In this paper, we experimentally compare the suitability of two VCSEL designs of different wavelength and technology as inexpensive, off-the-shelf transmitter components to enable low-cost and energy-efficient optical interconnects employing conventional (NRZ IM/DD) and advanced (OFDM) modulation. In particular, we assess the performance of a multimode (MM) 850-nm and a single-mode (SM) 1550-nm VCSEL over 100 m/1 km of 50.7-μm diameter OM-4 MMF links and 100 m/5 km SMF links. OFDM-QPSK is investigated in order to substitute IM/DD in order to increase the capacity in the aforementioned VCSEL-based, MMF/SMF links.