# DISCOVERY LEARNING vs RECEPTION LEARNING PARADIGMS: IMPLICATIONS FOR THE CLASSROOM TEACHER AND THE RESEARCHER*

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## Introduction

There has been considerable confusion clouding these two forms of learning approaches - reception and discovery, in the research literature. Reception learning is often identified as rote-learning (Ausubel, 1963) and discovery learning is a rather illusive concept which means different things to different researchers (Dearden, 1967, Richards, 1973). Ausubel (1969) has managed to sort out some of these confusions by his postulation of the two distinctive dimensions of the learning processes - one is the reception : discovery dimension which deals with the means by which knowledge to be learnt is to be presented to the learner and the other is the meaningful : rote dimension which refers to the alternate ways in which the learner may incorporate such knowledge into his existing schemata. He emphasized that these two dimensions are relatively independent such that it is possible to have these four kinds of learning - (1) meaningful-reception, (2) rote-reception,

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(3) meaningful-discovery, (4) rote-discovery. According
to him, the essential distinction between pure reception
learning and pure discovery learning lies in the manner
in which the material to be learnt is to be presented to
the learner. In reception learning, the entire material
to be learnt is presented to the learner in its final
form and all he is required to do is to internalize it.
In discovery learning on the other hand, the principal
content of what is to be learnt is not presented in its
final form and the learner is expected to reorganize or
restructure the material given in some fashion before he
incorporates it into his cognitive structure. In other
words, the answer is withheld from the learner and he has
to discover it himself. In actual practice however, ex-
amples of pure reception learning or discovery learning
are hard to come by (DeCecco, 1968). Instead many varie-
ties of these two kinds of learning situations exist.

## Discovery Learning

According to Glaser (1966), discovery learning
involves two events - one concerns learning by discovery
and the other is associated with learning to discover.
Though this appears to be a useful distinction, many of
the writers or advocators of the discovery approach have
tended to disregard it. In the literature, discovery
learning has often been referred to in a variety of ways,
though more often than not, it is 'learning by discovery'
rather than 'learning to discover' that is implied. Dear-
den (1967) and Ausubel (1969) restricted discovery learn-
ing to 'learning by discovery' and defined it as 'what
is to be learnt has to be found out by the learner him-
self'. Others (Kersh & Wittrock, 1962; DeCecco, 1968)
described discovery learning as that completed with
limited or no guidance from the teacher. Bruner's
(1961) interpretation of discovery learning can be
inferred from his concept of discovery which he maintains,

"... is not restricted to the act of finding out
something that before was unknown to mankind, but
rather include all forms of obtaining knowledge
for oneself by the use of one's own mind. ... It
is in essence a matter of rearranging or trans-
forming evidence in such a way that one is enabled
to go beyond the evidence so reassembled to addi-
tional new insights."

(p. 22)

Gagné (1966) gave an interpretation of the term
'discovery in learning' in an exceedingly broad sense.
He regarded any process that involves searching and select-
ing as discovery, and maintained that there are different
functions of discovery for different varieties of learn-
ing.  He differed from many other writers in that he even
extended his concept of discovery to the learning of
motor skills (cf. Hawkins, 1966; Dearden, 1967).  Richards
(1973) summed up what is involved in discovery learning
as follows:

"At its core all discovery learning involves an
individual confronting a situation 'open' in some
significant respect and attempting to 'close' it
by finding out for himself the one possible answer
or one or more of the many possible answers."

(p. 144)

The common thread which tends to run through all
these various definitions of discovery learning is the
emphasis that the learner must find  out or discover for
himself what is to be learnt.  This leads to the crucial
question, 'how is he to find out what is to be learnt?'
Dearden (1967) proposed three different models of discovery
learning.  The first of these is the 'pre-school model'
in which discovery learning is regarded as synonymous with
the typical daily accidental learning of a pre-school
child as he performs his activities and explores his

environment. Learning in this situation is a 'discovery
for oneself under the pressure of real interest and in
the course of spontaneous activity'. Second is the model
of "Abstractionism'. This is a more contrived situation
where the conceptual structure to be learnt is embedded
in some materials and presented to the learner in such a
way that the common features and relationships among
certain things are noticed or 'abstracted' by him. The
final model is the 'problem-solving' model. In this
conception of discovery learning, the teacher's activity
is to focus the learner's attention and effort in the
direction that ensures that appropriate discoveries will
be made by the learner.

