Scoping Review: Appropriate Big Ideas of Nano Science and Nanotechnology to Teach in Chemistry for Secondary School

ABSTRACT

In the last decade, the nanotechnology sector is rising to take over the manufacturing of consumer products including pharmaceuticals. Due to the rapid advancement of nanotechnology, Malaysia has also taken the lead by introducing nanotechnology to Form Five students in 2021 following the revision of curricula in 2017. While research on which big ideas in nanotechnology to teach is still lacking around the world, the goal of this scoping review was to identify appropriate big ideas of nanotechnology to include in the secondary school curriculum using the Model of Educational Reconstruction (MER). The scoping review was conducted by adopting a framework with five stages including (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results. From the 30 pertinent articles included in this paper, it was found that big ideas that were used in many of the included articles are size and scale, self-assembly, size-dependent properties, volume-tosurface area concept, and applications of nanotechnology. Students gave positive feedback when they learned this unit with hands-on activities, using models, and when they attend nanotechnology conferences, whereas teachers wanted more courses on teaching nanotechnology to be provided because most science teachers were trained before nanotechnology was included in science teachers' educational program. Overall, this study can be used to gain insights into the suitability of teaching nanotechnology concepts to secondary school students based on students' achievements in past studies as well as teachers' and students' perspectives..