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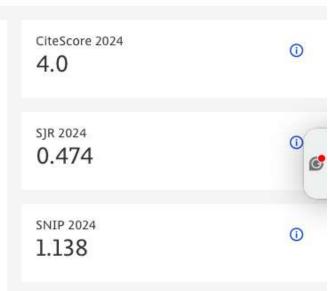
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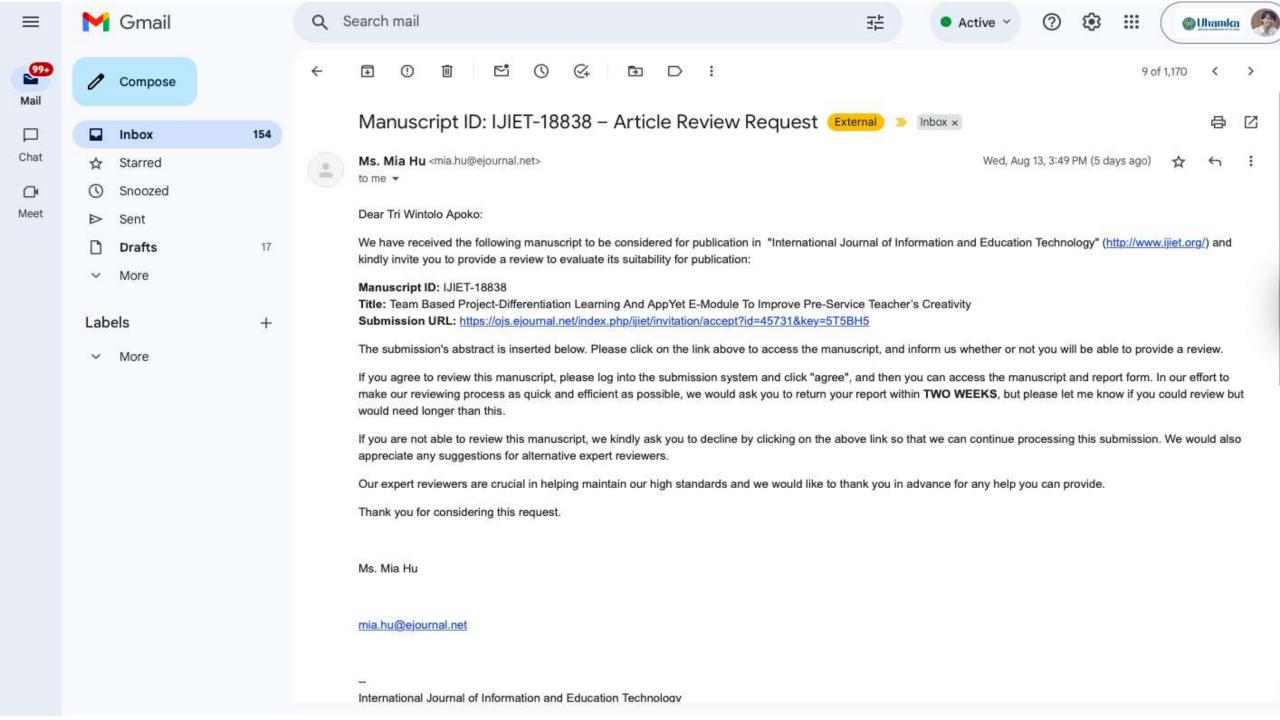
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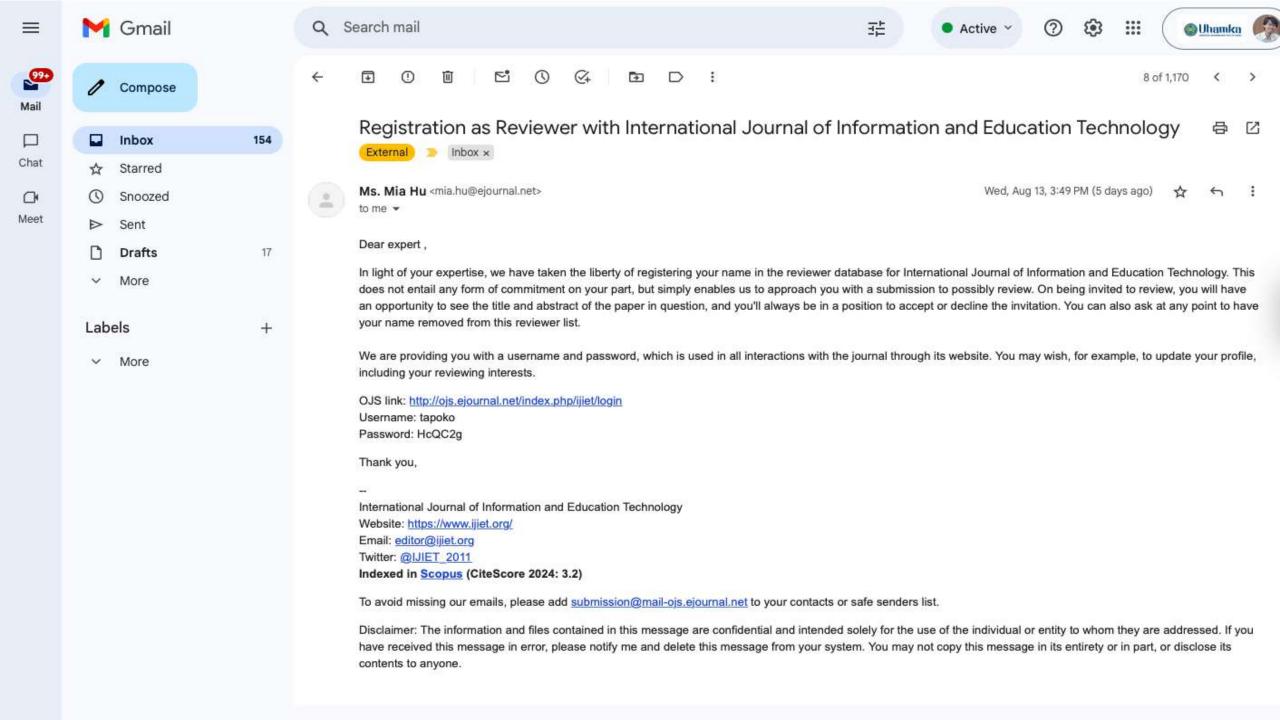
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Team Based Project-Differentiation Learning And AppYet E-Module To Improve Pre-Service Teacher's Creativity

