



Comment

Replication and emergence in cultural evolution: Sequential or entwined?

Comment on “Replication and emergence in cultural transmission” by Monica Tamariz

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Tamariz offers an impressively encompassing new model of core processes in cultural transmission and cultural evolution, that is stimulating in its fresh and considered thinking and deserves to be widely read, discussed and debated. It is peppered with a profusion of original and provocative thoughts. For example, I'm struck by her suggestion that model and frequency-biased transmission biases could be considered ‘epicultural’ factors, analogous to epigenetics in the organic realm because in cultural transmission they operate to modulate cognitive salience and thus the cultural fitness of the traits at stake, thus enhancing the heritability of the traits, yet perhaps only over the short to medium term.

I also find several of the more fundamental tenets of her ‘replication and emergence’ model compelling. Tamariz argues that by contrast with authors like Tomasello [1], who have stressed that human imitation depends on copying both actions and their goals, the process of replication that forms the first part of Tamariz's model is content-indifferent and not motivated by the function or goals of the actions concerned. I think that much evidence has accumulated that this can indeed be the case, including the corpus of over 50 studies [2] confirming and exploring the phenomenon of so-called ‘over-imitation’ (arguably mis-named, for it surely performs important functions in our everyday lives [3]), that has emerged in the last decade. These studies have shown both children and adults to copy actions whose goals are experimentally engineered to be inherently opaque because they are visibly causally irrelevant to the desirable outcomes that follow [2,3]. Other examples of copying others ‘just because that is what others do’ are provided by a burgeoning research literature documenting the acquisitions of rituals and conformity in general [3], some of which Tamariz reviews.

Tamariz focuses on humans, but ‘copying for copying's sake’ has also been documented in the literature on non-human animal culture. In one striking example, a chimpanzee in one of four enclosures in an African sanctuary began to insert a grass leaf in one ear and leave it there for extended periods, an apparently functionless custom that spread to others in that one community [4]. Japanese macaques have developed extensive repertoires of different forms of

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‘stone-handling’, an apparently functionless activity that is manifested in locally-unique arrays of these forms in different groups.

However although I thus recognize that copying *may* focus on actions per se, I remain puzzled about why Tamariz is so keen to *exclude* from the process of replication any links to goals or functions. If we simplify the latter to observable, desirable *results* of what a model does, it would seem rather surprising that a social learner, whether human or non-human, would ignore observable and desirable sequelae of the actions observed. An early experiment with Japanese quail [5] illustrates this concern. In this two-action study, models were trained either to peck a treadle or step on it. Half of both of these were trained on a lean, variable-interval schedule so they would peck (or step) repeatedly without reward when acting as a potential model, whereas the other models always received a reward. Observer quail copied the technique they had witnessed (peck or step) in the latter condition, but not when models gained no observable payoff. If quail thus take into account such results of actions in their copying, rather than just the actions alone, we might expect similar effects in humans and many other species. However most social learning experiments, whether with children or animals, have tended to test for copying of actions that gain rewards. Perhaps more analogues of the quail experiment need to be conducted with children and other animals, to directly test Tamariz’s conjectures?

A different experimental design arguably did so in a different way. In this study [6], children observed videos of a model using tools to open a complex puzzle box to obtain rewards inside. In one experimental condition children saw only what the tool did, with the manual actions obscured; in another, only the manual actions and not the tool; and in one of the other conditions, the whole display. Copying fidelity was greatest in the latter condition and least when only the actions could be seen. Our conclusion was accordingly that transmission fidelity is highest when a complete sequence of manual actions, tool movements, target object movements and desirable outcome-achievement can be witnessed. I remain unsure how Tamariz’s model accommodates such findings as these or the quail results and others like them.

Turning to the second major part of Tamariz’s model concerning ‘emergence’, I again have a mixed response. On the one hand, I agree there is much evidence that transmission may often depend on initial attempts to copy, with little understanding of underlying cause and effect, with an understanding emerging only later. However where such emergence involves repeated cycles of (i) observational learning and (ii) practice, as in, for example, stone-tool-making [7, Figure 1] or chimpanzee nut-cracking [8], ‘replication’ would appear to have taken place only once this helical process has achieved a mature skill (and perhaps a mature product, such as what is culturally recognized as a well-made handaxe). I remain unsure how Tamariz’s two stage sequential model, of initial replication followed by a fuller emergence, can accommodate such a process, in which copying and an emerging competent skill are instead entwined in the kind of helical development portrayed in Fig. 1?

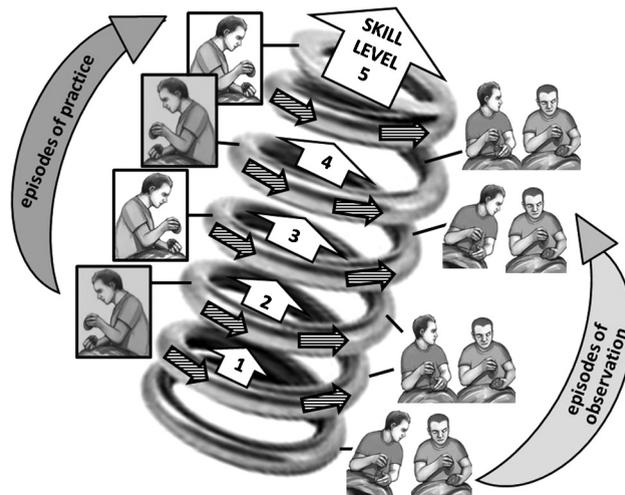


Fig. 1. ‘Helical curriculum’ model of the acquisition of stone-tool-making [after 7]. The helical curriculum is named after the concept of a ‘spiral curriculum’ in educational theory and practice, in which elevated levels of learning build through consecutive visits to the material of study at higher levels. Here, bouts of observation of a skilled model alternate with bouts of practice, skill emergence through the latter allowing more to be assimilated from observation at each turn of the helix.

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