DOCUMENT RESUME

ED 421 674 CG 028 602

AUTHOR	Halford, Graeme S.; Andrews, Glenda; Jensen, Ingalise
TITLE	Category Induction and Hierarchical Classification Assessed by Property Inference: The Influence of Complexity.
PUB DATE	1998-07-00
NOTE	27p.; Poster presented at the Biennial Meetings of the International Society for the Study of Behavioural Development (15th, Berne, Switzerland, July 1-4, 1998).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Age Differences; *Cognitive Development; Foreign Countries; Piagetian Theory; *Preschool Children; Preschool Education

ABSTRACT

Relational complexity has been found to be an effective metric for cognitive tasks. The hypothesis that the greater difficulty and later age of attainment of hierarchical classification as compared to category induction are attributable to differences in structural complexity was tested. Hierarchical classification entails a ternary relation between Categories B, A, and A prime such that A and A prime are included in B. Category induction entails a binary relation between a category and its complement. Forty children, 3 to 6 years old, were assessed on hierarchical classification by property inference between levels (basic-subordinate or subordinate-basic) and on category induction using property inference within levels (basic-basic, subordinate-subordinate). The same hierarchies were used in both tasks, and special care was taken to control for question content. As predicted from relational complexity theory, hierarchical classification was more difficult than category induction, and children older than 5 years succeeded on both tasks, but 3-year-olds succeeded on category induction only. Multiple regression analysis showed that 68% of the age-related variance was accounted for by performance on tasks from other domains that were known to entail the same level of relational complexity. (EMK)

Category Induction and Hierarchical Classification Assessed by Property Inference: The Influence of Complexity

Graeme S. Halford, Glenda Andrews, & Ingalise Jensen

University of Queensland

Brisbane, 4072, AUSTRALIA

Poster presented at XVth Biennial Meetings of the International Society for the Study of Behavioural Development held in Berne, Switzerland on July 1-4, 1998.

E-mail: gsh@psy.uq.edu.au; glenda@psy.uq.edu.au

Web: http:/www.psy.uq.edu.au/people/Department/gsh/index.html

Abstract

Hierarchical classification has traditionally been tested by comparing set numerosities in inclusion tasks (more apples or more fruit), whereas category induction has been tested by property inference (whether a property of an instance applies to other instances of that or different categories). Hierarchical classification can be assessed by property inference because of asymmetric relations between levels. Thus properties of a basic level category (fruit) apply to a subordinate (apples) but not vice versa. A common assessment method permits comparison of the tasks. The generally observed greater difficulty of hierarchical classification could be attributed to structural complexity. Hierarchical classification entails a ternary relation between categories, B, A and A' such that A and A' are included in B. Category induction entails a binary relation between a category and its complement. Relational complexity has been found to be an effective metric for cognitive tasks. Forty children aged 3:6-6:0 were assessed on hierarchical classification by property inference between levels (basic-subordinate or subordinate-basic) and on category induction using property inference within levels (basic-basic, subordinate-subordinate). The same hierarchies were used in both tasks, and special care was taken to control for question content. As predicted from relational complexity theory, hierarchical classification was more difficult than category induction, and children over 5 succeeded on both tasks but 3-year olds succeeded on category induction only. Multiple regression analysis showed that 68 % of the age-related variance was accounted for by performance on tasks from other domains that were known to entail the same level of relational complexity.

Category Induction and Hierarchical Classification Assessed by Property Inference: The Influence of Complexity

Background & Rationale

Hierarchical classification (Inhelder & Piaget, 1964) has traditionally been tested by class inclusion tasks in which the numerosities of classes at different levels of generality are compared (e.g., *Are there more apples or more fruit?)* Category induction (Gelman & Markman, 1987) has been tested by property inference tasks in which children judge whether a property of an instance generalises to instances of the same category or a different category.

