

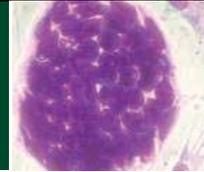
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LETTERS

edited by Etta Kavanagh

Studying Students in Montessori Schools

IN THEIR EDUCATION FORUM “EVALUATING MONTESSORI EDUCATION” (29 SEPT. 2006, P. 1893), A. Lillard and N. Else-Quest present Montessori education as being superior to other types of schools and having “remarkable outcomes.” Unfortunately, the analyses backing these value judgments are plagued by methodological and statistical problems and thus do not provide support for such claims.

To evaluate Montessori education, Lillard and Else-Quest measured the performance of children from a single Montessori school—a textbook example of pseudo-replication. The only test performed was thus if this particular school is a good school or not. But not even on that level was the comparison entirely valid, because the pupils in the school were compared with children mainly attending inner-city public schools (72% in 5-year-olds; 78% in 12-year-olds)—the category of schools most often subject to social and economic problems.

Further, the sex ratio in the Montessori sample was equal or skewed toward girls (50% girls in 5-year-olds; 59% girls in 12-year-olds), while the sex ratio in the inner-city public-school sample was skewed toward boys (60% boys in 5-year-olds; 64% boys in 12-year-olds). Girls in these age groups generally outscore boys (1, 2). However, not even with the study set up in this way did the Montessori school come out on top.

Pupils in the girl-dominated Montessori sample rather unsurprisingly scored higher on tests measuring social ability than pupils in the boy-dominated inner-city school sample. But the study also reported that although 5-year-olds in the Montessori sample did better in tests measuring cognitive/academic measures, no such difference could be found in the 12-year-olds.

The only really noteworthy result in this study is that for a sample consisting of mainly girls in a particular school in Milwaukee, several years of Montessori education has resulted in no detectable difference in academic performance in comparison with a group of mainly boys having been subject to schooling in Milwaukee inner-city public schools. Because alternative schools can be assumed to attract more dedicated teachers and often have superior resources to public schools (Montessori schools require a high teacher density and a special set of educational materials) and because young girls tend to outscore young boys academically, this is more a quality statement for Milwaukee public schools than anything else.

To make informed choices about schooling, parents and policy-makers everywhere are in dire need of proper comparisons between different education systems. Unintended misinformation through poorly performed studies only serves to make the current state of confusion over the pros and cons of various education systems worse.

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IN THEIR EDUCATION FORUM “EVALUATING Montessori education” (29 Sept., p. 1893), A. Lillard and N. Else-Quest do not consider that differential peer influences between their test and control groups of students may contribute to the differences they observed. The authors controlled for parental effects by examining only students whose parents had entered a lottery for entry into a Montessori school. However, the students who were unable to attend the Montessori school because their parents “lost” the lottery were dispersed to traditional schools, where they would have been educated with a majority of peers whose parents did not enter the lottery at all. The differences they found in the academic and behavioral performance of students in Montessori and traditional schools may not reflect the superiority of the former educational approach, but the negative effect of peer relationships in the latter.

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Children using a computer at a Montessori school.

Response

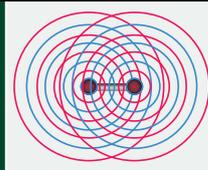
THE MONTESSORI SCHOOL WE STUDIED WAS an inner-city public school [see our note (3)] in the same school district as the other 27 city public schools, was given the same per-pupil funding as the district gives all its schools, and received no other funds toward the educational program. Although it is a single school, the traditional Montessori implementation, regulated by the Association Montessori Internationale (AMI), makes it very similar to other AMI Montessori schools; I would be wary of assuming similar results at non-AMI Montessori schools. Still, replication in other school districts is clearly desirable.

Gender did not contribute significantly to any of the differences reported in the paper; in all tests, we found significant differences favoring the Montessori samples, but analyses by gender on these variables at those ages revealed no differences between the boys and girls. In general, gender differences tend to be small enough that they often do not attain significance in studies with small samples. There were gender differences on several tests at age 12, where gender is unbalanced, but in the opposite direction for Montessori



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than the Letter presumes: Montessori boys at age 12 performed best of all the groups on those tests. In addition, the study was not set up to have gender representation differences across samples; the goal was equal representation, but the returned permission slips dictated the distributions.

Although the 12-year-olds had 6 more years of Montessori schooling, and thus one could argue should have shown stronger academic differences than the 5-year-olds, they also had 6 more years of enculturation in their low-income communities and homes that might work against what happens inside the school walls. Although the current environment emphasizes only academic tests, social skills were included in this study, on the grounds that they are extremely important in life—often, one could argue, more important than having superior academic skills.

