ABSTRACT
            In modal training studies, the comparative groups
differ in the use of a particular cognitive process; training to
overcome the deficiency is provided for the deficient group only, and
their performance is then compared to the standard set by the
untrained group. Improvements are necessary in the design of training
studies, as are a reconsideration of the types of skills that are the
subject of training, and a serious consideration of the relation of
the training and transfer tasks to the everyday functioning of the
cognitive process under investigation. Specifically, an adequate
training program must include the following: careful selection of the
cognitive skill to be examined; sensitivity to the actual beginning
competence of the learner; stringent analyses of the requirements of
the training and transfer task so that transfer failures can be
interpreted properly; training in multiple settings to alleviate the
problem of welding, direct feedback concerning the effectiveness of
the trained skill; and direct instruction concerning the
generalization of the trained skills. Until a research program can
provide answers to these basic questions, it is premature to conclude
that retarded or deprived children and unschooled nonwestern children
cannot show flexible effects of training. (DF)

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Technical Report No. 127

PERMISSIBLE INFERENCES

FROM THE OUTCOME OF TRAINING STUDIES

IN COGNITIVE DEVELOPMENT RESEARCH

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Permissible Inferences from the Outcome of

Training Studies in Cognitive Development Research

Our charge in this paper was to provide a statement on the reasons for
conducting cognitive training studies, and to comment on the interpretations
of the outcome of such research. As extensive reviews of the training
literature proliferate (Belmont, 1978; Belmont & Butterfield, 1977;
Borkowski & Cavanaugh, 1979; Brown, 1974, 1975, 1977, 1978a; Brown & DeLoache,
1978; Campione & Brown, 1974, 1977, 1978; Butterfield, 1977), the charge
would seem to be a simple one. But the task is not simple, mainly because
the rationale for conducting such studies, the problems encountered when one
does, and the interpretations inspired by the outcomes, all reflect some of
the most difficult and controversial issues of comparative research. In
short, the central issue is that of individual and group differences in
intelligence and the potential for modification of these differences as a
result of environmental factors, including direct training and general
experience. No student of psychology can be ignorant of the long history of
this topic and the controversy, rational and irrational, that it has evoked.
To deal with these issues adequately in a limited space would be impossible
and, therefore, the interested reader is referred to the list of papers
cited above for details of the problem as it concerns the intelligent
functioning of retarded individuals. For a treatment of the topic in
reference to cross-cultural comparative problems, the reader is referred to
any of the recent work by Cole and his associates (e.g., Cole & Scribner,
1975; Cole, Sharp, & Lave, 1976) and to Ginsburg (1977). For a wider
treatment of the topic of training and intelligence, the reader is referred
to Brown (1978a), Resnick (1976), and to a series of papers given at AERA

in 1978 and reprinted in Intelligence, 1978, (see papers by Campione &

Brown, Carroll, Hunt & McLeod, Sternberg, Snow, and Glaser & Pellegrino).

Here we will aim at giving a brief statement of the problem, with particular

reference to studies of retardation, and highlight the problems of inter-

pretation facing workers in this area.

The Modal Training Study

One reason that a justification and explanation of training studies is

needed is due to their very prevalence; this genre of research seems to

be a basic enterprise of comparative cognitive psychologists and it is

charitable to presume that there is a reason for this uniformity. Consider

the modal developmental study (Brown et al., 1978; Brown & DeLoache, 1978).

Children of varying age are compared on a single task purported to tap some

significant cognitive process. The typical, non-surprising result (if the

paper is published) is that the older child outperforms the younger parti-

cipant. In the better examples of this genre, there is a somewhat more

fine-grained analysis of the components of the task enabling the authors to

diagnose which processes are failing to function appropriately in the less

efficient learner. Other common variants of the situation are those that

pit against each other comparative groups that differ not only in age but in

terms of putative intelligence level or cultural milieu. The outcome of

these endeavors is almost universally a demonstration of poorer performance

and/or ineffective processing in the young, the slow, the deprived, the

deviant, the non-western, or more recently, the unschooled samples.