Hierarchical classification can be also assessed by property inference. Correct inferences require recognition of the asymmetry of the relation between categories at different levels of the hierarchy. Properties of a basic level category (fruit) apply to a subordinate category (apples) but the reverse is not necessarily true. A common assessment method (property inference) would permit comparison of hierarchical classification and category induction.

The study tested that hypothesis that the greater difficulty and later age of attainment of hierarchical classification as compared to category induction are attributable to differences in structural complexity. Complexity was assessed in terms of relational complexity which has been found to be an effective metric for cognitive tasks (Halford, Wilson, & Phillips, in press). Children were tested on hierarchical classification using property inference between levels of a hierarchy and on category induction using property inference within levels. They also completed two additional tasks (class inclusion and transitivity) that were known to entail the same level of relational complexity as hierarchical classification.

Relational Complexity metric (Halford, et al., in press)

Relational complexity refers to the arity of relations (i.e., number of arguments or entities related). Each argument corresponds to a dimension and an *N*-ary relation is a set of points in *N*-dimensional space. Number of dimensions corresponds to the number of interacting variables that constrain responses or decisions. A relational complexity metric is defined. Unary relations have a single argument as in class membership, dog(fido). Binary relations have 2 arguments as in larger-than(elephant, mouse). Ternary relations have 3 arguments as in addition(2,3,5). Quaternary relations such as proportion have 4 interacting components as in 2/3 = 6/9. Quinary relations entail 5 interacting components.

Processing load increases with complexity, but complexity can be reduced through segmentation and chunking strategies. Normative data suggests that children process unary relations at 1 year, binary relations at 2 years, ternary relations at 5 years, quaternary relations at 11 years (medians).

Complexity analyses

Hierarchical classification entails a ternary relation between 3 categories, B, A and A' such that A and A' are included in B as shown in Figure 1. Property inferences involving instances of categories at different hierarchical levels (between-level property inferences) and comparison of the numerosities of a larger subclass and its superordinate class (more B or more A) each have the complexity of a ternary relation.

Category induction entails a binary relation between categories at the same level of the hierarchy. Given that a property, *has bones,* applies to a category, *cold water fish*, does this property apply to instances of a complementary category, *sharks,* or to another instance of the *cold water fish* category? Thus within-level property inference and comparison of the numerosities of two subclasses (more A or more A') each have the complexity of a binary relation as shown in Figure 2.

Transitivity. Transitive reasoning is demonstrated when an inference A*R*C is deduced from premises A*R*B and B*R*C, where *R* is a transitive relation, and A, B, and C are the elements related. Determining the relation between A and C typically involves integrating premises A*R*B and B*R*C to construct an ordered triple, A*R*B*R*C (Sternberg, 1980; Trabasso, 1975). The A*R*C inference requires that both premises be considered in the same decision and has the complexity of a ternary relation. Constructing an ordered series by concatenation involves considering one premise at a time and has the complexity of a binary relation.

Predictions

Complexity effects were predicted on the three tasks. On the property inference task, between-level items (ternary relation) will be more difficult than within-level items (binary relation). On the class inclusion task, numerosity comparisons involving a major subclass and superordinate class (ternary relation) will be more difficult than comparison of subclasses (binary relation). On the transitivity task, ordering based on integration of two premises (ternary relation) will be more difficult than ordering based on a single premise (binary relation).

Age of Attainment. On property inference, class inclusion, and transitivity, children over 5 years will perform at above chance level on both binary and ternary relation items. Children under 5 years should succeed on the binary but not the ternary relation items.

Relation between tasks. If the difficulty of property inference is due to its relational complexity, property inference should correlate with class inclusion and transitivity tasks whose items also vary in complexity.

Age related variance. If capacity to process complex relations increases with age during childhood, then class inclusion and transitivity should account for age-related variance in property inference.

Method

Participants

Two groups of children participated. The younger group consisted of 18 children aged 3;6 to 4;10 (mean age, 4;1). The older group consisted of 22 children aged 4;11 to 5;11 (mean age, 5;5).

All children completed 3 tasks: property inference, class inclusion and transitivity.

