



Exploring student creativity in Internet of Things learning through the RADEC model

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Abstract

Creativity is an essential competency in technology education, particularly in Internet of Things (IoT) learning, which requires students to develop innovative solutions to real-world problems. This study aimed to explore students' creativity in IoT learning through the implementation of the RADEC (Read, Answer, Discuss, Explain, Create) learning model integrated with differentiated learning at the junior high school level. A descriptive qualitative design with a phenomenological approach was employed. The study involved 28 eighth-grade students and one Informatics teacher at a junior high school in Bandung. Data were collected through classroom observations, semi-structured interviews with the teacher, and documentation of students' creative products. Data were analyzed using thematic phenomenological analysis. The findings revealed that students demonstrated varying levels of creativity, ranging from Highly Creative to Less Creative categories, based on the indicators of fluency, flexibility, originality, and elaboration. Students generated diverse IoT-based innovation ideas related to communication, healthcare, transportation, environmental sustainability, and daily life. Collaborative discussions and students' familiarity with digital technology supported creativity development, while low reading interest and teacher readiness remained challenges. The findings suggest that RADEC integrated with differentiated learning provides opportunities for students to express and develop creativity within technology-based learning contexts.

Keywords: creativity, Internet of Things, RADEC, differentiated learning, phenomenology

INTRODUCTION

Education in Indonesia, particularly at the junior high school level, continues to face various challenges in developing the higher-order thinking skills required in the 21st century. In addition to literacy skills, students are expected to possess creativity, critical thinking, communication, and collaboration skills to cope with rapid technological advancements. Data from PISA indicate that Indonesian students' reading performance remains below the international average, with many students experiencing difficulties in identifying main ideas and understanding information presented in complex texts (OECD, 2020; 2023). This condition

highlights the need for learning approaches that not only support knowledge acquisition but also encourage students' active engagement in constructing understanding and generating creative ideas.

Recent studies have highlighted the important role of reading comprehension in supporting students' academic achievement and higher-order thinking skills. Reading comprehension is not merely the ability to decode written texts but also involves constructing meaning, evaluating information, and integrating knowledge from multiple sources. In the digital era, reading comprehension is increasingly associated with digital literacy, as students are required to navigate, evaluate, and interpret information from various digital platforms. Several studies have shown that digital learning environments can support reading comprehension by providing interactive resources, multimodal texts, and opportunities for self-directed learning (Khumaeroh et al., 2023). Moreover, technology-assisted learning has been found to facilitate students' engagement with reading materials and strengthen literacy development when appropriately integrated into classroom instruction (OECD, 2020). Therefore, strengthening reading comprehension remains essential in technology-based learning environments, including Internet of Things (IoT) education, where students are expected to understand information, analyze problems, and develop creative solutions based on technological concepts.

One learning model developed to address these needs is RADEC (Read, Answer, Discuss, Explain, Create). This model is grounded in social constructivist theory, which positions students as active participants in the learning process. In line with Vygotsky's concepts of social constructivism and the Zone of Proximal Development (ZPD), the RADEC model emphasizes independent learning activities, social interaction, collaborative discussion, and the co-construction of knowledge (Kusumaningpuri & Fauziati, 2021). These characteristics are highly relevant to technology-based learning, including Internet of Things (IoT) education, which requires students not only to understand technological concepts but also to develop creative thinking skills to solve real-world problems (Pasha & Osmani, 2024).

Research by Burhanudin et al. (2024) indicates that the implementation of the RADEC model contributes to the development of students' critical thinking, creativity, communication, and collaboration skills, particularly at the elementary school level. Furthermore, the implementation of the Merdeka Curriculum encourages the use of differentiated learning as a strategy to accommodate students' diverse abilities, needs, and learning styles (Nurhana et al., 2024). Differentiated learning provides opportunities for all students to participate according to their individual learning characteristics, thereby supporting a more inclusive and meaningful learning process. Studies on peer teaching (Nuriyani & Winarso, 2021) and discovery learning (Ekaputra & Widarwati, 2023) also demonstrate that interactive and experiential learning approaches can provide students with opportunities to develop their analytical abilities and creativity.

