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The Guiding of Learning: An Overview, Analysis and Classification of Guides

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Learning needs guidance and a key current issue in cognitive science is what guides exist, how they work and how they interact. Most current cognitive work has examined guides for language learning (e.g. children expect a new word to refer to a category and to a whole object rather than a part) and "theories", which are innate structural principles that guide further knowledge acquisition in a particular domain. For example, children expect objects to be solid and continuous and new knowledge must be consistent with this notion. This general problem of guiding learning is studied in several other fields, such as ethology, animal psychology and machine learning. They study the problem from varying viewpoints, however, and with somewhat different assumptions. All the work done on it may usefully be integrated into a single framework, to make some generalizations about the problem and suggest key research issues. I first argue that the problem of how learning is guided is best analysed as part of the more general evolutionary problem of ensuring that an individual has needed information. This general problem has many facets and trade-offs and how it is solved depends on the species, the niche, the learning process and other factors. This paper outlines some general guidelines for solving the problem and some general strategies that nature uses. There are many of these. This paper also outlines a preliminary taxonomy of learning guides. This has three major categories. One type is learning-based, where programming induces organisms to learn specific sorts of thing from specific experiences (e.g. schemas, contingencies) and/or restricts this learning to a limited period. Another type sets or alters motivation or an emotional reaction to a certain stimulus. This may encourage or prevent further learning about that particular stimulus. A third category includes general heuristics, which included responsiveness to stimulus novelty, change, and intensity and being provided with a teacher. These guides operate in various ways. They direct attention to important stimuli and help connect up stimuli that otherwise would not be connected. However, all essentially narrow some number of things down to manageable proportions. Many previously unrelated phenomena may be seen as methods of dealing with the evolutionary problem. Examples are curiosity, posttraumatic stress disorder, the incest taboo, imprinting and bird song learning, and the difficulty of changing some concepts in humans. Some further research issues suggested by the general framework are outlined. I conclude with a suggestion that cognitive scientists to look more at function, at what general problems humans need to solve and how many phenomena may be seen as solutions to these problems.