Property Inference Task

The property inference task investigated children's willingness to make inferences about properties based on category membership. Figure 3 shows the categorical structure on which the inferences were based. At the more general level, there were 2 categories, designated as basic and complementary basic. At the more specific level, there were 2 categories, subordinate and complementary subordinate.

Semantic Hierarchies. Eight different semantic contents were selected to conform to this hierarchical structure. The hierarchies and properties are shown in Table 1. The properties were ones that children would be unlikely have known previously but which they could understand. This was to ensure that responses would be based on inference rather than their prior knowledge.

Question types. Eight questions were generated for each hierarchy. Table 2 shows questions for the cold water fish hierarchy. The between-level (1-4) and within-level (5-8) questions were similar in terms of presentation format and content but differed in terms of structure.

Between-level questions involved inferences about instances of hierarchically related categories (i.e., at basic and subordinate levels). Questions 1 and 2 referred the same two categories, but the direction of the inference differed. Basic-to-subordinate inferences required *Yes* responses, whereas subordinate-to-basic inferences required *No* or *Can't tell* responses. Correct responses to both questions were required to demonstrate understanding of the asymmetric relation between categories at different levels. Questions 3 and 4 involved inferences based on basic and complementary subordinate categories. These were also jointly scored. Thus the maximum score for the between-level inferences for each semantic hierarchy was 2. For the eight hierarchies, the maximum score was 16.

Within-level questions (5-8) involved inferences about instances of categories at the same level. Questions 5 and 6 referred to basic level categories. Questions 7 and 8 referred to subordinate level categories. For consistency with the between-level inferences, these pairs of questions were also jointly scored. For the eight hierarchies, the maximum score was 16.

Materials. There were 48 pictures depicting the 6 instances of the 8 semantic hierarchies. There were two instances of each basic and subordinate category, and one instance of each complementary category.

Procedure. Children responded to 64 questions, 8 for each semantic hierarchy. The procedure is demonstrated using Questions 1 and 5 for the cold water fish hierarchy.

Question 1: Basic-to-subordinate

This is a cold-water fish	Category 1 instance presented
This is a salmon	Category 2 instance presented
A salmon is a type of cold-water fish	Inter-category relation specified
All cold-water fish have bones	Property of category 1 stated
Do all salmon have bones? Yes	Inference question

Question 5: Basic-to-complementary basic

This is a cold-water fish	Category 1 instance presented
This is a shark	Category 2 instance presented
A shark is not a cold-water fish.	Inter-category relation specified
All cold-water fish have bones	Property of category 1 stated
Do all sharks have bones? No	Inference question

Class Inclusion Task

Understanding the implications of hierarchical structures was also assessed using Andrews' (1997) modification of Hodkin's (1987) class inclusion task.

Materials & Procedure. The six displays contained coloured geometric shapes which formed an inclusion hierarchy. Figure 4 depicts a typical display with three yellow squares and two blue squares. Children responded to three questions per display. Question A required comparison of the two subclasses and involves a binary relation. Question C required comparison of the superordinate class and the major subclass. This requires inclusion reasoning which entails the ternary relation among three classes (squares, yellow things, blue things). Question B was included because Hodkin's method of estimating and correcting Question C for guessing requires that the number of errors on superordinate-minor subclass comparisons be known.

Scoring. The binary relation score (max = 6) reflected correct responses to Question A. The ternary relation score (max = 6) was computed by deducting the number of errors on Question B (min = 0) from the number of correct responses to Question C (max = 6) (Hodkin, 1987).

Transitivity task

Materials The premise displays consisted of 4 pairs of coloured squares in which one colour was higher than another (see figure). The 4 pairs together defined a unique vertical ordering of 5 coloured squares in a tower. For the example shown, the correct top-down order is red, blue, green, purple, yellow. More generally, A > B > C > D > E where A is top position and E is bottom. A different assignment of colours to ordinal positions was used on each trial.