Another attempt at describing the different models
of discovery learning was also made by Biggs (1971). The
types of models Biggs described are 'impromptu discovery',
'free exploratory discovery', 'guided discovery', 'directed
discovery' and 'programmed learning'. The names in them-
selves are self-explanatory and, as is also implied by
them, the distinction between some of these is not too
clear.

A good description of the different kinds of dis-
covery learning situations exemplified by the models and
curriculum development projects is that presented by
Richards (1973). He differentiated the different aspects
of discovery learning situations into five dimensions.
The 'process-product' dimension is similar to the two
different but related facets of 'learning by discovery'
and 'learning to discover' as distinguished by Glaser
(1966). Bruner (cited in Wittrock, 1966; p 35) also
recognized this dimension. The 'accidental-planned'
dimension concerns the nature of the starting point
from which learning by discovery develops. Learning by
discovery can be triggered off by a variety of situa-
tions ranging along this 'accidental-planned' dimension.
The 'autonomous-directed' dimension refers to the form

and extent of guidance or structure given to the enquiry
process once it is in progress. This dimension as Richards
has rightly pointed out, represents the distinction most
frequently used in the literature to differentiate various
types of discovery learning situations. The 'concrete-
symbolic' dimension is associated with the extent to which
learning situations involve the manipulation of concrete
objects by the learner. Finally, the 'open-closed'
dimension emphasizes the end-product of the enquiries.
In any discovery learning situation, 'there may be one
definite answer or more than one and there may be one
method of approach or many'.

Learning situations can be found which exemplify
all combnations of these five dimensions. This is ex-
plicated by the following illustrations:

"To illustrate, guided learning (involving teacher-
pupil questioning and discussion) might proceed
from an unplanned starting point, involve much
activity with concrete objects and the open-ended,
with learning to discover as one of its main
objectives. Or, it might be deliberately planned
from the very beginning, involve a minimum of
physical activity and have one definite end in
view, with discovery simply serving as a means.
Other combinations of these factors might
operate in different discovery situations".

(p 150)

It has been realized that discovery learning on
the part of students can result from either inductive or
deductive teaching. There is recognition that discovery
learning cannot and should not be equated with laissez-
faire or unstructured learning situations nor should it
be interpreted that students should discover everything
anew (Bruner, 1966; Dearden, 1967). Kendler (1966) in
his 'Reflection on the Conference', expressed that there

is recognition among the participants at the conference
that in discovery learning situations, guidance can be
given to students and added:

> "Students can be encouraged, prodded, and shaped
> to discover.  In short, learning by discovery
> implies controlling the behaviour of the student
> just as the old-fashioned drill method.  The only
> difference is the pattern of control".

(p 172)

Bruner (1966) suggested six ways in which teachers
may prepare students for discovery learning.  These con-
trived situations include organizing learning materials
in such a way that the learner can:

1  develop the attitude that he can 'use his head effectively
   to process problems even when overcome by limited or
   unconnected information;

2  approach the new material to be learnt in a way that is
   analogous to the Piagetian processes of assimilation
   and accommodation;

3  cultivate the appropriate motivation for learning;

4  learn the strategies and heuristics for information
   processing and problem-solving;

5  make productive use of their own self-cues;

6  develop the 'capacity for handling information flow
   manageably so that it can be used in problem-solving'.

There is general consensus in the literature
that discovery learning cannot be treated in  an all-en-
compassing way.  Though discovery is often characterized
by flexibility in organization of the learning environment,
the choice of any particular situation needs to be con-
sidered in terms of these factors: 1) the nature and
content of the subject matter to be taught, 2) the kind of
learners, 3) the educational objectives to be attained

and 4) the learner's learning history.

The promoters of discovery learning have hypothe-
sized many merits for this approach of learning. Bruner
(1961) pioneered in this direction by claiming four major
benefits for the learner: 1) increase in general intellec-
tual potency, 2) improvement in motivation via the shift
from extrinsic reward (which may follow from learning)
to intrinsic reward (e.g. interest in the activity itself),
3) enhancement of memory processes in that he is more
likely to make the learned material easier to retrieve
and reconstruct, and 4) acquisition of the heuristics of
discovery. According to Dearden (1967), discovery learn-
ing also has the added advantage of allowing more scope
for individual differences and permitting a more intelli-
gent appreciation of what one is doing.

