香港城市大學
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Classical Mechanics in Sci-Fi Movies

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Abstract:

Classical Mechanics serves as an essential cornerstone in the academic curricula of both Physics and Engineering programs. It introduces students to critical principles such as the Newtonian motion and the conservation of energy, momentum, and angular momentum. Despite the subject's foundational importance, traditional pedagogical approaches often fall short in engaging Gen Z students, mainly because textbook examples feature mechanical components like gears and levers, which may not resonate with a younger audience. In light of this challenge, the PI aims to redesign the educational experience of Classical Mechanics coursework, specifically targeting the PHY1101 course and its related modules. The proposed project involves an innovative, multimedia-based teaching strategy that will incorporate thoughtfully curated clips from contemporary science fiction (Sci-Fi) movies, known for their vivid and imaginative portrayals of physical laws in hypothetical environments like outer space. These meticulously chosen clips will serve dual purposes: they will either exemplify accurate representations of principles of Classical Mechanics or highlight glaring scientific inaccuracies, both of which will catalyze in-depth classroom discussions led by the PI. This interactive learning environment aims to encourage students to critically analyze, question, and dissect the physics depicted on screen, thereby enriching their understanding of the course material. This novel approach enables students to contextualize the concepts of Classical Mechanics within scenarios that are both intriguing and culturally relevant, effectively bridging the gap between academic theory and real-world (or speculative) applications. To supplement this, the PI will distribute custom-tailored explanatory notes and design homework assignments that are intricately linked with the Sci-Fi themes explored in class. These resources will serve to reinforce the concepts discussed and will facilitate the application of theoretical knowledge in a manner that is both engaging and intellectually stimulating. An additional educational facet involves students writing physics-focused movie reviews, a unique activity that offers a platform to critique the scientific accuracy or inaccuracy of these films, while also developing essential skills in critical thinking, media literacy, and scientific communication. A multi-faceted evaluation plan will rigorously assess the efficacy and impact of this teaching approach. Various methods, including qualitative and quantitative student questionnaires and analytical reviews of targeted homework assignments, will provide insights into the project's influence on learning outcomes, classroom engagement, and the retention of complex mechanical principles. The feedback gathered will not only serve to refine the course material for future iterations but will also offer data that can be shared with educational researchers and peers in the academic community. Upon successful evaluation, all developed resources—ranging from the edited movie clips and comprehensive explanatory notes to the uniquely crafted homework sets—will be

compiled and made publicly available through the City University of Hong Kong's educational database, serving to extend the project's academic reach, inspire similar initiatives, and potentially pave the way for scholarly publications in the field of physics education.