

## **Integrative Biology Teaching and Learning Model Based on STEM Education**

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**Abstract :** Changes in global situation such as environmental and economic crisis brought the new perspective for science education called integrative biology. STEM has been increasingly mentioned for several educational researches as the approach which combines the concept in Science (S), Technology (T), Engineering (E) and Mathematics (M) to apply in teaching and learning process so as to strengthen the 21st-century skills such as creativity and critical thinking. Recent studies demonstrated STEM as the pedagogy which described the engineering process along with the science classroom activities. So far, pedagogical contents for STEM explaining the content in biology have been scarce. A qualitative literature review was conducted so as to gather the articles based on electronic databases (google scholar). STEM education, engineering design, teaching and learning of biology were used as main keywords to find out researches involving with the application of STEM in biology teaching and learning process. All articles were analyzed to obtain appropriate teaching and learning model that unify the core concept of biology. The synthesized model comprised of engineering design, inquiry-based learning, biological prototype and biologically-inspired design (BID). STEM content and context integration were used as the theoretical framework to create the integrative biology instructional model for STEM education. Several disciplines contents such as biology, engineering, and technology were regarded for inquiry-based learning to build biological prototype. Direct and indirect integrations were used to provide the knowledge into the biology related STEM strategy. Meanwhile, engineering design and BID showed the occupational context for engineer and biologist. Technological and mathematical aspects were required to be inspected in terms of co-teaching method. Lastly, other variables such as critical thinking and problem-solving skills should be more considered in the further researches.

**Keywords :** biomimicry, engineering approach, STEM education, teaching and learning model

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