The majority of comparative studies rest here; having demonstrated a

developmental effect, some cognitive infirmity of the poorly performing group is inferred, and the research enterprise terminated. An intrepid minority, however, go farther and question the nature of the group differences. Traditionally, the further question has been posed in the form: Is the deficiency one of the production or mediation? To restate the problem, the choice presented is between a "deficit" that is readily remediated or one that is not. Remediation can be effected by intervention such as direct instruction, or changing task environments. If either is successful, the original problem is pronounced situationally specific and not due to a stable limitation of the learner. Alternatively, if the deficit appears to be impervious to intervention, it is attributed to a limitation of the learner, one that could be the result of either (or both) inadequate past experience or inherent cognitive potential. Regardless of the etiology, if the deficit is not easily removed, it is taken as an indication of a structural limitation of the organism, perhaps of a permanent nature, or at least diagnostic of current cognitive status (Brown, 1974; Campione & Brown, 1978). A variety of ploys exist that can be used to help distinguish between the oversimplified dichotomy, however, as "cross-situational, cross-cohort, cross-cultural" (Weisz, 1978) comparisons are the exceptions rather than the rule. The major interest of developmental psychologists concerned with the problem has converged on the training study.

The modal training study can be described as follows: The prerequisite is that the comparative groups of interest differ in terms of efficiency in the use of a particular cognitive process. Training designed to overcome

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the deficiency is provided for the originally deficient group only, and their performance is then compared to the standard set by the untrained older group. The outcome of such endeavors is encouraging in its stability. If the training is relatively extensive and based on reasonable task and subject analyses, satisfactory improvements in performance occur. In the best examples, retarded children's performance can be improved to the level set by untrained adults (Butterfield, Wambold, & Belmont, 1973). Again, with appropriate training, the effects of the intervention have been found to persist for at least a year (Brown, Campione, & Murphy, 1974; Brown, Campione, & Barclay, 1978). However, with retarded subjects, it is rarely the case that transfer to new variants of a training task is found (Brown, 1978a; Campione & Brown, 1978). A similar statement can be made in regard to transfer of training studies conducted with schooled and unschooled populations in other cultures. A typical interpretation of these findings is that generalization of the effects of training across traditional task boundaries is not a cognitive characteristic of retarded or deprived children in our society and unschooled peoples in non-western society. It is our major contention in this paper that such a strong interpretation is illegitimate, for the data necessary to support it do not exist.

What would be needed before we could arrive at such a strong conclusion? Several initial steps would be necessary: (a) improvements in the design of training studies; (b) a reconsideration of the types of skills that are the subject of training; and (c) a serious consideration of the relation of the training and transfer tasks to the everyday functioning of the cognitive

process under investigation. We will consider these requirements separately.

Basic Requirements of an Adequate Training Study

Earl Butterfield's (1977) detailed analysis of the steps needed to conduct the ideal training study impressed and somewhat daunted investigators in the field. We agree that it is indeed a difficult task to engineer adequate training that could result in practical improvements in performance and in relatively unambiguous theoretical interpretation of the outcome. We would like to add that the situation is even more complex than the Butterfield article would indicate if the aim of training is not only significant enhancement of performance on the initial task but also durability and generality of the benefits of training. To be judged effective, training should improve the overall level of accuracy and the strategies used to attack the task, thereby permitting reasonable attribution of the component process(es) causing the original deficit. But, in addition, for both practical and theoretical reasons, effective training can only be judged as such if it results in long-term improvement in the subject's performance on both the training task and a class of situations that are similar to the training vehicle. To design an adequate training program that would meet these criteria, the following steps would have to be included.

Diagnosis of the Original Difference. Before instruction is even contemplated, preliminary steps must be taken to ensure that the target of training represents a cognitive skill that proves an intransigent problem for the poor performer. To establish that this is, in fact, the case, it would be necessary to examine the spontaneous operation of the skill in more

than one task and in more than one setting (Brown, 1978a). In addition, serious attempts should be made to ensure that the poor performers are not simply serving the necessary role of convenient experimental foils (Brown & DeLonche, 1978; Gelman & Gallistel, 1978) by providing a baseline against which a developmental trend can be established. Quite simply, the young should not be faced with proving their ability on a task ill-designed to measure any competencies they may possess. Sufficient task design and analyses should be undertaken so that the particular rules or strategies used by the young child can be detected, so that we do not end up with a total lack of information concerning what it is that the younger subjects are doing when they fail to perform in an "appropriate" manner. Additional refinements that would be nice, if not absolutely necessary, would be that starting, intermediate, and end state levels of competence could be identified so that instructional routines could be tailored to fit the diagnosis (Brown & DeLoache, 1978).