Contrary to Lindenfors's assumption, traditional Montessori actually has a rather low teacher density. The AMI standard teacher-child ratio is 1:28 to 1:35. Regardless, the notion that teacher-child ratio is related to student achievement is misguided: Relations have sometimes been found in first grade (1), but not consistently enough to claim it generally true (2).

Also, Montessori is not more expensive than traditional schooling; once a classroom is outfitted with materials (at a cost of roughly \$25,000), the costs per year are less (estimated at \$800 per year by the North American Montessori Teachers' Association) than in traditional classrooms because there are no textbooks to replace. The notion that per-pupil expenditures have an impact on student achievement is also not upheld by the data (3).

MacKinnon makes the excellent suggestion that child outcomes at the Montessori school might be the result of having peers whose parents entered them in a lottery. One way to investigate this is to see whether children in control schools that also admit by lottery (thus, their classmates might have listed that school as their first choice) did better than children at control schools that did not. Milwaukee does not make obvious to an outsider which schools admit by lottery, but they do indicate that Citywide Specialty Schools are more likely to. The control children in our study who were at Citywide Specialty Schools

did not as a group perform as well as the children at the Montessori school studied, suggesting that the results were not simply due to schooling with peers whose parents entered them in a lottery.

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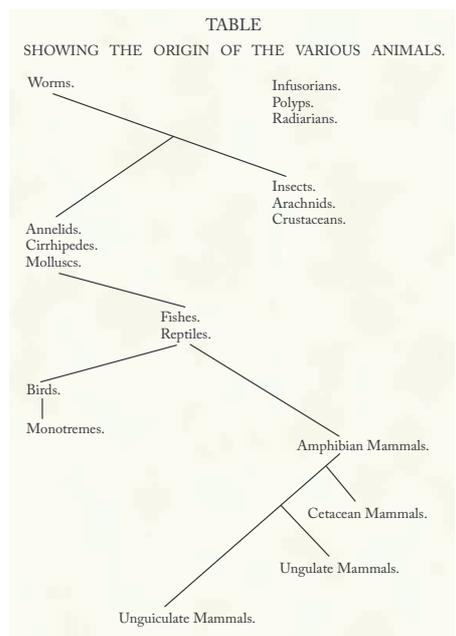
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Darwin: Not the First to Sketch a Tree

IN THE PERSPECTIVE BY A. ROKAS, "GENOMICS and the tree of life" (29 Sept., p. 1897), the caption to the accompanying photo identifies Charles Darwin's 1868 notebook sketch as "the first known sketch of an evolutionary tree." This is mistaken. Nearly 60 years earlier, in 1809, Jean Baptiste Lamarck presented an evolutionary tree of the animals in *Philosophie Zoologique* (1). Modern evolutionary biologists would benefit from read-



Lamarck's evolutionary tree [redrawn from (1)]

ing Lamarck; there is much nonsense in his work, but there are also quite substantial insights. Lamarck towered over his contemporaries in both the rigor of his evolutionary thought and the identification of a credible, coherent, and falsifiable hypothesis for the mechanism of evolutionary change. That his mechanism was wrong does not take anything away from the originality of his thought (although his failure to test his hypothesis is not consistent with current scientific practice and is largely responsible for his current neglect).

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Human Dispersal into Australasia

WE AGREE WITH P. MELLARS THAT LONG-distance dispersal of prehistoric human populations may involve multiple small founder effects with consequent loss of genetic diversity—and possibly also cultural traits—with increasing distance from source ("Going east: new genetic and archaeological perspectives on the modern human colonization of Eurasia," Special Section: Migration and Dispersal, Review, 11 Aug. 2006, p. 796). However, Australian genetic and stone artifact data are not consistent with this pattern.

Genetic studies of the mitochondrial DNA (mtDNA) of indigenous Australians have only just begun, with fewer than 300 individuals sampled from less than 5% of the continent's landmass (1–3). Even so, observed mtDNA variation in Australians already includes five Australia-specific haplogroups, and more if New Guinea samples are added to represent the landmass that was Sahul for most of the 50,000 to 60,000 years that humans have occupied the island continent (4, 5). Larger, continent-wide samples may well show Australia to have been as genetically diverse as Europe or Africa.

The earliest Australian stone artifact industries consist of small flakes and flake tools with some prepared platform cores and occasional radial or centripetal cores, and are strongly influenced by the form of local stone materials (6, 7). It is unlikely that these industries carry the sort of cultural information that Mellars and others assume. His argument that these are "Mode 4" (Upper Palaeolithic) industries that devolved in response to local conditions (8) lacks parsimony, given that