Within the context of science education, each stage of the RADEC model encourages students to read, answer questions, discuss ideas, explain their understanding, and create solutions based on acquired knowledge. This process provides students with opportunities to generate new ideas and explore various alternative approaches to problem-solving (Khafiza et al., 2025). Research by Yuniasih et al. (2024) also shows that RADEC learning can facilitate

the development of creative thinking skills because students do not merely receive information but also use that knowledge to generate original ideas and solutions.

Despite these advantages, studies examining the implementation of the RADEC model in Internet of Things (IoT) learning at the junior high school level remain limited. Most existing IoT-related studies have been conducted in higher education or vocational education contexts, while its application at the junior high school level has received relatively little attention. Furthermore, the integration of the RADEC model with differentiated learning in the context of IoT instruction remains underexplored in the literature. This gap is important to address because IoT learning requires not only an understanding of technological concepts but also the ability to generate creative ideas and solutions to problems encountered in everyday life.

Based on this gap, the present study aims to explore students' creativity in Internet of Things (IoT) learning through the implementation of the RADEC model integrated with differentiated learning at the junior high school level. Specifically, this study seeks to describe how students' creativity emerges during the learning process, examine the teacher's experiences during the implementation of RADEC-based IoT learning, and identify the factors that support and hinder the development of students' creativity in technology-based learning environments.

RESEARCH METHOD

This study employed a descriptive qualitative research design with a phenomenological approach to explore students' creativity and the teacher's experiences during the implementation of the RADEC (Read, Answer, Discuss, Explain, Create) learning model in Internet of Things (IoT) instruction at the junior high school level. A phenomenological approach was selected because it enables researchers to gain an in-depth understanding of participants' subjective experiences and how they interpret learning experiences within a particular context (Hossain et al., 2024; Sitio & Diponegoro, 2023). Consistent with phenomenological principles, this study focused on participants' perspectives regarding the learning process, classroom interactions, and experiences in developing creativity through RADEC-based IoT learning (Wita et al., 2022; Rafidiyah & Kailani, 2020).

The study was conducted at a junior high school in Bandung, Indonesia. The participants consisted of 28 eighth-grade students who participated in IoT learning using the RADEC model and one Informatics teacher who implemented the model in the classroom. Participants were selected purposively based on their direct involvement in RADEC-based IoT learning activities. In this study, the researcher served as the primary research instrument and was directly involved in classroom observations, interviews, and documentation, as is common in phenomenological qualitative research.

The data collection process followed the stages proposed by Creswell (2012) including identifying participants and the research setting, obtaining research permission, determining the types of data to be collected, preparing data collection protocols, and conducting data collection while adhering to ethical principles. Prior to the study, permission was obtained from the school, and consent was secured from both the teacher and participating students. Ethical considerations were addressed through the implementation of informed consent to ensure voluntary participation without coercion (Creswell & Creswell, 2018).

Data were collected through classroom observations, semi-structured interviews with the Informatics teacher, and documentation of students' learning products. Classroom observations were conducted to examine learning activities, student interactions, and the implementation of each stage of the RADEC model in IoT instruction. The teacher interview served as the primary source for exploring experiences, perceptions, and perspectives regarding the implementation of the RADEC model in IoT learning. The teacher was also asked to describe the challenges encountered during instruction, the strategies employed throughout the learning process, and his perceptions of students' participation during RADEC-based IoT learning activities. In addition to observations and interviews, students' assignments and creative products were collected as documentary evidence to examine students' creativity in designing IoT-based solutions (Ilham et al., 2024; Yulianti et al., 2022). These documents were analyzed using creativity indicators consisting of fluency, flexibility, originality, and elaboration, adapted from Febrianingsih (2022).

To ensure the credibility and trustworthiness of the findings, this study employed data triangulation, member checking, and audit trails. Triangulation was conducted by comparing data obtained from observations, interviews, and documentation. Member checking was carried out by confirming preliminary interpretations with participants to ensure the accuracy of meaning. In addition, audit trails were maintained to document all research procedures and analytical decisions, thereby ensuring transparency and traceability throughout the research process (Creswell, 2012).

Creativity was assessed using four indicators: fluency, flexibility, originality, and elaboration.