One last distinction concerning the identification of the initial learning problem concerns the type of knowledge that the child may lack. We refer here to the tenuous separation of task-specific knowledge and the general control of that knowledge. Ginsburg (1977) distinguished between the learning of principles and the learning of strategies. For example, one can acquire either the principle or the practice of addition or both. Knowing that you need to add is the principle, but knowing how to employ a counting routine effectively would be the strategy. We have made similar distinctions between the general and specific results of training, a

distinction that has been placed in the context of the memory-metamemory

literature (Brown, 1978a). For example, in a traditional memory task, one

can make the distinction between knowing that one should introduce an

active strategy (the principles of being strategic or engaging in self-

regulation) and knowing that a particular variant of a rehearsal strategy

would be the most helpful. Assessing differences in these types of know-

ledge would have important implications for what kind of training might be

designed. For example, faced with a task where rehearsal is required, the

nonrehearser could be in one of several states of ignorance. He could lack

the principle that he must be strategic at all, or he could lack the principle

that he should rehearse. Even if he has been known to rehearse in the past,

he may lack sufficient mastery over this task appropriate strategy for a

variety of reasons, including: not knowing how to rehearse effectively, not

recognizing the new task as one that demands rehearsal, or not knowing how

to modify his existing strategy to meet the changed surface structure of the

new task. Simply designating a subject in any one of these dilemmas a

non-rehearser is an inadequate diagnosis of his starting state of knowledge.

A more fine-grained initial subject analysis would greatly inform the sub-

sequent task analysis undertaken to design training. A very different form

of training would be prescribed for subjects suffering from the varying kinds

of ignorance.

Training. The design of a training routine should be based on adequate

task, situation, and subject analyses, a point that has been made many times

and a practice that has been shown to be successful in a variety of domains

(Brown, 1970, 1974; Butterfield et al., 1973; Campione & Brown, 1974;
Gelman & Gallistel, 1978). This literature has been adequately reviewed,
and we have no space to reiterate it here. One point about training studies
that has not received attention, however, is that instruction is rarely pro-
vided for the originally adequate. Given that the aim is often a practical
one of enhancing the performance of the inefficient, the common practice of
training only those in need is obviously economically defensible. But there
are interesting theoretical questions that remain unanswered by this proce-
dure, and, the simple expedient of also providing training for a subset of
the originally competent serves a useful function. Sometimes the tactic
establishes convincingly the exact nature of the original problem. For
example, Brown, Campione, and Gilliard (1974) attributed the superiority of
older children on a judgment of recency task to their ability to capitalize
on the presence of relevant background cues that could serve as temporal
anchor points. Training an anchor-cue utilization strategy completely
removed the developmental effect: trained subjects, young and old alike,
performed identically, whereas untrained older children had out-performed
untrained younger children. In other cases, however, individual or group
differences are of the same magnitude before or after intervention (Huttenlocher
& Burke, 1976; Lyons, 1977). We believe there are nontrivial theoretical
reasons to expect these differences pertaining to the nature of the strategic
components of the tasks and the concept of individual differences in
intelligence (Campione & Brown, 1978).

Another training tactic that can clarify some problems of interpretation

is one that has been employed successfully by two of the major training
programs (Brown, Campione, Bray, & Wilcox, 1973; Belmont & Butterfield, 1977).
In order to pin down the culprit responsible for an initial performance
decrement, one both prevents the originally efficient from engaging in the
activity putatively responsible for their effectiveness and induces the
poor performers to adopt the appropriate activity. If these manipulations
result in comparable patterns of performance, one can be more confident
that the original diagnosis was correct.

Maintenance and Generalization. Given that one can induce adequate
performance on the training task, it is then desirable to show that the
benefits of the instruction are durable and generalizable. By durable we
mean that the effects of training will persist in the absence of intrusive
aids, when minor changes in surface structure (e.g., stimulus materials)
take place and over significant time intervals. But more than that, success-
ful training must result in appropriate generalization, i.e., transfer to
tasks where the new behavior would obviously be helpful but not to situations
where its use would be less than optimal. Generalization involves more than
just the use of a trained behavior, it involves discrimination of appropriate
and inappropriate settings: the learner must know where and how to transfer
and when not to (Brown, 1978; Campione & Brown, 1974, 1978; Ginsburg, 1977).

Given the proliferation of evidence suggesting that such flexible genera-
lization of training is rarely the outcome of cognitive training studies, are
we justified in concluding, as many have, that failure to generalize is a
defining feature of the cognitive apparatus of retarded children? We think

not, if only because the appropriate tests have yet to be made. Despite
the great deal of interest, there has been a dearth of informed experimenta-
tion or observation of the conditions that would promote flexible learning.
However, we do have enough experience to provide guidelines that we believe
would result in appropriate transfer.