Procedure In the binary relation items, children constructed 2 × 5-square towers, beginning with an internal pair, either BC or CD. Ordering squares B and C, required consideration of a single premise, B *above* C, and is equivalent to a binary relation. Adding each subsequent square (e.g., D) required consideration of a single premise, C *above* D. One point was awarded for each correctly ordered initial pair and subsequent square. This yielded a maximum binary relation score of 8.

In the ternary relation items, children predicted which of 2 squares (positions B and D) would be higher up in the tower. Two premises, B *above* C and C *above* D must be integrated to form the ordered set, B *above* C *above* D, from which B *above* D can be concluded. As a check on guessing, C was placed after B and D. If the child had integrated BC and CD to conclude B *above* D, the correct position of C (between B and D) should have been apparent. Credit was given for responses where B, D, and C were placed correctly to yield a ternary relation score (max = 8).

Results & Discussion

Predictions 1 & 2

Table 3 shows the mean number of correct within-level and between-level inferences made by each age group. Between-level inferences were more difficult than within-level inferences, $F(1,38) = 29.64$, $p < .001$. The same hierarchies were used in both types of inferences, and special care was taken to control for question content and task procedures. The difficulty appears to be due to the structural complexity of the inferences. Between-level inferences required ternary relations, whereas within-level inferences entailed binary relations. Older children performed better than younger children, $F(1,38) = 19.28$, $p < .001$.

Table 4 shows the mean number of correct responses to items on the class inclusion task made by each age group. There were significant effects of complexity, $F(1,38) = 186.31$, $p < .001$, and age, $F(1,38) = 22.13$, $p < .001$ and a significant Age × Complexity interaction, $F(1,38) = 15.37$, $p < .001$. Numerosity comparisons involving the superordinate class and major subclass were more difficult than subclass comparison for both age groups, but the effect was greater for younger, $F(1,17) = 169.84$, $p < .001$ than older children, $F(1,17) = 46.10$, $p < .001$.

Table 5 shows the mean number of correct responses to transitivity items made by each age group. Ordering based on integration of two premises (ternary relation) was more difficult than ordering based on a single premise (binary relation), $F(1,38) = 181.06$, $p < .001$. The effect of age did not reach significance, $F(1,38) = 2.79$, $p = .10$.

Prediction 3

Table 6 shows the intercorrelations between the tasks. All pairwise correlations were significant. This is consistent with our relational complexity analyses which indicated that high levels of performance on the three tasks require ternary relations to be represented. Class inclusion was more strongly related than transitivity to property inference, Steiger's $t(39) = 2.06$, $p < .05$, perhaps reflecting the hierarchical structure common to class inclusion and property inference but not transitivity.

Prediction 4

Age was strongly related to property inference performance accounting for .47 ($.69^2$) variance. Age, class inclusion, and transitivity together accounted for .49 of total variance in property inference, Multiple $R = .70$, $F(3, 36) = 11.34$, $p < .001$. The unique contribution of age was .15 (squared semi-partial correlation). Thus class inclusion and transitivity reduced the contribution of age from .47 to .15, thereby accounting for 68% of age related variance in property inference.

Conclusions

The complexity effects and the similar patterns of success for the older and younger children observed across the 3 tasks are consistent with the predictions of the relational complexity approach. The greater difficulty of items requiring ternary versus binary relations suggest that processing loads increase with the arity of relations. The correlations and regression analyses indicate the existence of a domain general capacity to process relations of increasing complexity. This capacity appears to increase with age during childhood. Children under 5 years processed binary relations, but experienced difficulty with ternary relations. These data are consistent with age norms obtained in other studies (Andrews, 1997). The presence of a domain general factor in no way precludes the influence of domain specific factors, as evidenced in our data by the stronger correlation between tasks that share a common hierarchical structure. The property inference and class inclusion data suggest that the generally observed greater difficulty and later age of attainment of hierarchical classification over category induction are due to differences in structural complexity.

References

Andrews, G. (1997). Assessment of relational reasoning in children aged 4 to 8 years. ERIC document 402 073.