Table 1. Student Creativity Rubric

Student Response	Score
Fluency	
Did not answer or gave an idea that is not relevant to the problem	0
Gave one idea that is not relevant to the problem-solving	1
Gave one relevant idea but the answer is incomplete	2
Gave one relevant idea related to problem-solving but it was incomplete and unclear	3
Gave one relevant idea related to problem-solving that was complete and clear	4
Flexibility	
Did not answer or gave an incorrect answer	0
Gave an answer using one or more methods but all were incorrect	1
Gave an answer using one method, but with errors in the calculation resulting in a wrong result	2
Gave an answer using one method with correct calculation and correct result	3
Gave answers using more than one method, all correct	4
Originality	
Did not answer or gave an incorrect answer	0
Gave an answer using own method but it was not understandable	1
Gave an answer using own method, correct process but unfinished	2
Gave an answer using own method, but had calculation errors resulting in wrong outcome	3
Gave an answer using own method, correct process and correct result	4
Elaboration	
Did not answer or gave an incorrect answer	0
Answer had errors and lacked elaboration or detail	1
Answer had errors but included general elaboration	2

Answer had errors but included detailed elaboration	3
Answer was correct and included detailed elaboration	4

Table 1 above describes student creativity rubric. Students creativity indicators scores range from 0-4.

FINDINGS & DISCUSSION

The observation results revealed that Internet of Things (IoT) learning was implemented through the stages of the RADEC (Read, Answer, Discuss, Explain, Create) learning model integrated with differentiated learning. Each stage was designed to provide students with opportunities to gradually build conceptual understanding while simultaneously developing creativity through collaborative activities and problem-solving tasks. During the Read stage, students were asked to read learning materials prepared by the teacher before classroom activities began. Based on the interview findings, the Informatics teacher stated that one of the challenges encountered during instruction was students' low interest in reading learning materials. The teacher explained:

"Students today have little understanding of the benefits of technology, most of them are just playing games"

"their enthusiasm for reading is low. There needs to be something new to attract them to read."

These findings indicate that one of the challenges in technology-based learning is encouraging students to actively engage with learning materials before classroom instruction begins. From a phenomenological perspective, the teacher's experiences provide insight into the realities of teaching and learning in the digital era (Forbes, 2021),

During the Answer stage, students were required to answer questions individually based on the material they had previously studied. The teacher then grouped students according to their level of understanding and the accuracy of their responses to support the implementation of differentiated learning. Students with stronger understanding were paired with those requiring additional assistance, creating opportunities for peer support and collaborative learning. According to Fauzia & Ramadan (2023), differentiated learning aims to provide equitable learning opportunities for all students according to their needs and abilities.

The Discuss stage provided students with opportunities to discuss their answers and exchange ideas with group members. Classroom interactions demonstrated collaborative learning processes in which students with better understanding assisted their peers in comprehending IoT concepts. This finding is consistent with the Zone of Proximal Development (ZPD) theory, which emphasizes the importance of social interaction in supporting students' learning processes (Topçiu & Myftiu, 2015).

During the Explain stage, each group presented the results of their discussions and explained their understanding to other groups. This activity encouraged students to communicate ideas and defend their arguments. Meanwhile, during the Create stage, students were asked to design IoT-based solutions as an application of the concepts they had learned. This stage provided opportunities for students to generate new ideas, explore various alternative

solutions, and demonstrate creativity in designing technology-based innovations. Consistent with the findings of Burhanudin et al. (2024), experiential learning through the RADEC model provides students with opportunities to develop creativity through exploration, collaboration, and solution-creation activities. Therefore, the Create stage became an important component for identifying students' creativity profiles, which are presented in the following section.

Students' Creativity Profile

To obtain an overview of students' creativity in designing IoT-based solutions, students' assignments were analyzed using a creativity rubric based on the indicators of fluency, flexibility, originality, and elaboration, adapted from Febrianingsih (2022). Based on the scoring criteria, students' creativity levels were classified into five categories: Highly Creative, Creative, Moderately Creative, Less Creative, and Not Creative. The distribution of students across these categories is presented in Table 2.