Let us begin with the simplest form of transfer failure, the situation
where the child does not even maintain the new behavior unless specifically
prompted to do so (Brown, 1978; Brown, Campione, & Barclay, 1978). One
explanation of this finding is that the child simply does not appreciate
that the trained strategy improved performance. If it is true that young
children are totally unaware of the utility of a strategy, why should they
benefit from instruction? If trained to rehearse, they will rehearse only
if the situation remains unchanged and they receive continual reminders.
But why should they be expected to maintain the behavior, let alone use
the new skills insightfully, if the reason for the activity was never made
clear? Young children will maintain the effects of training, however, if
they can be made aware of the usefulness of the trained strategy (Kennedy &
Miller, 1976), and a clear first step in designing training studies should
be in include explicit feedback of the new behavior's effectiveness.

The aim of training is to achieve not only maintenance but generalization.
A major impediment was pointed out by the Soviet psychologist Shif (1969),
who identified a consistent problem with training retarded children, i.e.,
the effect of training seemed to be "welded" to the situation in which it was
provided. Given that there are ample examples of such welding in the

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literature, we suggest that direct attempts to overcome the problem should be initiated. Training in multiple settings appears to be the answer. If the learner is instructed in the use of a strategy in more than one appropriate setting, this should reduce the tendency for strict situationally-specific learning to occur (Brown, 1974, 1978; Campione & Brown, 1974). There is some preliminary evidence that the tactic will be successful (Belmont, Butterfield, & Borkowski, 1978).

The very young child in a training study is often unaware that the separate phases of the experiment are indeed related (Bullock & Gelman, 1977; Campione, 1973). It is not surprising, therefore, that the utility of a prior solution or strategy to a new variant of the training task does not occur to them spontaneously. But, if the aim of training is flexible generalization, then it seems reasonable to include in the training package direct instructions concerning generalization. For example, one could tell the child that the trained behavior could help him on a variety of similar tasks and that the trick is to know which ones. The child could then be exposed to a variety of prototypic tasks (those on which experienced users of the strategy would always attempt to use it) and the utility of the strategy in such situations explained and demonstrated. At that point, inappropriate tasks could be considered, and the reason why the trained behavior would not be helpful could be pointed out. Finally, the child could be presented with a generalization test containing new prototypic and inappropriate tasks and his intelligent/unintelligent application of the strategy examined. As far as we know, this procedure has not been attempted, but we

are currently investigating the feasibility of such direct generalization
training which incorporates the suggestions made above, together with direct
instruction in modifying an overlearned strategy to fit changes in the exact
specifications of the new tasks.

Another crucial decision for those who would undertake training studies
is the choice of both the training and transfer tasks. It is obviously
necessary that the tasks should be related in such a way that efficient
users of the cognitive skill in question would spontaneously adopt it on
both occasions (Brown, 1978; Brown, Campione, & Murphy, 1977). The tasks
must evoke the same underlying cognitive process but differ sufficiently
in surface structure to provide a reasonable test of generalization. Many
of the "successful" training studies have employed transfer tests that vary
so little from the training vehicle that one can dispute whether it really
is generalization they have achieved or simply maintenance. The investigator
must justify the distinction between maintenance and generalization on at
least practical, and preferably theoretical, grounds.

An additional requirement is that the investigator be able to distinguish
between different potential causes of transfer failures, for a failure to
perform adequately on transfer could be due to the trainees' inability to
see the relation of the trained behavior to the new task, the usual inter-
pretation, or to his inability to execute some other component of the transfer
task which neither they nor the investigator fully appreciate. In an early
series of studies addressed at identifying transfer mechanisms in a discrimi-
nation learning paradigm (Campione & Brown, 1974), we discussed a number of

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possible reasons for failing to observe transfer. One, termed the inter-
action of components hypothesis, was based on the view that subjects might
in fact generalize the trained component to a transfer task but be unable to
demonstrate the generalization due to a weakness with some other component
of the transfer task. As a simple example, an attempt to generalize a
trained rehearsal strategy to a new task would be hidden if the subjects
could not come up with names or labels for the stimuli. Unless the experi-
menter is aware of these additional components, it is impossible to interpret
transfer failures. In the 1974 paper, we also provide some data consonant
with the interaction of components hypothesis. Therefore, our final pre-
scription for designing training is that sufficient task analyses be in-
stituted to enable an unambiguous attribution of failures to the proper
cause.