Gelman, S. A., & Markman, E. M. (1987). Young children's inductions from natural kinds: The role of categories and appearances. Child Development, 58, 1532-1541.

Halford, G. S., Wilson, W. H., & Phillips, S. (in press). Processing capacity defined by relational complexity: Implications for comparative, developmental, and cognitive psychology. Behavioral and Brain Sciences. Available at http://cogsci.ecs.soton.ac.uk/bbs/

Hodkin, B. (1987). Performance model analysis in class inclusion: An illustration with two language conditions. Developmental Psychology, 23, 683-689.

Inhelder, B., & Piaget, J. (1964). The early growth of logic in the child. London: Routledge & Kegan Paul.

Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. Psychological Bulletin, 87, 245-51.

Sternberg, R.J. (1980a). The development of linear syllogistic reasoning. Journal of Experimental Child Psychology, 29, 340-356.

Sternberg, R.J. (1980b). Representation and process in linear syllogistic reasoning. Journal of Experimental Psychology: General, 109, 119-159.

Trabasso, T. (1975). Representation, memory, and reasoning: How do we make transitive inferences? In A. D. Pick (Ed.). Minnesota symposia on child psychology (Vol. 9, pp.135-172). Minneapolis: University of Minnesota Press.

Table 1.

Eight Hierarchical sets containing natural kinds categories and their properties

Basic	Property of Basic	Complementary Basic	Subordinate	Property of Subordinate	Complementary Subordinate	Property of Complementary Subordinate
bats	use sonar to help them fly	sugar gliders	horseshoe bats	eat insects	vampire bats	eat animal blood
caterpillars	turn into cocoon	centipede	two-ribbed arcatiid caterpillars	turn into moth	swallow-tail caterpillars	turn into butterfly
cats	climb trees	hyenas	tigers	like swimming	lions	live in prides
igneous rocks	made in volcanoes	sedimentary rocks	basalt	used to make roads	pumice	used to clean feet
otters	eat meat	beavers	sea otters	swim in the ocean	Asian otters	live in rivers
cold-water fish	have bones	sharks	salmon	swims upstream	trout	have dark flesh
turtles	swim in the sea	tortoises	soft-shell turtles	swim in swamps	leather-back turtles	swim in ocean
squirrels	gnaw wood	weasels	grey squirrels	live in trees	striped squirrels	live in burrows

Table 2.

Eight question types for the hierarchical sets and the questions for the fish hierarchical set

Question types	Example Questions	
Between-level		
1. Basic to subordinate	Do all salmon have bones?	Yes
2. Subordinate to basic	Do all coldwater fish swim upstream?	No
3. Basic to complementary-subordinate	Do all trout have bones?	Yes
4. Complementary-subordinate to basic	Do all coldwater fish have dark flesh?	No
Within-level		
5. Basic to complementary-basic	Do all sharks have bones?	No
6. Basic to basic	Would this cold-water fish have bones?	Yes
7. Subordinate to complementary-subordinate	Do all trout swim upstream?	No
8. Subordinate to subordinate	Would this salmon swim upstream?	Yes

Table 3

Means (SD) for Within-level and Between-level Property Inferences by Age Group (max = 16)

Age group	Within-level	Between-level
Younger (3;6 - 4;10)	5.67*	3.00
n = 18	(2.30)	(2.00)
Older (4;11 - 5;11)	9.14**	7.32**
n =22	(3.72)	(3.59)

Above chance level, *p < .01; ** p < .001

Table 4

Means (SD) for Subclass Comparison and Inclusion Questions by Age Group (max = 6)

Age group	Subclass Comparison	Inclusion
Younger	5.00**	-0.50
n = 18	(1.33)	(2.20)
Older	5.86**	2.82*
n =22	(0.64)	(2.20)

Above chance level, *$p < .01$; **$p < .001$

Table 5

Means (SD) for Binary and Ternary Transitivity items by Age Group (max = 8)

