The SAGE Encyclopedia of Lifespan Human Development

Expertise

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Book Title: The SAGE Encyclopedia of Lifespan Human Development
Chapter Title: "Expertise"
Pub. Date: 2018
Access Date: April 10, 2018
Publishing Company: SAGE Publications, Inc.
City: Thousand Oaks,
Print ISBN: 9781506307657
Online ISBN: 9781506307633
DOI: http://dx.doi.org/10.4135/9781506307633.n303
Print pages: 818-820

Expertise is the accrual of domain-specific knowledge through experience. In the view presented here, expertise is not absolute (e.g., 10,000 hours of practice) but rather relative. People gain expertise via formal education, informal learning from others, practical experience, or exploration. Because additional experiences can result in additional expertise, accumulation of expertise can continue across the life span. This entry focuses on conceptual effects of expertise, showing how expertise leads to changes in conceptual organization (i.e., how we organize what we know) and reasoning (i.e., how we use what we know to make guesses about what we don't know) and how, perhaps surprisingly, the effects of gaining expertise are remarkably similar across the life span.

Expertise and Conceptual Organization

One way human beings organize what we know is through categorization. We automatically and effortlessly group the things we encounter in the world—objects, plants, animals, other people—into categories. Mental representations of categories, along with related knowledge, are called *concepts*. For example, our concept *bird* is a mental representation of many different kinds of knowledge, including features (colorful, has feathers, flies), specific memories (rainbow lorikeets in a gum tree in Sydney), declarative knowledge (birds are dinosaurs), or mental images. Critically, we organize concepts into conceptual systems based on different kinds of knowledge about relations among them.

Expertise involves increased knowledge in a specific subject area, or *domain*, so one obvious effect of expertise is more extensive, detail-rich representations of concepts within the domain of expertise. One well-documented effect of expertise is to make categorical distinctions at relatively specific levels more obvious and salient to experts than novices. For a bird expert, a common yellowthroat and a golden-winged warbler may seem like clearly distinct species, whereas a novice may simply classify both as *birds*.

In addition to simply accruing more information in a given domain, expertise may lead to changes in the salience and availability of different kinds of conceptual relations. For example, taxonomic relations—linking concepts on the basis of shared membership in higher order categories—are particularly salient and available for novices in a given domain. This availability may be because readily observable features are often highly predictive of membership in taxonomic categories; for example, shared features like feathers, flight, and shape support the belief that lorikeets, ducks, and sparrows are all *birds*. Thus, novices with relatively little knowledge still have access to perceptual information predictive of taxonomic relations.

In contrast, experts' more extensive knowledge typically involves deeper understanding of nonobvious properties, providing them with access to knowledge of multiple kinds of relations among concepts. For example, when sorting local mammal species into groups, the Itza' Maya of Guatemala, who possess extensive folk knowledge of local plants and animals, typically do so on the basis of extrinsic factors that arise from extensive experience rather than superficial observation, like shared habitat or ecological interactions. In contrast, undergraduates in the United States, who have little knowledge of local species, sort on the basis of size and appearance. Likewise, commercial fishermen in New England sort marine creatures into groups on the basis of commercial, ecological, and behavioral factors, whereas novices sort the same creatures based largely on appearance. For both the Maya and the fishermen, experience gives rise to knowledge of a variety of conceptual relations and suggests that nontaxonomic relations (i.e., relationships based on factors other than shared category membership) are more useful or informative in certain contexts. For example, ecological and behavioral characteristics of fish may be more salient than taxonomy for commercial fishermen because these are more useful for finding and catching fish.

In sum, acquisition of expertise has the effect of enriching concepts within the domain of expertise. This enrichment in turn makes distinctions among subordinate categories more salient and renders a wider range of relations among concepts—especially extrinsic relations based on nonobvious features—more salient and accessible. Importantly, taxonomic relations among concepts do not become less salient or accessible; rather, knowledge of extrinsic relations appears to augment rather than replace taxonomic knowledge among experts.

Expertise and Reasoning

Apart from changes in how we organize what we know, acquiring expertise also leads to systematic changes in how we use our concepts (what we know) to make inferences about novel events or properties (what we don't know). Many cognitive scientists examine this issue by studying category-based induction, the process by which we project knowledge about one set of categories to another, based on what we know about how those sets of categories are related. For example, if you learn that ducks have bacteria X15, you might also expect bacteria X15 to be found in sparrows (because they are both birds) or foxes (who might acquire the bacteria by eating ducks). The degree to which you make these inferences depends in part on what you know about relations among ducks, sparrows, and foxes and how salient that knowledge is (because you know little about bacteria X15). Category-based inferences among novices are based largely on taxonomical relations among categories (i.e., similarity and class inclusion). However, systematic research on expert category-based inference has revealed a number of ways that expertise influences reasoning.