Table 2. Distribution of Students' Creativity Levels

Creativity Category	Score Range (%)	n	Percentage (%)
Highly Creative	81–100	12	42.9
Creative	66–80	6	21.4
Moderately Creative	56–65	6	21.4
Less Creative	41–50	4	14.3
Not Creative	0–40	0	0.0
Total		28	100

Table 2 shows that students' creativity levels varied across categories. The largest proportion of students (42.9%) was classified as Highly Creative, followed by the Creative (21.4%) and Moderately Creative (21.4%) categories. A smaller proportion of students (14.3%) was categorized as Less Creative, while no students were classified as Not Creative. Notably, nearly two-thirds of the participants (64.3%) were categorized as either Highly Creative or Creative, indicating that students generally demonstrated the ability to generate original and meaningful IoT-based innovation ideas. The absence of students in the Not Creative category suggests that all participants demonstrated at least some degree of creative potential when designing IoT-based solutions.

Highly Creative

Students classified as Highly Creative demonstrated the ability to generate original, relevant, and applicable ideas for solving real-world problems (Nurhayati et al., 2023). They were not only capable of producing multiple ideas but were also able to explain the mechanisms and potential benefits of their proposed solutions in detail.

Table 3. Examples of IoT Innovation Ideas from Highly Creative Students

Student Code	Main Innovation Idea
QB	A chip implanted in the human brain that can translate all languages in real time
N	Microscopic robots for disease and cancer detection
KS	Intelligent robots to assist elderly people
EK	Smart glasses capable of detecting danger
MG	AI-based robots for environmental protection and plant care

Table 3 presents IoT innovation ideas proposed by students belonging to highly creative category. Student QB proposed the following idea: *“A chip implanted in the human brain that can translate all languages in real time.”* This idea reflects a high degree of originality because it integrates communication technology, artificial intelligence, and human interaction into a single innovative solution. In addition, the student provided a detailed explanation regarding how the technology could function in daily life, indicating strong elaboration skills. Such characteristics are consistent with highly creative individuals who are capable of generating novel ideas and developing them into meaningful solutions (Nurhayati et al., 2023).

Similarly, student N proposed *“Microscopic robots that can enter the human body to detect cancer and other diseases.”* This response demonstrates originality and flexibility in applying IoT concepts within the healthcare domain. The student not only identified a problem but also proposed a technologically advanced solution with potential social benefits. According to Yuniasih et al. (2024), students with advanced creative thinking abilities are able to connect technological concepts with authentic real-life problems and generate innovative solutions.

Another notable example was provided by student MG: *“AI-powered robots that help protect forests and take care of plants automatically.”* This idea reflects the ability to combine environmental awareness with emerging technologies. The proposed innovation addresses contemporary environmental issues while demonstrating an understanding of how IoT and artificial intelligence can contribute to sustainability. Such findings support the view that creative thinking develops when students are encouraged to explore ideas through meaningful and contextual learning experiences (Burhanudin et al., 2024).

Creative

Students in the Creative category were able to generate relevant and useful ideas, although their solutions were generally less original and less detailed than those produced by students in the Highly Creative category (Yuniasih et al., 2024).

Table 4. Examples of IoT Innovation Ideas from Creative Students

Student Code	Main Innovation Idea
SH	Smart refrigerator that recommends meals based on users' moods
K	Smart glasses with navigation and weather-monitoring features
F	Brain-connected communication device

Table 4 outlines IoT innovation ideas proposed by creative students. Student SH proposed: *“A smart refrigerator that can recommend food menus based on the user's mood.”* This idea demonstrates creativity through the integration of daily-life needs and smart technology. Although the concept is practical and relevant, the explanation provided was less detailed compared with students in the Highly Creative category. Nevertheless, the idea still reflects originality and the ability to connect technology with human needs.

Student F suggested: *“A device connected to the human brain that can help people communicate faster.”* This response demonstrates imaginative thinking and originality. However, the explanation focused mainly on the main concept without further elaboration regarding implementation or technical feasibility. According to Yuniasih et al. (2024), students at this level often demonstrate strong creative potential but require additional support to further develop and refine their ideas.

Moderately Creative

Students in the Moderately Creative category were able to generate relevant ideas related to IoT-based problem solving, yet their solutions tended to be less varied and less innovative than those produced by students in the Highly Creative and Creative categories (Suryaningsih et al., 2023). Although these students demonstrated an understanding of technological concepts, their ideas generally focused on a single solution and showed limited exploration of alternative approaches.

