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# Real-time bio-signal-processing of students based on an Intelligent algorithm for Internet of Things to assess engagement levels in a classroom

Pyoung Won Kim<sup>1</sup>

## Abstract

The level of student engagement refers to the degree of immersion of students during a class. This paper presents an Intelligent algorithm that provides information to the teacher by measuring the level of engagement in real time. The Internet of Things (IoT) algorithm for assessing student engagement levels is presented in this study, evaluating the psychological state of students by measuring the electrodermal activity (or galvanic skin response). The algorithm proposed in this study is innovative in that it allows teachers to provide feedback to students while monitoring students in real time. This study provides a basis for IoT applications for teaching and learning. In particular, this study constructs a color fuzzy model to represent student engagement levels by saturation. An application on the teacher's mobile phone transforms like a chameleon, in real time, according to the immersion of students during class. If students learn this algorithm, they can monitor their own immersion levels. This is to encourage students to perform some kind of engineering thinking.

**Keywords:** Intelligent Algorithms, Internet of Things, Engagement, Immersion, Galvanic Skin Response, Engineering Thinking

## 1. Introduction

Educators are increasingly focusing on the level of learner engagement. This is because it is key to explaining a student's low achievement, a high level of student boredom, classroom alienation, and the high dropout rate [8]. The level of engagement is multidimensional because it can be defined in various dimensions and measured in various ways. According to previous research, learner engagement is composed of behavioral, emotional, and cognitive factors. Behavioral engagement can be identified by the absence of apparent positive conduct and disruptive behavior [5, 6]. Emotional engagement focuses on the extent of positive (and negative) reactions to teachers, classmates, academics, or schools [4, 22].

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