
achievement of groups of pupils is at present accounted for by
the quality of the cues.

Not yet available are publications which deal with the relation
between the cues and the learning gains of individual pupils.

Bloom recognizes well that in most studies that he quotes, attention was paid to dimensions like the difficulty of instruction, the clarity of ideas and concepts during class instruction, and the extent to which the instruction was interesting or dynamic.

It is not quite sure whether this suits the concept of cues as we have defined them.

5.2. The Clark et al.study.

In an experiment by Clark et al.(1979) one cluster of teacher behavior variables was structuring.

This category structuring consists of telling the pupils what is going to happen next, the learning material to be examined and how the material will be dealt with.

In the treatment structuring was devided into high and low. High structuring was further specified as:

- reviewing the main ideas and facts covered in the lesson.

- stating objectives at the beginning of the lesson.

- outlining the lesson content.

- signalling transitions between parts of a lesson,

- indicating important points in a lesson.

- summarizing the parts of the lesson as the lesson proceeded.

It can be stated that the enumeration above could be considered being cues as in our definition. The cues-items have a strong resemblance with the events of instruction which have been discussed before.

The conclusion of this study is that the treatment variations indeed affect pupil achievement. High structuring was effective. It is interesting to see that positive effects were also found three weeks after the end of the teaching for the measures of retention. Here high structuring was effective too in bringing about achievement. The authors infer that on the retention test high structuring was effective. It must be said, in fairness, that this effect was found in combination with low soliciting and high reacting.

5.3. The Anderson et al, study.

Anderson et al.(1979) before doing an experiment, developed an instructional model, about the functioning of young children in a small-group setting.

The first part of the model dealt with management of the group as a whole and the second part emphasized the responses that teachers give in feedback to pupils' answers.

The purpose of the model was to get and maintain attention, to sequence information clearly to the pupils and to provide information about the relevant aspects of a question or an answer. The teachers were asked to use four principles as guidelines which were concerned with introducing the lesson and new material. The function of the principles was to prepare the pupils for the lesson by getting their attention and making sure that the pupils know what to do in activities.

The four principles are;

- The introduction to the lesson should give an overview of
  what is to come in order to mentally prepare the pupils
  for the presentation.
- It is also at the beginning of the lesson that new words
  and sounds should be presented to the pupils so that they
  can use them later when they are reading or answering questions.
- The teacher should have the pupils repeat new words or sounds
  until they are said satisfactorily.
- After moving into the lesson, but before asking the pupils
  to use new material or undertake new tasks, the teacher should
  present a demonstration or an explanation of any new activity.

Anderson et al conclude that the absence of giving overviews of
any kind to introduce lessons is negatively related to achievement.
The same is true for new words given to the pupil with no
directions about how to read them.
They suggest that using overviews will have an impact on pupil
achievement.

5.4. Rosenshine's review.

In his article Rosenshine (1979) reviews research findings in the
field of content covered by the class.
In his view variables that are related to content covered and
task orientation or academic focus are the most promising for
future research. This research approach is characterized by
focusing on the pupil, particularly on the content which the
pupil covers or masters. Important are the amount of time the

pupil is engaged in academically relevant tasks and also the settings which promote engagement.

Content covered by the pupil is measured by determining the opportunity to learn and the amount of relevant material that has been covered. Rosenshine gives an enumeration of the many ways in which the variable relating to content coverage has been studied:

- inspecting the content of textbooks used
- asking teachers to indicate the percentage of pupils who have had an opportunity to learn each item on a test.
- counting the number of pages of the common textbook covered during a semester.
- coding the content in a short presentation that was relevant to the test questions.
- counting the number of words that the teacher attempted to teach.
- counting the number of mathematics problems covered.
- comparing the results of different curriculum programs on general and on curriculum-related posttests.
- coding the level of the workbook the pupils had completed just before they took a posttest.

Rosenshine's conclusion is that in most studies a significant relationship was found between content covered and gains in pupils' achievement.

5.5. Levin's review.

Above we already mentioned that the cue informing the pupils
about learning objectives and its relation to achievement
has been studied separately.

Some studies dealing with the effects of informing the pupils of
learning objectives on their achievement are reviewed by Levin (1977).
She concludes prudently that the statement of the learning
objectives as an instructional cue, can have a positive effect
on pupils' achievement. However, as for this topic, there are
too many contradictory studies. We need more consistent findings.

5.6. Duell's study.

Duell (1974) studied the effects on learning of providing students
with objectives stated in behavioral terms as they study text
materials. The purpose was to discover under what conditions
providing objectives during study improves the amount learned.
The data of the study support the hypothesis that the judged
importance of an item of information determines whether knowlegde
of objectives during training is helpful. Students receiving
behavioral objectives during the training performed better on test
questions that the majority of the students classified as unimpor-
tant than students given a nonbehavioral objective.
The findings support the assumption that providing students with
behavioral objectives produces greater learning. This is only true
if the objectives direct the student to learn information which he
would not classify as important or likely to be tested.

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