Ausubel (1969) argued for a more balanced assess-
ment of the relative pedagogical values of reception and
discovery approaches to learning. He admitted that the
discovery method can be legitimately used with palpable
advantages only when it is used discriminately. Five
instances where it can stand out over reception learning
were described. These include

1  Transmission of subject matter to children who are
   at the Piagetian stage of concrete operation in their
   cognitive development and to adolescents who are
   relatively less equipped with the basic concepts and
   terminology of a given discipline;

2  Evaluation of the meaningfulness and depth of learning
   of a particular concept or generalization;

3  Problem-solving;

4  Transfer of learning; and

5  Motivation.

Kagan (1966) gave equally compelling arguments for
and against the discovery method of learning. He outlined

these four advantages of discovery learning: 1) It creates
arousal and consequently maximizes attention during learn-
ing; 2) The greater intellectual effort required in
discovery learning leads to an increase in the value of
the task; 3) It increases the learner's expectancy that
he is able to solve different problems independently;
and 4) It helps those children who have a passive depen-
dency conflict with respect to the teacher, to resolve it
because discovery method gives such children,

> "... more latitude and freedom and removes them
> from the submissive posture ordinarily maintained
> between teacher and children."

<div align="right">(p 159)</div>

Kagan also cautioned that discovery method is not
appropriate for children who have low initial motivation,
and impulsive children who are apt to jump to wrong con-
clusions when they are placed in discovery learning
situations to formulate their generalizations. Also
children below the age of 9 have not learnt the joy of
discovery and for them the incentive value attached to
discovery is rather fragile. For this reason they may not
derive the benefits that are associated with discovery
methods when they are put in such situation.

## Reception Learning

The distinctive feature characterizing reception
learning is that what is to be learnt is directly imparted
to the learner (Dearden, 1967; Ausubel & Robinson, 1969).
The impartation of this knowledge need not be confined to
the traditional picture of an authoritative teacher
telling something in an incomprehensible manner to a
group of passive recipients who just accept the informa-
tion and commit it to memory. According to Dearden,
information can be imparted directly in various forms
and ways, such as a 'reasoned explanation of something

or an experimental demonstration of it'. Other examples
of reception learning situations can be information
gathering from textbooks or from machine programmes.

Ausubel (1969) maintained that reception learning
can be both meaningful and rote, depending on how the
learner responds to the generalization given. The
learning is meaningful in so far as the learner can
relate what is presented in generalized form by the
teacher to his existing structure of experience in
some fashion. On the other hand, if he just memorises
the information given by the teacher, then rote-learning
results. Some of the advantages of reception learning
are to be found in this quotation from his writings
(Ausubel, 1963; p 19):

> "The art and science of presenting ideas and
> information meaningfully and effectively - so
> that clear, stable, and unambiguous meanings
> emerge and are retained over a long period of
> time as an organized body of knowledge -- is
> really the principal function of pedagogy.
> This is a demanding and creative rather than
> a routine and mechanical task. The job of
> selecting, organizing, presenting, and trans-
> lating subject-matter content in a developmentally
> appropriate manner requires more than the rote
> listing of facts. If it is done properly it
> is the work of the master teacher and is hardly
> a task to be disdained... . Beginning in the
> junior high school period, students acquire
> most new concepts and learn most new proposi-
> tions by directly grasping higher - order
> relationships between abstractions. To do so
> meaningfully, they need no longer depend on
> current or recently prior concrete-empirical
> experience, and hence are able to bypass com-
> pletely the intuitive type of understanding

that is qualitatively superior to the intuitive
level in terms of generality, clarity, precision
and explicitness. At this stage of development,
therefore, it seems pointless to enhance intuitive
understanding by using discovery techniques."

Besides Ausubel, Carroll (1964) has also pointed
out that reception learning when supplemented by practice
can be an effective means of learning concepts and prin-
ciples while Dearden (1967) claimed that its merit lies
in the area of skill mastery. It is also a well-recog-
nized fact that reception learning is a more economical
way of learning in terms of time spent. In reception
learning situations, the learner has also the advantage
of having a more organized view of the discipline he is
studying because the teacher, being more qualified and
richer in experience, can obviously organize the infor-
mation more effectively for learning than the novice
learner can.

The above review of the literature gives a
representative sampling of the underlying assumptions
and conceptual issues of the reception and discovery
learning paradigms.