Table 5. Examples of IoT Innovation Ideas from Moderately Creative Students

Student Code	Main Innovation Idea
I	Flying vehicles for future transportation
GR	Weather engineering technology

Table 3 describes IoT innovation ideas proposed moderately creative students. Student I proposed: *“A flying vehicle that can help people travel faster and avoid traffic congestion.”* This idea demonstrates the student's ability to connect technology with transportation challenges. The proposed solution is relevant to contemporary mobility issues and reflects an awareness of future technological possibilities. However, the idea was limited to a single concept and lacked further exploration of how IoT technology would support its implementation. In terms of creativity indicators, the response showed moderate fluency, flexibility, originality, and elaboration. According to Suryaningsih et al. (2023), students at this level often demonstrate creative potential but tend to rely on familiar concepts rather than generating highly innovative solutions.

Similarly, student GR suggested: *“A technology that can control weather conditions to reduce the impact of extreme weather.”* The idea reflects an attempt to address environmental challenges through technology. While the concept shows originality and relevance, the explanation remained general and lacked detailed descriptions regarding the operation and feasibility of the proposed innovation. The response demonstrates an emerging level of creative thinking, but requires further development to reach higher levels of originality and elaboration. This finding supports previous research indicating that students with moderate creativity are generally capable of identifying problems and proposing solutions, although their ideas often remain at a conceptual level (Suryaningsih et al., 2023).

Less Creative

Students in the Less Creative category produced ideas that were functional but relatively common and less developed. Their responses tended to focus on everyday solutions that are already widely available and demonstrated limited exploration of alternative possibilities (Syefrinando et al., 2022).

Table 6. Examples of IoT Innovation Idea from a Less Creative Student

Student Code	Main Innovation Idea
R	Automated time reminder device

Table 6 indicates IoT innovation ideas proposed by less creative students. Student R proposed: *“A device that reminds people about time and daily schedules automatically.”* This

idea demonstrates a basic understanding of how technology can assist everyday activities. However, the proposed solution was relatively conventional and did not show substantial novelty compared to existing technologies. The response was limited to a single idea and provided only a brief explanation regarding its function. As a result, the scores for fluency, flexibility, originality, and elaboration remained relatively low. According to Syefrinando et al. (2022), students in this category generally require additional guidance and opportunities to expand their ideas, explore alternative solutions, and develop more innovative approaches to problem solving.

Themes of Students' IoT Innovation Ideas

Students' IoT innovation projects and teacher interview data revealed four major innovation themes. These themes provide qualitative insights into the patterns underlying the creativity categories identified in the previous section.

Table 7. Emerging Themes of Students' IoT Innovation Ideas across Creativity Levels

Creativity Level	Innovation Domain	Representative Ideas	Key Creativity Characteristics
Highly Creative	Human Technology Integration; Healthcare; Artificial Intelligence; Environmental Sustainability	Real-time language translation chip implanted in the human brain; Microscopic cancer-detection robots; AI-powered environmental protection systems	Cross-disciplinary integration; high originality; strong elaboration; innovative problem solving
Creative	Assistive Technology; Smart Living	Brain-connected communication devices; Smart glasses with navigation and weather-monitoring features; Mood-responsive smart refrigerators	Practical innovations; clear application; moderate originality and elaboration
Moderately Creative	Transportation; Environmental Technology	Flying vehicles for urban mobility; Weather engineering systems	Focus on a single domain; limited variation; partially developed innovation concepts
Less Creative	Everyday Utility Technology	Automated reminder devices; Basic notification systems	Conventional solutions; low originality; minimal elaboration

As shown in Table 7, four major innovation domains emerged from students' IoT-based solution designs: healthcare and human technology integration, communication and accessibility, environmental sustainability, and smart living technologies. These themes illustrate how students interpreted IoT concepts and applied them to authentic problems encountered in everyday life.

The healthcare and human technology integration domain included ideas such as microscopic cancer-detection robots, intelligent assistive robots for older adults, and brain-implanted language translation chips. These innovations reflected students' attempts to address human health, communication, and accessibility challenges through advanced technological solutions. The emergence of this domain suggests that students viewed technology not only as a tool for automation but also as a means of improving human well-being.

The communication and accessibility domain was represented by innovations such as brain-connected communication devices and smart glasses equipped with navigation and

environmental monitoring features. These ideas focused on enhancing human interaction, mobility, and access to information. The findings indicate that students were able to recognize practical problems in daily life and propose technology-based solutions to address them.