In summary, we have suggested that the basic requirements of an adequate
training program must include: 1) careful selection of the cognitive skill
to be examined; 2) sensitivity to the actual beginning competence of the
learner; 3) stringent analyses of the requirements of the training and
transfer task so that transfer failures may be interpreted properly; 4)
training in multiple settings to alleviate the problem of welding; 5) direct
feedback concerning the effectiveness of the trained skill; and 6) direct
instruction concerning the generalization of the trained skills. Until a
research program can provide answers to these basic questions, it would be
premature to conclude that retarded children can, under no circumstances,
show flexible effects of training.

Reconsideration of the Skills Trained

Specific versus General Skills. Given the impressive evidence of young children's general problems with self regulation and control of their goal-directed activities (Brown, 1975, 1978a; Brown & DeLoache, 1978; Meichenbaum, 1977; Mischel & Patterson, 1976), and the less than optimistic forecast concerning the benefits of training specific cognitive strategies, we believe that it would be judicious to re-think the type of skills that are the subject of intensive training. If it is true that young children in general, and slow-learning children in particular, experience major problems when required to orchestrate and regulate their own attempts at strategic intervention (Brown, 1978a; Brown & DeLoache, 1978; Campione & Brown, 1977, 1978), then an alternative approach to training specific mnemonics would be to train the metacognitive skills that provide the most pronounced difficulties for the immature learner (Brown, 1978a; Brown, Campione, & Murphy, 1977). Metacognitive skills, such as checking, planning, asking questions, self-testing, and monitoring ongoing attempts to solve problems are characteristically lacking in retarded children's laboratory learning performance (Brown, 1978a). In addition, these skills are, by their very nature, general ones in that they apply in a wide variety of problem solving situations. Furthermore, they are the very control processes implicated in breakdowns of effective transfer of training (Brown, 1974, 1978; Campione & Brown, 1974, 1977, 1978). As such, the rationale for directing training attempts at metacognitive skills is persuasive.

There is another reason why training attempts directed at general

skills might be more likely to result in transfer. One problem with specific

skills is that they are just that--specific to a very small class of situations.

For learners to generalize the effects of instruction in the use of specific

routines, they would have to be able to discriminate the situations in which

the routine would be appropriate from those in which it would not. Adequate

generalization requires both extended use in novel situations and decisions

not to use the trained routines in other situations where it would not be

beneficial (Brown, 1978a; Campione & Brown, 1974, 1978). In the case of

truly general skills, this discrimination should not be necessary, as the

skill or routine could simply be used in a whole battery of problem solving

situations without regard to any subtle analysis of the task being attempted.

In this sense, "general metacognitive skills" might be regarded as easy ones

to instruct, or at least the most likely to lead to transfer across task

boundaries; and it makes sense to begin training with skills which are the

simplest.

The types of general problem solving skills we are particularly inter-

ested in would be the ability to stop and think before attempting a problem,

to ask questions of oneself and others to determine if one recognizes the

problem, to check solutions against reality by asking not "is it right, but is

it reasonable," to monitor attempts to learn to see if they are working or

are worth the effort (Brown, 1978a, 1978b). There are serious problems

associated with this position, for it is certainly easier to suggest that

training should be aimed at showing children "how to organize their knowledge"

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and "how to solve problems," etc. (Norman, Gentner, & Stevens, 1976) than it is to instantiate these suggestions in concrete training programs. But, in view of the dismal failure, so far, to induce generalization in slow-learning children, an attempt to address the problem of training general skills seems to be timely.

We have some preliminary evidence that training such general skills will be effective in producing transfer, both from our own laboratory and from a consideration of behavior modifications programs aimed at teaching self-instructional routines (Meichenbaum, 1977). The task presented to retarded adolescents was one of estimating their readiness to be tested for rote recall of a list of picture names. We trained a stop-test-and-study routine where the test element was anticipation. Trained students performed more effectively and maintained their superiority over a one-year retention interval. They also transferred the trained routine to a task demanding the same general tactic but differing in surface structure, i.e., a prose recall task where the subject was required to retain the gist of the passage. In comparison to a pair of control groups, the trained students were observed to engage in more overt self-checking behavior, took more time studying, recalled more idea units from the passage, and, further, their recall was more clearly related to the thematic importance of the constituent idea units, a pattern characteristic of developmentally more advanced students (Brown, Campione, & Barclay, 1978).

