
Editorial

STEM Education in the Context of Traditional Multi-disciplinary Wisdom

The current edition of the NSF Science Magazine is devoted to the theme of STEM (or STEAM) Education, which is apparently a system of education expected to generate innovation skills through integration of the essential elements of science, technology, engineering, mathematics and humanities.

However, it has been claimed that despite massive STEM education reforms in the US, implementation of this system had not realized the expected outcome. On the other hand, it has also been claimed that this cross-disciplinary system of education as practiced in Finland had shown signs of success, although no specific reference is made by them to this system as STEM Education.

In the above context it would be relevant to re-visit briefly Sri Lanka's spectacular technological genius of a bygone era when the country prospered and developed under a feudal system of administration. Although there is no clear understanding of how education and knowledge were inculcated in ancient times (except in *Gurukula* education and the system of apprenticeship training), it is amply clear that a system of 'multi-disciplinary wisdom' had prospered and played a significant role in the development strategy of ancient Sri Lanka. A few technological marvels of that bygone era will illustrate this contention.

According to Henry Parker (1909), the British engineer in colonial Ceylon, who investigated most of Sri Lanka's ancient hydraulic contraptions, the *Bisokotuma* was a unique water-tight device to control the delivery of water from a massive reservoir to the low lying paddy fields. Interestingly, about the middle of the 19th Century, similar open wells called 'valve-towers' and 'valve-pits' had been built at numerous reservoirs in Europe. These were also meant to regulate the flow of water from reservoirs. Parker (1909), concludes in this context that, "*such also was the function of the bisokotuma of the Sinhalese engineer, they were in fact the first inventors of the valve pits more than 2100 years ago*".

The technological brilliance of the ancient Sinhalese engineer, who constructed these contraptions, essentially required multi-disciplinary wisdom comprising a sound knowledge in the disciplines of structural engineering, mechanical engineering, hydraulics, hydrography, hydrodynamics, geology, geophysics, soil science, and the mystique science of astrology.

There are numerous such examples which include the ecosystem based trans-basin 25 mile long Elahera – Minneriya Yoda Ela in the ancient district of Thamankaduwa, and the 50-mile long Jaya Ganga in the Kala Oya Basin taking water to Anuradhapura. R. L. Brohier (1965) commenting on the magnificent engineering feat of the latter, states that "*it verily baffles understanding how a canal of this magnitude could have been planned and executed over a difficult terrain nearly 1500 years ago, which meanders over the first 17 miles at an unbelievable gradient of no more than 6 inches per mile*". Attempts to renovate these canals in recent times resulted in disastrous consequences.

It is also not possible to ignore the multi-disciplinary capability of our ancient iron masters, who not only excelled in design engineering several types of iron smelting furnaces for the production of high grade iron, but also pioneered for the first time in a global context more than 1000 years ago, the production of export quality 'crucible steel' and 'high-carbon stainless steel'. Gil Juleff (1996), the British archeologist, who discovered the west-facing, wind operated furnaces in Samanalaweve in the 1990s, records that *Sri Lanka's ancient iron smelting technology appears to have its roots in the 3rd Century BC, and after reaching a zenith in the 9th Century AD, the industry disappears from the archeology records in the 11th Century, believed to be due to frequent invasions from South India.*

Nevertheless despite any shortfalls, let us hope that the current reforms in education will help to re-shape the mindsets of our student population.

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