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Transforming the undergraduate curriculum - engaging first year students in authentic research experiences

The Department of Biological Sciences at Minnesota State University, Mankato has recently implemented a first-year undergraduate research experience (called the Research Immersive Scholastic Experience in Biology program; RISEbio) designed to improve student success and engagement in biology. In this program, first year students exchange introductory biology labs for the RISEbio curriculum, where they learn basic laboratory, analytical and scientific reasoning skills before beginning authentic mentored research projects in their second and third semesters. Students in one of three research tracks examine the neural control of reproductive behavior by examining gene expression in the brain of the seasonally breeding green anole lizard (*Anolis carolinensis*). Working in groups, students gain experience with bioinformatics by examining preliminary RNA-seq data and selecting a gene of interest. Then, students design and test primers to amplify their gene of interest, followed by isolating RNA from the hypothalamus of breeding and non-breeding lizard brains. Lastly, students utilize their isolated RNA samples and validated primers in quantitative RT-PCR studies to determine if their gene of interest

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is differentially expressed in the anole brain. Preliminary work has identified melatonin receptor 1A (MTNR1A) as more highly expressed in the breeding compared to non-breeding anole hypothalamus, while corticotropin releasing hormone binding protein (CRHBP) expression does not differ seasonally. Together with other aspects of the RISEbio program, these early research experiences have led to increased student outcomes, including increased academic success and enhanced scientific motivation.