Genius in variety

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In the newspaper I read about prodigies. A three year-old rock drumming toddler. An eight year-old boy doing complicated calculations, and a 20-year-old girl who has already achieved a PhD in theoretical physics. In my life, I have experienced such a "prodigy" from my area once. Peter was a six year old boy. Completely out of the blue, it seemed, he started playing the classical masters on the piano. Two handed, on a very simple third-party keyboard, because his parents (my acquaintances) had no interest in music at all. Peters's performance was without education or any form of teaching at all. Where do these talents come from? It seems completely uninformed by learning and experience.

On a closer look, however, Noam Chomsky already showed in the 1960s that skills such as language acquisition and logic are never determined by learning and experience. And that does not only apply to prodigies; in only a few years (practically) all children learn their native language on the basis of poor data (spoken language) consisting of incomplete sentences full of errors. Yet every child distills "effortlessly" the correct rules from the imperfect language utterances (many half sentences, incongruous conjugations, etc.); when children are still young they already can decide whether a sentence or conjugation is correct or not (at age 7 or 8 they can give a so-called well-formed judgment).

Even more amazing than the prodigies, is the fact that many science and game changing people showed a delayed instead of an accelerated development in their early childhood. For example, it is known that Alessandro Volta, the inventor of the battery in 1800, developed late, unable to speak properly until he was seven. (His parents thought he was mentally retarded). Wilhelm Röntgen also visited so-called 'extraordinary' primary education (a school for children with learning difficulties in the Netherlands, in Apeldoorn, a city where our university has a faculty). There are numerous other famous examples of delayed development in geniuses: not only Albert Einstein, but also the CV's of many contemporary professors make their way through lower craft schools before developing their scientific careers.

In short, frontier scientists and artists - geniuses - develop in a large variety of ways in their childhood, from prodigies (eg Jean Piaget) to ordinary students, from good students to slow and even very slow pupils. All as fascinating, and incomprehensible from didactical, pedagogical and psychological frameworks. We are all acquainted with physical differences between people and pros and cons thereof in diverse contexts. Small, fast and viable, for example, opposite to large, slow and powerful. One type is not better than the other, every "construction" is sometimes an advantage, sometimes a disadvantage. But do we have only one type in the case of idea cognitive development? At school, there is especially focus on good = fast performers. Well, of course, there is remedial teaching for slow developers, but we rarely realize that some slow developers will eventually develop to be geniuses. Already in primary school, didactics is strongly related to average development (normal distribution). However, from data mining it results that even the child's month of birth coincides with the rates of success at school and consequently at careers: young students (born in May or June) have a greater chance to walk behind older students (born in November or December). Some children, however, develop atypically, in a different order.

It would be nice if we could distinguish various types of developers. By using modern data analysis techniques (machine learning), several more or less typical patterns of development can be distinguished. For example, some children may explore for a long time in one phase and then continue to the next, while other children seem to take a leap at a young age. Many other patterns, which we do not know yet, could be discovered by pattern detectors. But unfortunately, reality is exactly the opposite: ICT applications narrow the scope, rather than helping teachers to look more specifically to each child. The now dominant methods of determining the levels of school readiness and achievements, with standardized testing already for 4 years old children, is certainly not without risks. We need to make sure that, by means of more automation/standardization, we do not promote only one type of development. Because application of technology - modern data analysis - allows for personalized didactics. Making visible differentiation (diversity), instead of favouring indifference. But bad or insufficient applications (being innovative, use as much ICT in education, or other silly likewise arguments) bring about the opposite: indifference!