Review of: "Enhancing Science Education with Learning Management System for Effective Learning Outcomes"

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Potential competing interests: No potential competing interests to declare.

Abstract: ***"Technology-assisted science instruction and reflective thinking are advised by the National Science Teachers Association (NSTA, 2012, 2015, 2020)."*** Technology-assisted science instruction sounds so exciting and futuristic. Many studies have concluded the benefits of Technology-assisted science instruction.

However, what does reflective thinking have to do with this article? How reflective thinking is related to Technology-assisted science instruction as compared to not using technology and being a reflective learner. Being a reflective learner is associated with metacognitive research and enhances science instruction despite not including technology.

" Insufficient technological expertise, inadequate infrastructure, resistance to change… learning outcomes."

Does this article address all these issues in detail or are these factors addressed by other research?

The abstract does not specify a specific phase of learning. It generalises primary, secondary, and tertiary education. What credible evidence is there that suggests that Technology-assisted science instruction will improve science learning to a credible degree within such broad phases of education?

When studying the effectiveness of technology socio-cultural factors need to be addressed. Which part of the world is this article referring to? This will make the context of the article clearer.

Introduction

I note that this article is part of your work: that is great. However, you will need to mention this earlier article and indicate how it differs from the current article.

"it was identified that the …in the cognitive, effective, and the psychomotor domains of science education."How does this promote Technology-assisted science instruction?

"The students of this 5th Generation Revolution are engulfed and adept in technology utilization in schools." Where are these students from and which phase of education are they in?

"Really, it is high time technology is deregulated in science education right from primary schools to the tertiary… There is an urgent need to integrate technology in science education to enhance students' learning outcomes and the development of 21st-century skills."

I agree but why is there a justification for technology in science as compared to other approaches? Research done by researchers like John Hattie suggests that despite technology improving the attainment of science learners, other approaches may be less complicated and more effective. Does the government have enough money for this initiative? It will be great to know the context and location of this article.

"The National Science Teachers' ….reflective thinking (NSTA, 2012; 2015;2020)." Is this a comparative study? If so, how does this research compare in the socio-cultural context with the USA or is this American (USA) research? The issue with reflective thinking must be addressed in terms of technology.

How does Figure 1 link to LMS and what evidence do we have that LMS is the way to go? There are many other less complicated and more affordable approaches to promote the effective learner-centred approach.

"The simulated … ands out for its comprehensive and prognostic characteristics of lifting students' learning outcomes in science (Adesina & Ajadi, 2023; Gambari, 2021; Nguyen, 2021)."

I love this. I think addressing the issues above will strengthen this part of the introduction.

This part will be strengthened if there is a research question/s. Structure is important to add to clarity whilst reading the article. The language used is accessible to readers who are not familiar with the information in the article.

Learning Management System

This part is very informative. I suggest titling this as a literature review. I am still lost with the context and location of this research. Please provide these details. This part will be strengthened by giving an example of LMS in real real-life context during COVID. Most parts of the world did not have access to this type of technology. I am teaching in a first-world country such as Scotland. During the pandemic, we had issues with the internet infrastructure in some parts of the country, pupils who could not access the technology due to financial reasons. How viable is LMS within your context?

Types of Learning Management Systems

Learning with More Than Human and Digital Media

How Does Education Take Place?

If this is part of the literature review, perhaps more citations are needed. Link this theory to the context of the article in terms of phases of education and justify your reasoning.

How Science Educators Can Use LMS

This is done well. What does specific research say about LMS in terms of improving science education? Can this be compared to other approaches? Please relate all of this to the context of this article. Don't be too general. Do you think focusing on a specific phase of education and a sample population will add to the clarity of the article?

Way Forward on Enhancing Science Education with LMS

How realistic are these ideas within the context of the article? Where is the researched backing of the ideas? Why should this be promoted more than other approaches?