Age group	Binary	Ternary
Younger	7.11**	1.94
n = 18	(1.41)	(2.01)
Older	7.77**	2.70*
n =22	(0.69)	(2.51)

Above chance level, $*p < .05$; $** \ p < .001$

Table 6

Correlations among Property Inference, Class Inclusion, Transitivity and Age, with Descriptive Statistics

Variables	Property inference	Class inclusion	Transitivity	Age
Property inference [a]	1.00			
Class inclusion [a]	.56**	1.00		
Transitivity [a]	.39*	.45**	1.00	
Age	.69**	.70**	.48**	1.00
Means	12.95	6.80	9.84	58.15
SD	(6.76)	(3.47)	(2.73)	(9.50)
N	40	40	40	40

$p < .01$ ** $p < .001$

[a] Binary and ternary items combined

Figure Captions

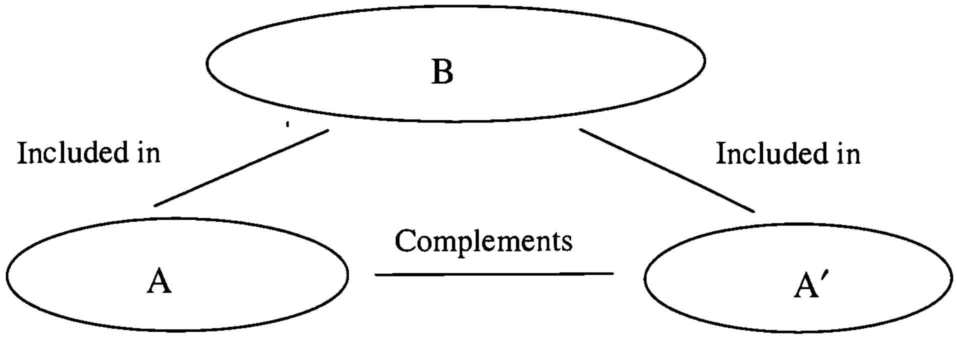
Figure 1. Classes involved in hierarchical classification.

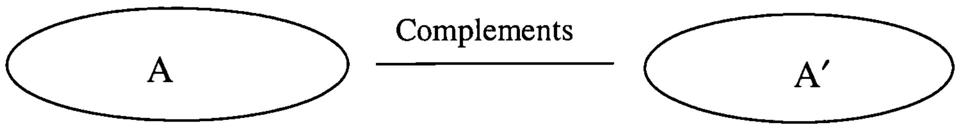
Figure 2. Classes involved in category induction.

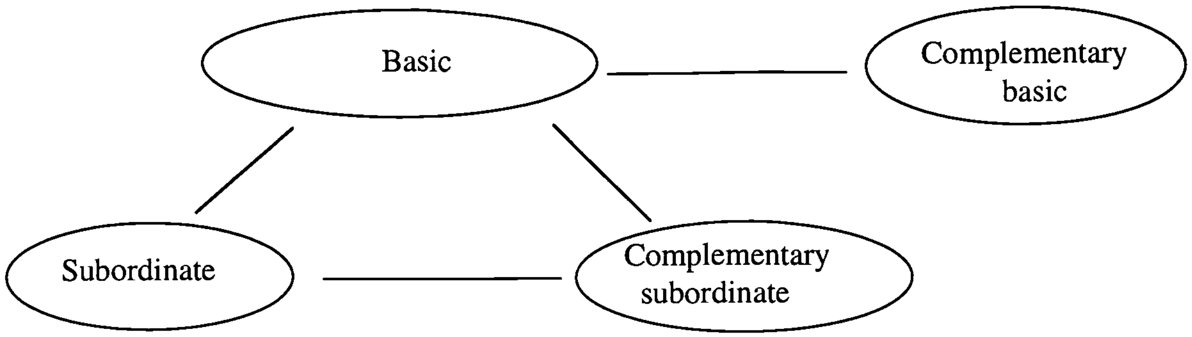
Figure 3. Categorical structure underlying the property inferences.