Thus, our major success to date came when we turned to a very simple self-testing routine. We are currently examining the generality of the

effects of teaching children to self-interrogate when faced with a certain class of problems (instructions, math problems, a laboratory task, etc.). The type of self-interrogation which we think might work is to provide the child with a routine set of questions to ask himself before proceeding, e.g., (a) stop and think! (b) do I know what to do (i.e., understand the instructions, both explicit and implicit)? (c) is there anything more I need to know before I can begin? and (d) is there anything I already know that will help me (i.e., is this problem in any way like one I have done before)? It is with self-instructional routines such as these that those engaged in behavior modification training and classroom management have achieved their major success in inculcating generalized improvement (Meichenbaum, 1977; Stokes & Baer, 1977).

Transfer Appropriate Processing. We would like to point out that the preceding discussion applies principally to situations where the child must acquire and transfer mechanisms of learning that lead to rote recall, or at least gist recall of material. But this is not the only form of learning, for a fundamental form of learning can be described as "coming to understand something that one had not previously understood" (Bransford & Nitsch, 1978; Brown, 1978b). Bransford's concept of transfer appropriate processing has much in common with a major tenet of Soviet psychology--that activities are purposive and goal directed. An appropriate learning situation therefore is one that is compatible with the desired end state, and one cannot decide upon appropriate training unless one considers the question "appropriate for what end?" (Brown, 1978b). Traditionally, learning studies have relied

almost exclusively upon accuracy of memory in assessing the success of

learning, but the practice can lead one to neglect some important aspects

of learning that are necessary for valuable kinds of transfer. Knowledge

in a form that permits optimal memory need not be in an optimal form to be

used to understand a novel input. For example, Nitsch (1978) investigated

the effectiveness of several study activities for helping subjects learn a

set of new concepts. The task consisted of having subjects learn a definition

and several examples of a number of concepts. Two of the several study

activities were: memorization of the definitions, or identifying the list

of examples. While the group attained equivalent levels of learning as

assessed by a memory test of the original examples, they differed reliably

at identifying novel examples of the concepts which were introduced in the

transfer phase. Thus, in the former case, the study activities appear

equivalent, whereas in the latter case, a clear advantage accrues to the

condition where identifying examples was the main activity in the study period.

These studies, and others from Bransford's laboratory, illustrate that the

optimal learning situation can only be determined relative to the uses to

which the acquired knowledge will subsequently be put. Investigation of the

compatibility of the learning situation for a variety of subsequent uses

would go a long way toward clarifying our knowledge about appropriate

training.

Relations of Trained Skills to Real-Life Experience

As a result of both our success and failure in attempting to train

retarded children to perform more effectively on common problem-solving tasks

we suggest that the types of cognitive activities which are most suitable

for intensive intervention should have certain properties: (a) they should

be applicable in a wide range of situations, (b) they should readily be

seen by the child to be reasonable activities that work, (c) they should

have some counterpart in real-life experience, and (d) their component

processes should be well understood so that effective training techniques

can be devised.   In this final section we would like to address (c) the

problem of real-life counterparts.   This discussion will be brief because we

have run out of space and because detailed discussions of this topic have

been featured in recent articles (Cole, Hood, & McDermott, 1978; Ginsburg,

1977; Rogoff, 1978).   Here we would just like to confirm the complexity

of the problem as illustrated by these prior papers and to stress that the

problem of ecological validity is rarely considered in discussion of the

cognitive performance of retarded children (Brown, 1978a).

The issue can be addressed at two levels.   First there is the problem

of the cultural context of learning and the design of cognitive tasks.

Consider an example, Lave (1977) examined transfer of arithmetic and

measurement skills by Liberian tailors with varying amounts of tailoring

experience and varying degrees of formal education.   Transfer problems were

formally equivalent in terms of the underlying computational requirements

but were presented in a surface format that was appropriate either to the

familiar context of tailoring or to the context of formal education.   Exper-

ience was significantly related to transfer efficiency.   Tailoring experience

led to success across tailoring problems whereas experience with formal

education led to transfer across traditional school problems. Transfer
operates within limited contexts and depends on experience and task fami-
liarity. This kind of detailed attention to the conditions promoting
generalization has rarely been lavished on the disadvantaged child in our
society. But in order to fully understand the retarded student's general
failure to be strategic, or transfer learning, on tasks that represent formal
educational enterprises, it is necessary for us to consider the processes of
learning within realms with which they are experienced (Brown, 1978a).

