

MINOR IN SCIENCE OF LEARNING

Overview of Minor

No	Course Code	Course Title	AU	Pre-requisites	Offered in
1	AGE06A	Brain Literacy for Educators	3	Nil	January semester
2	AGE06B	Applications of Educational Neuroscience	3	Nil	August semester
3	AGE06C	Social and Emotional Development from a Neuroscience Perspective	3	Nil	January semester
4	AGE06D	Neurodiversity and the Learning Experience	3	Nil	August semester
5	AGE06E	<u>NIE students:</u> Neuroscience, Computational Thinking and Artificial Intelligence in Learning* <u>NTU students:</u> Computational Thinking and AI in Learning* <i>*Note: Only the course titles differ – the course content and assessments remain the same for both NIE and NTU students.</i>	3	Nil	January semester

Rationale

The purpose of this minor is to provide NTU students with the opportunity to gain exposure to key developments in scientific advancements in learning, particularly in the field of Science of Learning. Traditionally, research devoted to understanding learning has taken place in many different disciplines. Basic research about the brain mechanisms underlying learning in humans and other species has traditionally taken place in the fields of Neuroscience and Biology; research about how the human mind “computes,” develop and use knowledge, has taken place in Cognitive Science and Psychology; research about how machines (e.g. computers and robots) learn has taken place in Computer Science and other areas of Engineering; and research about how learning occurs in the classroom has taken place in Education. More recently, scientists and practitioners have recognized that understanding learning in all of its manifestations will require multiple approaches that span these disciplines and more. The Science of Learning is an approach that recognizes the value and importance of cross-fertilization across traditional fields of study, drawing on many different methods and techniques to understand how learning occurs— with the ultimate goal of optimizing learning for all.

This Minor in SoL will strengthen Singapore’s research capabilities and grow a pool of scientifically-competent manpower, as students will develop scientific expertise of the effectiveness of Singapore’s education methods as well as develop new methods to realise better learning outcomes. This will enhance employment possibilities as education and learning are integral aspects of all enterprises. Students will be equipped with cutting-edge competencies and skills in the development of learning optimizations. They will also be

exposed to new ideas pertaining to rapidly advancing technologies such as Artificial Intelligence and Neuroscience modalities.

Objectives

Upon completion of the Minor in Science of Learning, students would be able to:

- 1) Understand how learners with neurological differences may interact with their learning environment and engage in the learning process differently
- 2) Develop teaching strategies that cater to neurodiversity
- 3) Have basic knowledge on the structural and functional organization of the brain
- 4) Have a greater awareness of neuromyths
- 5) Understand how information learned can be applied to teaching
- 6) Understand emotions from a neuroscience perspective
- 7) Understand how emotions can impact a learner's learning process
- 8) Identify classroom and behavioural management strategies that are informed by affective neurosciences
- 9) Understand a range of neuroscientific evidence in specific areas of cognitive functions
- 10) Explore possible ways that neuroscientific findings can be applied to teaching and learning
- 11) Have a heightened awareness as to how progressive technologies such as AI and Neuroscience can or cannot do for education
- 12) Understand how these developments can influence a learner's development and is also in-turn shaped by learners' needs

Course descriptions

AGE06A Brain Literacy for Educators

Advancements in biosensor and brain imaging technologies in the last 20 years have allowed educators to dive in new depths with regard to understanding the inner workings of a learner's brain. Through understanding the structural and functional organizations of the brain, educators can have a deeper appreciation of the mental processes that take place in the act of learning. Having fundamental knowledge of the neuro-biological processes of learning will enable educators to make more informed choices about their teaching practices.

AGE06B Applications of Educational Neuroscience

As a field, Science of Learning is relatively new. However, the interest in the potential applicability of the findings from brain science has been intense. With a wide range of evidence in specific areas of cognitive function currently available, it is a worthwhile venture to explore the ways in which these findings can be applied to teacher education and teaching practices. Understanding neuroscientific findings would allow for students of this course to evaluate existing teaching practices with a fresh perspective and to establish new ones that are grounded in brain science.

AGE06C Social and Emotional Development from a Neuroscience Perspective

Behavioural sciences have shed light on how the social and emotional maturity of a learner plays a big role in their learning. By examining social and emotional competencies from a neuroscience perspective, educators will be able to enrich their understanding of such competencies and their impact on learners. With a more comprehensive grasp of the impact that social and emotional development can have on learning, educators can then be in a better position to develop strategies informed by neurological findings, as well as to evaluate existing strategies employed in teaching and learning contexts.

AGE06D Neurodiversity and the Learning Experience

Behavioural and learning challenges displayed by otherwise well-behaved students often point towards underlying neurological patterns. Understanding these neurological patterns will help educators better understand their learners' cognitive abilities, and therefore how to optimize neurologically diverse learners, this course will also explore the social factors that can impact the learning experience of learners at different developmental stages. Borrowing from the fields of developmental psychology and cognitive neurosciences, this course will help educators better understand how they can meet the needs of neurologically diverse learners.

AGE06E (For NIE students) Neuroscience, Computational Thinking and Artificial Intelligence in Learning***AGE06E (For NTU students) Computational Thinking and AI in Learning***

While developments in Artificial Intelligence (AI) and neuroscience are co-occurring exponentially, much less can be said about how education is leveraging on some of such critical developments and in turn use it to enhance pedagogies and learning. This course will focus on unexplored spaces at the intersections of neural AI, brain science and computational science. Takeaways include implications for education and how cutting edge teaching and learning methodologies harnessed from AI, Computational Science and Science of Learning fields may be developed and applied in local learning contexts.

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