Figure 4. An example display with relevant questions for the class inclusion task

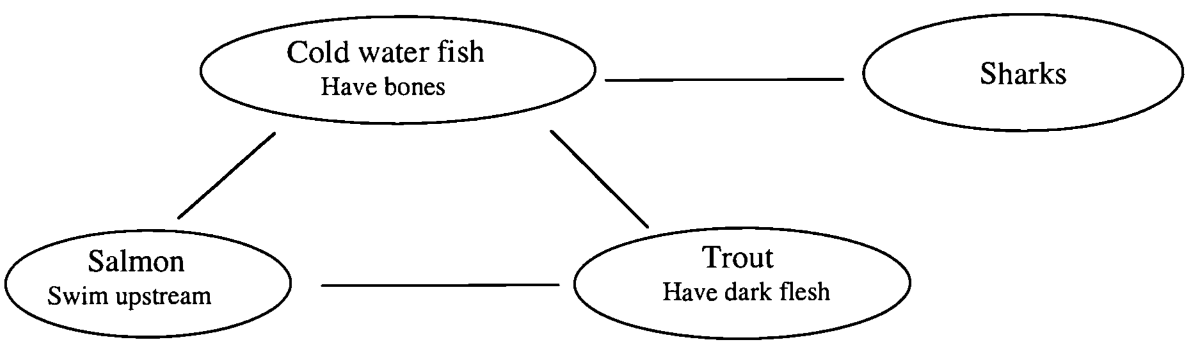
Figure 5. An example premise display for the transitivity task


B
Included in
Included in
Complements
A
A′

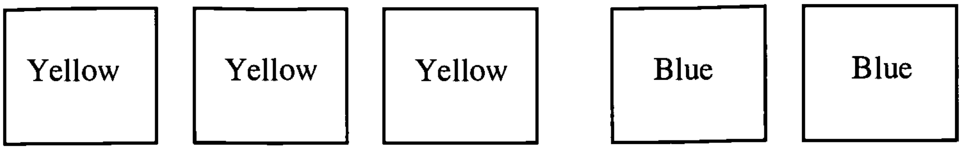

A
Complements
A′


Basic
Complementary basic
Subordinate
Complementary subordinate

A


Cold water fish
Have bones
Sharks
Salmon
Swim upstream
Trout
Have dark flesh

B



Question A. *Are there more yellow things or more blue things?*

Question B. *Are there more squares or more blue things?*

Question C. *Are there more squares or more yellow things?*

Blue	Red	Green	Purple
Green	Blue	Purple	Yellow

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

ERIC®

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: CATEGORY INDUCTION AND HIERARCHICAL CLASSIFICATION ASSESSED BY PROPERTY INFERENCE: THE INFLUENCE OF COMPLEXITY

Author(s): GRAEME S. HALFORD, GLENDA ANDREWS, INGALISE JENSEN

Corporate Source:

Publication Date:

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.

☑ Check here
For Level 1 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) *and* paper copy.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all Level 2 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2

☐ Check here
For Level 2 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but *not* in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here→ please

Signature: G S Halford

Printed Name/Position/Title: GRAEME S. HALFORD, PROFESSOR IN PSYCHOLOGY

Organization/Address: SCHOOL OF PSYCHOLOGY, UNIVERSITY OF QUEENSLAND, BRISBANE 4072 AUSTRALIA

Telephone: 07 33656401

FAX: 61 7 33654466

E-Mail Address: gsh@psy.uq.edu.au

Date: 7th July 1998

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:

Address:

Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:

Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

KAREN E. SMITH
ACQUISITIONS COORDINATOR
ERIC/EECE
CHILDREN'S RESEARCH CENTER
51 GERTY DRIVE
CHAMPAIGN, ILLINOIS 61820-7469

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
1100 West Street, 2d Floor
Laurel, Maryland 20707-3598

Telephone: 301-497-4080
Toll Free: 800-799-3742
FAX: 301-953-0263
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com