One effect of expertise on reasoning is to increase the use of nontaxonomic relations to guide inferences. In a number of domains, experts are more likely than novices to make inferences based on extrinsic relations—like habitat and predation. This includes the Maya and commercial fishermen mentioned above reasoning about hypothetical sicknesses but also tree experts' reasoning about hypothetical tree diseases, music experts' reasoning about hypothetical composing techniques of famous musicians, and undergraduates' reasoning about alcoholic beverages (an *expert* domain) versus animals (a *novice* domain). This is consistent with the observation in the previous section that expert knowledge involves access to a wider range of nontaxonomic conceptual relations. The salience and increased availability of such nontaxonomic relations allows experts to base inferences on a wider range of knowledge than novices.

Expertise also increases the flexibility with which experts are able to shift among different conceptual relations as bases for inductive inferences, a process known as *inductive selectivity*. Because they possess knowledge about a wider variety of relations among categories and because this knowledge is more readily accessible, experts are more selective in their inferences by using different relations to guide inferences in different contexts. For example, expert fishermen use their knowledge of marine predator–prey relationships to guide inferences about the spread of a hypothetical disease. However, when reasoning about properties unrelated to their specific knowledge (e.g., *blank* properties, such as *has property X*), fishermen fall back on taxonomic similarity to guide inferences. In contrast, undergraduates show little selectivity, using taxonomic similarity to guide inferences for both diseases and blank properties. Thus, experts' patterns of reasoning are guided by experience that could directly inform the inductions that they need to make; their knowledge of disease transmission makes predator–prey relationships more salient when making inductions about disease X, but without relevant experience about property X, they make the same inferences as novices. Similarly, undergraduates—who presumably have more personal experience with alcoholic beverages than with wildlife—show selective patterns for inferences when reasoning about alcohol but not when reasoning about animals.

Thus, converging evidence suggests that expertise encourages the systematic use of what we know about conceptual relations to inform inferences about what we don't know by providing the ability to flexibly reason about categories based on experience and knowledge of a variety of nonobvious relations. In many cases, this knowledge renders taxonomic relations utilized by novices less relevant to expert inductive reasoning. As with conceptual structure, however, taxonomic reasoning doesn't disappear among experts but rather becomes one tool among many.

Expertise and Development

In one sense, development could be seen as the acquisition of expertise in a large number of domains as children accrue knowledge of the world and organize that knowledge conceptually. In another sense, there is evidence that the conceptual consequences of acquiring extensive knowledge in a specific domain are similar in children and adults. For example, 4- to 7-year-old dinosaur experts represent complex taxonomic, ecological, and dietary information among dinosaur species, whereas child novices rely on information about superficial similarity. Likewise, when asked to sort local birds, insects, and plants into groups, children with more direct, unstructured experience with nature are more likely to sort on the basis of ecological relations than their less-experienced peers who rely on taxonomic relations. These examples suggest that expertise in children, like adults, leads to the ability to organize concepts on the basis of nonobvious, extrinsic relations as well as observable taxonomic relations.

Similarly, children's reasoning differs as a function of expertise. Children living in rural communities and children with higher levels of direct unstructured interaction with nature are more likely to draw inferences based on shared habitat or predator–prey relations than children living in more urban communities or those with little direct experience with nature. Rural children also demonstrate inductive selectivity—basing inferences about insides on taxonomic relations and inferences about sickness on ecological relations—earlier and more reliably than their suburban or urban peers. This increased attention to context resulting in selective inferences mirrors the patterns seen in adult expert reasoning, as discussed above.

As people age into late adulthood, they tend to experience declines in performance on certain areas of cognitive (e.g., attention, working memory, reaction time) and motor assessments. Likewise, gaining new expertise becomes more challenging—although not impossible—in late adulthood. However, decline is not inevitable, and some evidence suggests that expertise buffers decrements in performance for skill-based tasks, including chess, bridge, typing, and piano playing. Older experts tend to outperform younger novices on such tasks, and sometimes perform comparably to younger experts. This sustained excellence may be due to the maintenance of skills via continued practice across the life span or compensating for age-related declines in cognitive performance with more efficient conceptual representations.

In sum, throughout the life span, expertise alters the way that we organize and use our knowledge about categories. For both children and adults, extensive experience in a domain leads to the ability to utilize nontaxonomic relations to guide inferences and to do so in a flexible and context-sensitive manner. Further, expertise may protect against declines in skill-based performance due to aging.

Conclusions

The conceptual effects of expertise are far reaching. As we gain domain-specific experience in a particular area, we both restructure our knowledge of that area and adjust how we utilize that knowledge to reason about novel events and properties. As reviewed here, expertise expands the knowledge contained within concepts, increases the salience and availability of nontaxonomic relations among concepts, and increases flexible use of knowledge in reasoning. These effects are similar in adults and children. In sum, the knowledge that we gain from experience helps us to restructure our concepts and guides inductive reasoning in a systematic way that promotes successful, context-sensitive, flexible inferences. Thus, through its impact on conceptual frameworks, expertise promotes more effective and flexible problem-solving.

See alsoCategorization; Cognitive Development; Experience-Dependent; Experience-Expectant Processes; Knowledge; Reasoning; Urban and Rural Living

- expertise
- inferences
- fishermen
- birds
- selectivity
- bacteria
- domain

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http://dx.doi.org/10.4135/9781506307633.n303
10.4135/9781506307633.n303

Further Readings

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