Abstract-Creativity is an essential competence for pre-service teachers in preparing innovative learning designs that meet diverse student needs. However, many pre-service teachers face challenges in developing creative skills due to limited opportunities for collaborative and differentiated learning experiences. This study aims to investigate the effectiveness of team-based project-differentiation learning supported by an AppYet based e-module (TBP-DIFLAE) in improving pre-service teachers' creativity. The study employed a quasi-experimental design with a non-equivalent control group involving 51 pre-service physics teachers at a teacher education institution. The experimental group participated in TBP-DIFLAE principles, while the control group received conventional instruction. Creativity was assessed using a validated rubric covering originality, fluency, flexibility, and elaboration. The findings show that the experimental group achieved a significant improvement in creativity (N-Gain = 0.38, middle effect size, p < 0.05) compared to the control group. The study concludes that the integration of t TBP-DIFLAE significantly enhances pre-service teachers' creativity. These findings provide practical insights for teacher education programs, highlighting the potential of combining technology and collaborative-differentiated strategies to foster creativity and prepare future teachers for 21st-century educational challenges.

Keywords— team based project, differentiated, e-module, pre-service teacher's, creativity

I. Introduction

teaching materials makes a significant contribution to the success of the learning process [9]. In line with the progress of the times, in this era of the Industrial Revolution 4.0, the development of digital-based teaching materials has become a necessity for teachers and educators [5], [10]. Based on these statements, it is clear that in the Industrial Revolution 4.0 era, pre-service teachers must possess professional competencies to integrate and develop engaging and innovative digital-based teaching materials, considering their vital role in supporting the success of the learning process.

The ability to develop digital teaching materials must align with improvements in students' conceptual understanding. This means that the digital teaching materials created by pre-service teachers should not only follow technological developments but must also be adapted to support students' mastery of concepts. Concepts play a key role in the formation of scientific knowledge. A person's ability to identify characteristics or classify objects and events in their surroundings requires conceptual mastery [11]. Conceptual mastery is defined as students' ability to understand meaning in a scientific sense, both in terms of theory and its application in daily life. It reflects students' efforts to absorb and transfer information from specific learning content, which can be used to solve problems, conduct analysis, and interpret phenomena. With strong mastery of physics concepts, students will be better supported in facing and









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