## Validity of Assumptions

Many of the claims on the superior pedagogical
value of discovery learning have not been borne out by
research evidence. (Craig, 1956; Kittell, 1957; Kersh,
1958 & 1962; Wittrock, 1963). It has been found that
when the criterion of learning is how fast subjects
learn easily understood rules or how well they remember
and use these rules to solve problems, reception learn-
ing and discovery learning tend to produce equivalent
results. Ausubel (1963) maintained that expository
teaching has greater pedagogical value than what most
people would like to believe. He argued that many

concepts are better introduced by expository teaching for
some children. Rowell et al (1969) obtained results which
lend support to Ausubel's claims. Other corroborative
evidence is to be found in the study of Roughead and
Scandura (1968). Their findings led them to emphasize
the point that in Mathematics, 'what is learned' during
guided discovery can sometimes be identified and taught
with equal effectiveness by expository method.

Conflicting findings have been found with respect
to Bruner's (1961) claim that learning by discovery in-
creases the learner's interest and ability in future
situations. Kersh's (1958, 1962) findings seem to
provide supportive evidence while Craig (1965) obtained
contradictory results.

Ausubel (1969) attacked the indiscriminate use
of discovery learning, and pleaded for a more balanced
evaluation of the two approaches -- reception and dis-
covery. In the same context he made an eloquent attack
on these unsupported claims for discovery learning --
1) All real knowledge is self-discovered; 2) Meaning
as an exclusive product of nonverbal discovery; 3) Sub-
verbal awareness as the key to transfer; 4) Discovery
method as the principal method of transmitting subject-
matter content; 5) Problem-solving as a primary goal
of education; 6) Every child a creative child; 7) Ex-
pository teaching as authoritarian; 8) Discovery learn-
ing organizes learning effectively for later use; 9)
Discovery as a unique generator of motivation and self-
confidence; and 10) Discovery as a prime source for
intrinsic motivation.

Another small sample of studies appears to focus
attention on the strength of discovery learning in
facilitating the acquisition of the heuristics of dis-
covery and transfer of learning. Guthrie (1967) ob-
tained evidence to suggest that the discovery method
facilitates transfer but not retention, while expository

teaching facilitates retention but impedes remote transfer. Worthen (1968) compared the expository and discovery methods of task presentation in terms of sequence characteristics in Mathematics. He found that the superiority of discovery sequencing stands out in the learner's ability to retain mathematical concepts and to transfer the heuristics of problem-solving. Anastasiow et al (1970) compared the effectiveness of these three teaching strategies of discovery, guided discovery, and didactic with a group of kindergarten children and using Mathematical principles of set, intersection, form and colour. The findings supported the general view that any effective form of teaching strategy would function equally well for content mastery but discovery techniques are more efficacious for the learning of principles. A subsidiary finding hinted that discovery methods work more effectively with learners of the higher ability range.

The denigration of reception learning is based on the misconception of equating it with a rote-learning. Research evidence seems to shed light on the efficiency of this method. Ausubel (1960) demonstrated that advance 'organizers' (prior presentation of highly generalizable concepts under which new learning may be subsumed) can be effectively used in reception learning situations to facilitate the incorporability and longevity of unfamiliar but meaningful verbal material. The convincing results of other similar studies (Ausubel & Fitzgerald, 1962; Ausubel & Yussef, 1963; Newton & Hickey, 1965; Merrill & Stolurow, 1966; Scandura & Wells, 1967; Grotelueschen & Sjogren, 1968) are substantive enough to refute the generalization that retention and meaningful learning are exclusive to discovery methods of learning. It has also been found that such 'organizers' seem to produce most apparent facilitative effects on learners with low ability, who presumably would lack the ability to organize and relate the new material to their existing

cognitive structure (Ausubel & Fitzgerald, 1962). In
the learning of more complex tasks, advance 'organizers'
may differentially benefit learners of superior ability
(Crotelueschen & Sjogren, 1968) and those with more back-
ground knowledge (Ausubel & Fitzgerald, 1962), enabling
them to learn the material which is beyond the capacity
of the less able and less sophisticated ones.

