FEASIBILITY OF HYBRID VIRTUAL AND TRADITIONAL LABORATORY SYSTEMS FOR SCIENCE TEACHING

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The integration of virtual and traditional laboratory systems has gained attention as a potential approach to enhance science teaching. It is then inevitable to investigate the practicality of hybrid models that combine virtual and traditional laboratories, considering the advantages and challenges they present. By examining research and scholarly articles, we can gain insights into the potential benefits and practical considerations of implementing such systems in science education.

Studies have suggested that hybrid laboratory systems combining virtual and traditional components can improve student learning outcomes. Virtual laboratories can provide conceptual understanding, while traditional laboratories offer hands-on experiences and skill development. A study by Kirschner et al. (2006) found that the hybrid approach improved students' conceptual understanding and practical skills compared to traditional laboratories alone.

Hybrid laboratory systems provide increased flexibility and accessibility. Virtual laboratories can be accessed remotely, allowing students to engage in experiments outside the traditional classroom setting. This flexibility enables personalized learning, accommodates diverse student needs, and expands access to laboratory experiences. As demonstrated in the paper by Bashir et al. (2021), hybrid course delivery improved accessibility and engagement, particularly for students in underserved areas.

The feasibility of hybrid laboratory systems also hinges on cost considerations. Virtual laboratories can offer cost savings by reducing the need for physical equipment and consumables. However, integration and maintenance costs associated with virtual laboratory platforms must be considered. The investigations of Potkonjak et al. (2016) highlighted that while virtual laboratories may reduce material costs, there may be additional expenses related to software licenses, training, and technical support.

Therefore, implementing hybrid laboratory systems requires careful planning and training for both teachers and students. Educators need support in integrating virtual components into their curriculum effectively. Moreover, students need guidance on navigating virtual platforms and understanding their limitations. The findings of the works of Mulhayatiah et al. (2017) supported this notion by emphasizing the importance of teacher training and providing adequate resources to support the implementation of hybrid laboratory systems.

Furthermore, hybrid laboratory systems have the potential to enhance student engagement and motivation in science learning. Virtual laboratories can offer interactive simulations and visualizations that capture students' attention, while traditional laboratories provide the excitement of hands-on experimentation. This is evident in the conclusions of Sanger et al. (2018) as they reported that hybrid laboratory systems increased student motivation, interest, and enjoyment in science compared to traditional laboratories alone.

To sum it up, the feasibility of hybrid virtual and traditional laboratory systems in science teaching lies in their potential to enhance learning outcomes, flexibility, accessibility, and student engagement. However, considerations such as cost, practical implementation, and adequate training for teachers and students must be addressed. As demonstrated by the cited studies, implementing hybrid laboratory systems requires careful planning, ongoing support, and a balanced approach to ensure effective integration of virtual and traditional components in science education.

References:

Bashir, A., Bashir, S., Rana, K., Lambert, P., & Vernallis, A. (2021). Post-COVID-19 adaptations; the shifts towards online learning, hybrid course delivery and the implications for biosciences courses in the higher education setting. In Frontiers in Education (p. 310). Frontiers.
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational psychologist, 41(2), 75-86.
Mulhayatiah, D., Sinaga, P., Rusdiana, D., Kaniawati, I., & Suhendi, H. Y. (2021, March). Pedagogical and professional physics teacher training: why hybrid learning is important?. In Journal of Physics: Conference Series (Vol. 1806, No. 1, p. 012036). IOP Publishing.
Potkonjak, V., Gardner, M., Callaghan, V., Mattila, P., Guetl, C., Petrović, V. M., & Jovanović, K. (2016). Virtual laboratories for education in science, technology, and engineering: A review. Computers & Education, 95, 309-327.
Sanger, M. J., Brecheisen, D. M., & Hynek, B. M. (2001). Can computer animations affect college biology students' conceptions about diffusion & osmosis?. The American Biology Teacher, 104-109.