We study the impact of network architecture on the efficiency of information transmission and dynamics of learning in large networks using laboratory experiments. We designed a novel interface which allows studying interplay between network architecture and information diffusion in large networks in the controlled laboratory environment. In particular, we study both aggregate and individual behavior. On the aggregate level we show that networks with an individual that observes everyone are performing well when signals are of low quality, but perform surprisingly bad when signals are of high quality. On the individual level we identify behavioral frictions that impede information flow and hopefully provide an interesting insight into their non-trivial effect.