Studies (cited in Allen, 1970) have shown that
another pedagogical technique for enhancing the efficency
of expository teaching is cueing, using test-like questions.
Allen (1970) investigated the effects of advance 'organizers'
and questions on the learning and retention of written
social material. His results showed that:

1) Questions resulted in specific facilitative
   learning effects which tend to diminish over
   time. Furthermore, the interacting effects of
   questions and advance 'organizers' appeared to
   vary with intellectual ability;

2) Advance 'organizers' also tended to have a
   differential ability effect on learning. For
   the less able students, they served to main-
   tain the specific facilitative effect of ques-
   tions and no general facilitative effect, while
   for the above average students, it did not main-
   tain the specific facilitative effect of questions
   but did result in a general enhancement of
   learning.

A plausible inference that can be drawn from these
studies is that by skilful organization and engineering
of materials, enhancement of learning equivalent to that
claimed for discovery methods can also be effected through
direct impartation of information. A suggestion from
these studies is that in the selection of introductory
materials to facilitate learning and retention, variables
such as intellectual ability and complexity of learning
tasks must be taken into consideration.

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## Conclusion

1       Implications for the classroom teacher.

        Discovery learning in school does not necessarily
mean complete abdication of the teacher's responsibility
in the learning situation.  Rather it implies that the
role of teacher becomes one more of guidance than of
dispenser of factual information.  Here teacher and
learner participate cooperatively in the learning
adventure and the former must be cognitively alert to
be able to stimulate and provide imaginative encourage-
ment to the latter.  Discovery learning involves both
freedom and structure and must not be confused with the
laissez-faire environment.

        The pedagogical strength of expository teaching
can be reinforced by the teacher's skilful use of sui-
table introductory materials and the supplement of
relevant practice.  It is a more economical form of
teaching with regard to time and should be used if the
learning outcome can be effectively reached by either
approach, e.g. content mastery and skill learning.

        The adoption of any particular approach to use
depends on a number of factors, as pointed out earlier
on.  To reiterate, these include the nature of the
subject matter, nature of the learners, educational
objectives to be achieved and the learning history of
the learners.  These factors must be considered in the
light of the arguments and suggestions advanced by Ausu-
bel, Dearden and Kagan, together with the empirical
evidence provided by the research findings.

        It must be noted that neither a pure discovery
approach nor a pure reception approach can accommodate
all the learning conditions necessary for achieving
particular educational objectives with a particular
group of students.  In practice, a combination of the
relative emphasis of each approach may be more appropriate.

DeCecco's advice that the selection of any one approach
or combination of the two approaches should be governed
by the answers to these questions 'For what purpose?',
'For which students?', and 'Under what learning condi-
tions?', is a useful one to follow.

2        Suggestions for the research worker

The overall research picture on these two app-
roaches to learning is diffuse, because the interpre-
tability of findings is confounded by numerous factors
such as differences in semantics, the illusive nature
of the discovery learning hypothesis and methodological
problems. In more specific terms, information concern-
ing the degree of direction given in discovery treat-
ments, the taxonomic level of tasks involved, and the
allocation of learning time as well as the intellectual
composition of subjects have not been described in detail.
In this respect, future workers should take cognizance
of these short-comings and learn from the mistakes made
by their predecessors.

The direction of future research studies should
go beyond the controversial issue of discovery learning
versus reception learning. Some examples of more mean-
ingful research studies can be found from the missing
links in previous studies. Craig's (1965) study has
opened up an interesting area for further investigation.
Though his study has shown that by providing continuing
tasks, discovery approaches to learning may encourage
'out-of-school' activity, the question of 'what type of
activity?' has been left unanswered. The study of Scan-
dura and Wells (1967) pointed out that the underlying
mechanisms by which 'organizers' improve test performance
should be studied experimentally.

Another possible avenue to explore can be 'abs-
tracted' from this statement by Ausubel (1969):

"... the research literature does not provide us
with a range of serious attempts to measure the
effect of various degrees of directedness in in-
struction over a variety of tasks similar to
those which are now (or might be) taught in schools."

(p 499)

To extend this suggested line of investigation,
Kornreich (1969) added that 'an analysis of what educa-
tional prompts are optimal for achieving educational
goals' should be considered.  His study also paved the
way for the further research to be done on problem-solving
responses, that is, an investigation into how students
arrive at their answers.

The usual comparison of the efficiency of different
teaching strategies reported in the literature may not be
meaningful in view of the fact that teachers generally
tend to achieve excellence in a variety of conditions.
A more useful investigation would be to study the frequency
of teacher effectiveness in a variety of teaching styles
(Anastasiow, 1970).

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