This problem brings us face to face with the whole issue of ecological
validity and the comparative research enterprise (Cole, Hood, & McDermott,
1978) and a level of complexity above the mere problem of providing familiar
contexts of learning. As Cole et al. point out there are serious problems
with the assumption that what is important concerning cognitive skills can
be identified in the laboratory and then observed in real life situations
where a familiar variant of the skill operates naturally. It is entirely
possible that laboratory tasks are related in only trivial ways to the common
exercises of intelligent adaptation. If so, one would need to examine the
learning process in cultural manifestation with which cognitive psychologists
themselves are unfamiliar, where the very identification and classification
of learning activities would prove troublesome and measurement problems would
be severe. Yet in spite of the complexity of the problem, an awareness of
these issues must lead us to consider learning in natural contexts as well as
laboratory settings and thereby inform theories of learning in ways that
would be precluded by a total reliance on standardized tests and laboratory
tasks.

References

Belmont, J. M.   Individual difference in memory: The case of normal and

retarded development.   In M. Gruneberg & P. Morris (Eds.), Aspects

of memory.   London: Methuen, 1978.

Belmont, J. M., & Butterfield, E. C.   The instruction approach to develop-

mental cognitive research.   In R. V. Kail, Jr., & J. W. Hagen (Eds.),

Perspectives on the development of memory and cognition.   Hillsdale,

N.J.: Lawrence Erlbaum Associates, 1977.

Belmont, J. M., Butterfield, E. C., & Borkowski, J. G.   Training retarded

persons to generalize memorization across memory tasks.   In M. M.

Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), Practical aspects of

memory.   London: Academic Press, 1978.

Borkowski, J. G., & Cavanaugh, J. C.   Maintenance and generalization of

skills and strategies by the retarded.   To appear in N. R. Ellis (Ed.),

Handbook of mental deficiency: Psychological theory and research, Second

edition.   Hillsdale, N.J.: Lawrence Erlbaum Associates, 1979.

Bransford, J. D., & Nitsch, K. E.   Coming to understand things that we could

not previously understand.   Address presented at NICHD conference on

"Implications of basic speech and language research to the school and

clinic," Bethesda, May, 1976.

Brown, A. L.   Subject and experimental variables in the oddity learning of

normal and retarded children.   American Journal of Mental Deficiency,

1970, 75, 142-151.

Brown, A. L.   The role of strategic behavior in retardate memory.   In N. R.

Ellis (Ed.), International review of research in mental retardation, Vol. 7. New York: Academic Press, 1974.

Brown, A. L. The development of memory: Knowing, knowing about knowing, and knowing how to know. In H. W. Reese (Ed.), Advances in child development and behavior, Vol. 10. New York: Academic Press, 1975.

Brown, A. L. Development, schooling and the acquisition of knowledge about knowledge. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1977.

Brown, A. L. Knowing when, where, and how to remember: A problem of meta-cognition. In R. Glaser (Ed.), Advances in instructional psychology, Vol. 1. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978. (a)

Brown, A. L. Theories of memory and the problems of development: Activity, growth, and knowledge. In L. Cermak, & F. I. M. Craik (Eds.), Levels of processing in memory. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978. (b)

Brown, A. L., Campione, J. C., & Barclay, C. R. Training self-checking routines for estimating test readiness: Generalization from list learning to prose recall. Technical report, Center for the Study of Reading, University of Illinois, 1978.

Brown, A. L., Campione, J. C., Bray, N. W., & Wilcox, B. L. Keeping track of changing variables: Effects of rehearsal training and rehearsal prevention in normal and retarded adolescents. Journal of Experimental Psychology, 1973, 101, 123-131.

Brown, A. L., Campione, J. C., & Gilliard, D. M. Recency judgments in

children: A production deficiency in the use of redundant background

cues. Developmental Psychology, 1974, 10, 303.

Brown, A. L., Campione, J. C., & Murphy, M. D. Keeping track of changing

variables: Long-term retention of a trained rehearsal strategy by re-

tarded adolescents. American Journal of Mental Deficiency, 1974, 78,

446-453.

Brown, A. L., Campione, J. C., & Murphy, M. D. Maintenance and generalization

of trained metamnemonic awareness in educable retarded children. Journal

of Experimental Child Psychology, 1977, 24, 191-211.

Brown, A. L., & DeLoache, J. S. Skills, plans and self-regulation. In R.

