

RESEARCH ARTICLE

## Innovative Teaching and Learning Approaches Integrating Interactive Sensor Technology and Emotional Intelligence in Early Childhood Education at TASKA

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### ABSTRACT

This study examines innovative teaching and learning approaches integrating interactive sensor technology and emotional intelligence within early childhood education at TASKA. The research is driven by the growing need for holistic development in young children encompassing cognitive, emotional, and social domains. A qualitative case study design was employed to observe how teachers utilize interactive sensor-based tools such as touch panels, motion sensors, and emotion recognition systems to enhance children's engagement and emotional regulation. Data collection involved classroom observations and teacher interviews. Findings reveal that combining digital interactivity with emotional learning strategies improves children's self-awareness, cooperation, and motivation. This study underscores the importance of leveraging technology thoughtfully to foster socio-emotional growth and provides insights for educators striving to balance innovation with human connection in early childhood education.

**Keywords:** *Digital learning, Early childhood education, Emotional intelligence, Interactive Sensor Technology.*

### INTRODUCTION

The rapid advancement of educational technology has transformed teaching and learning practices, including in early childhood settings. In Malaysia, TASKA institutions are increasingly adopting digital-based pedagogies to align with the expectations of 21st-century parents who emphasize both academic and emotional development in their children. Integrating interactive sensor technologies such as movement-responsive games and touch-sensitive devices enables children to engage in multisensory learning experiences that are both developmentally appropriate and stimulating.

Emotional intelligence as conceptualized by Goleman (1995) is essential for developing children's self-regulation, empathy, and interpersonal skills. Despite its importance, many early childhood programs tend to prioritize cognitive achievements, often overlooking emotional development. This study addresses this gap by exploring the integration of interactive sensor tools with emotional intelligence-based instructional strategies in TASKA classrooms. The research objective is to understand how this integration promotes emotional awareness, effective communication, and enhanced engagement in

learning among young children.

Contextually, Malaysian early childhood education is progressively embracing technological tools to improve learning experiences. According to recent trends, digital platforms, educational games, and interactive devices are increasingly incorporated in preschools to support play-based and experiential learning while fostering digital literacy. Balancing screen time with hands-on activities remains a challenge, but the strategic use of technology can enhance holistic child development including social and emotional domains (Freesia Kids, 2024).

### METHOD

#### Research Design

This study employed a qualitative case study design to explore the effectiveness of integrating interactive sensor technology and emotional intelligence within a real-life TASKA setting. This design was selected to facilitate an in-depth understanding of teacher practices and children's behavioral responses in a naturalistic educational environment.

#### Participants

The participants included three early childhood educators and twenty children aged

4 to 6 years from a TASKA center in Terengganu. Teachers were purposively selected based on their experience with digital learning tools. Prior parental consent was obtained before participation.

### **Data Collection Strategy**

Data were collected through direct classroom observations, video recordings, and semi-structured interviews with teachers. Observations focused on children's emotional expressions, engagement levels, and behavioral responses during activities utilizing sensor-based technologies such as motion-detecting games and emotion-recognition software. Interviews were audio recorded, then transcribed and coded to extract emerging themes relevant to the research objectives.

### **Data Analysis**

Data analysis followed Braun and Clarke's (2006) thematic framework. Thematic coding identified recurring patterns related to engagement, self-regulation, empathy, and teacher facilitation strategies. Themes were compared across observation sessions to assess consistency and deepen insight into teaching and learning dynamics.

## **RESULTS**

This study found that integrating interactive sensor technology with emotional intelligence-based teaching significantly enhanced children's engagement and emotional responsiveness in the TASKA setting. Observations and interviews revealed increased excitement and cooperation during sensor-based activities involving movement and emotional expression. Teachers reported that children became more aware of their emotions when interacting with emotion-detecting sensors, which provided immediate feedback on facial expressions.

Three major themes emerged through thematic analysis:

### **1. Enhanced Emotional Awareness**

Children demonstrated an increased ability to accurately identify and label their emotions. For example, during an emotion-recognition activity, a child recognized and named feelings of "happiness" and "surprise" after viewing their facial expressions on the sensor display.

### **2. Active Participation**

Sensor-based games and activities encouraged both physical movement and social interaction among children. One teacher noted that children were more willing to collaborate and take turns while

playing motion-responsive games, enhancing peer engagement.

### **3. Teacher Adaptability**

Teachers creatively adapted their instructional methods by combining emotional coaching with digital interactive tools. They tailored prompts and feedback to guide children's emotional regulation and foster empathy during technology-mediated activities.

## **DISCUSSION**

The study's findings align with prior research by Wahab and Mansor (2023), which demonstrated that digital technology can support socio-emotional learning when applied intentionally and appropriately. The use of interactive sensor technologies facilitates active learning while promoting emotional expression in a safe, non-threatening environment. This integration marks a pedagogical shift from traditional teacher-centered approaches toward child-centered exploration, emphasizing experiential learning.

Emotional intelligence serves as a vital bridge between technology and empathy, ensuring that the human aspects of teaching remain central despite technological integration. This study contributes to the expanding body of literature emphasizing the importance of emotional development in early childhood education. It highlights how digital innovation can augment rather than replace human connection, reinforcing the role of educators in nurturing socio-emotional growth alongside cognitive skills.

Consistent with these findings, recent work by Hilkemeijer (2019) describes how digital tools, when used purposefully, enhance emotional awareness, self-expression, and peer collaboration in early learners. Similarly, Belpaeme et al. (2025) confirm that AI-driven interactive robots improve emotional self-regulation and social skills. These perspectives support the potential of technology as an intentional pedagogical instrument that fosters meaningful human interactions and emotional learning in early childhood settings.

## **CONCLUSION**

The integration of interactive sensor technology with emotional intelligence within TASKA presents a promising approach to fostering holistic development in young children. Through hands-on, emotionally engaging activities, children demonstrate increased motivation, enhanced emotion

regulation, and improved social skills.

Educators are encouraged to adopt this combined approach to balance technological innovation with empathy, thereby creating richer, more meaningful learning experiences. Future research should explore the effects of this integrative approach on larger sample populations and investigate its long-term impact on children's emotional and cognitive development. Additionally, longitudinal studies could provide deeper insights into how sustained use of sensor-based emotional learning tools influences developmental trajectories.

#### ACKNOWLEDGEMENT

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#### DECLARATION OF POTENTIAL CONFLICT OF INTEREST

The author declares that there are no potential conflicts of interest related to this research. All procedures were conducted with impartiality, and no financial or personal relationships influenced the outcomes of this study.

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