Siegler (Ed.), Carnegie-Mellon symposium on cognition. Hillsdale, N.J.:

Lawrence Erlbaum Associates, 1978.

Bullock, M., & Gelman, R. Numerical reasoning in young children: The ordering

principle. Child Development, 1977, 48, 427-434.

Butterfield, E. C. On studying cognitive development. In G. P. Sackett (Ed.),

Observing behavior. Vol. 1: Theory and application in mental retardation.

Baltimore: University Park Press, 1977.

Butterfield, E. C., Wambold, C., & Belmont, J. M. On the theory and practice

of improving short-term memory. American Journal of Mental Deficiency,

1973, 77, 654-669.

Campione, J. C. The generality of transfer: Effects of age and similarity of

training and transfer tasks. Journal of Experimental Child Psychology,

1973, 15, 407-418.

Campione, J. C., & Brown, A. L. The effects of contextual changes and degree
of component mastery on transfer of training. In H. W. Reese (Ed.),
Advances in child development and behavior, Vol. 9. New York: Academic
Press, 1974.

Campione, J. C., & Brown, A. L. Memory and metamemory development in
educable retarded children. In R. V. Kail, Jr., & J. W. Hagen (Eds.),
Perspectives on the development of memory and cognition. Hillsdale,
N.J.: Lawrence Erlbaum Associates, 1977.

Campione, J. C., & Brown, A. L. Toward a theory of intelligence: Contributions
from research with retarded children. Intelligence, 1978, in press.

Cole, M., Hood, L., & McDermott, R. P. Concepts of ecological validity: Their
differing implications for comparative cognitive research. In W. S.
Hall, & M. Cole (Eds.), The quarterly newsletter of the Institute for
Comparative Human Development, 1978, 2, 34-37.

Cole, M., & Scribner, S. Theorizing about socialization and cognition.
Ethos, 1975, 3, 250-268.

Cole, M., Sharp, D. W., & Lave, C. The cognitive consequences of education:
Some empirical evidence and theoretical misgivings. Urban Review,
1976, 9, 218-233.

Gelman, R., & Gallistel, C. R. The young child's understanding of number:
A window on early cognitive development. Harvard University Press, 1978.

Ginsburg, H. Some problems in the study of schooling and cognition. In
W. S. Hall, & M. Cole (Eds.), The quarterly newsletter of the Institute
for Comparative Human Development, 1977, 1, 7-10.

Huttenlocher, J., & Burke, D. Why does memory span increase with age?
Cognitive Psychology, 1976, 8, 1-31.

Kennedy, B. A., & Miller, D. J. Persistent use of verbal rehearsal as a
function of information about its value. Child Development, 1976,
47, 566-569.

Lave, J. Tailor-made experiments and evaluating the intellectual conse-
quences of Apprenticeship training. In Hall & Cole, Child Development,
1977, 1, 1-3.

Lyons, D. R. Individual differences in immediate serial recall: A matter of
mnemonics? Cognitive Psychology, 1977, 9, 403-411.

Meichenbaum, D. Cognitive-behavior modification: An integrative approach.
New York: Plenum, 1977.

Mischel, W., & Patterson, C. J. Substantive and structural elements of
effective plans for self-control. Journal of Personality and Social
Psychology, 1976, 34, 942-950.

Nitsch, K. E. Structuring decontextualized forms of knowledge. Unpublished
Ph.D. Thesis, Vanderbilt University, 1978.

Norman, D. A., Gentner, D. R., & Stevens, A. L. Comments on learning schemata
and memory representation. In D. Klahr (Ed.), Cognition and instruction.
Hillsdale, N.J.: Lawrence Erlbaum Associates, 1976.

Resnick, L. B. (Ed.) The nature of intelligence. Hillsdale, N.J.: Lawrence
Erlbaum Associates, 1976.

Rogoff, B. B. Spot Observation: An introduction and examination. In Hall
& Cole, Child Development, 1978, 2, 21-26.

Shif, Z. I.   Development of children in schools for the mentally retarded.

In M. Cole, & I. Maltzman (Eds.), A handbook of contemporary Soviet

psychology.   New York: Basic Books, 1969.   Pp. 326-353.

Stokes, T. F., & Baer, D. M.   An implicit technology of generalization.

Journal of Applied Behavior Analysis, 1977, 10, 349-367.

Weisz, J. R.   Transcontextual validity in developmental research.   Child

Development, 1978, 49, 1-12.

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