Another prominent theme was environmental sustainability. Students proposed innovations such as AI-powered environmental monitoring systems, automated plant-care technologies, and weather-management concepts. These ideas demonstrate students' awareness of environmental issues and their ability to connect IoT concepts with sustainability challenges. This finding suggests that technology learning can encourage students to consider broader societal and environmental problems when generating innovative ideas.

Finally, the smart living domain included solutions designed to improve convenience and efficiency in everyday activities, such as smart refrigerators and automated reminder systems. Although these ideas were generally more practical and familiar, they nevertheless demonstrated students' ability to apply IoT concepts to real-life contexts.

Taken together, these themes indicate that students' creativity extended beyond generating technological ideas alone. Their innovations reflected attempts to address authentic human, social, environmental, and practical challenges. This finding suggests that the Create stage of the RADEC model provided opportunities for students to connect technological knowledge with meaningful real-world problem solving.

Educational Implications

The findings suggest that students' creativity emerged through a learning process that combined independent preparation, collaborative discussion, and solution design. Rather than appearing as an individual cognitive outcome, creativity developed through interactions that occurred across the stages of the RADEC model. Students first engaged with information independently, then refined their understanding through discussion and explanation before generating IoT-based solutions. This finding supports social constructivist perspectives that view knowledge and creativity as products of social interaction and collaborative meaning-making (Kusumaningpuri & Fauziati, 2021).

The variation in students' creativity levels indicates that creativity was expressed along a continuum rather than as a fixed attribute. Students in the Highly Creative category tended to generate ideas that integrated multiple domains, such as healthcare, artificial intelligence, communication, and environmental sustainability. In contrast, students in the Moderately Creative and Less Creative categories generally proposed solutions that were more focused on familiar and practical contexts. These findings support the view that creativity develops gradually and may be influenced by prior knowledge, learning experiences, and opportunities for exploration (Nurhayati et al., 2023).

Collaboration emerged as an important factor in supporting students' idea development throughout the learning process. During the Discuss and Explain stages, students exchanged perspectives, received feedback, and refined their proposed solutions. These interactions appeared to contribute not only to conceptual understanding but also to the elaboration and improvement of creative ideas. This finding is consistent with the Zone of Proximal

Development (ZPD) theory, which emphasizes the role of social interaction in facilitating learning and cognitive development (Topçiu & Myftiu, 2015).

The study identified several factors that both supported and challenged the implementation of RADEC-based IoT learning. Students' familiarity with digital technology, interest in technological topics, and willingness to collaborate were identified as important supporting factors. At the same time, the teacher reported challenges related to students' low interest in reading learning materials and difficulties in understanding abstract IoT concepts. To address these challenges, the teacher connected IoT concepts with everyday contexts that were familiar to students. These findings suggest that the successful implementation of innovative learning approaches depends not only on instructional design but also on teacher readiness and students' learning dispositions.

CONCLUSION

This study explored students' creativity in Internet of Things (IoT) learning through the implementation of the RADEC (Read, Answer, Discuss, Explain, Create) learning model integrated with differentiated learning at the junior high school level. The findings revealed that the RADEC learning process provided opportunities for students to actively engage in reading, discussion, explanation, and creative problem-solving activities. Through these learning experiences, students demonstrated varying levels of creativity in designing IoT-based solutions, ranging from Highly Creative to Less Creative categories. No students were classified as Not Creative, indicating that all participants demonstrated creative potential to some extent.

The findings also showed that students were able to generate a variety of technology-based ideas addressing real-world problems, including innovations related to communication, healthcare, transportation, environmental sustainability, and daily life. Students in the Highly Creative category demonstrated stronger originality and elaboration in developing innovative solutions, while students in other categories generally proposed more conventional ideas with varying levels of detail and flexibility. These findings suggest that IoT learning supported by the RADEC model can provide a meaningful context for students to express and develop their creative thinking.

In addition, collaborative interactions during the Discuss and Explain stages enabled students to exchange ideas, support one another's learning, and refine their understanding of IoT concepts. However, the study also identified several challenges, particularly students' low interest in reading learning materials and the need for greater teacher readiness in implementing innovative technology-based instructional approaches.

Overall, this study highlights the potential of integrating RADEC and differentiated learning in creating learning environments that encourage student participation, collaboration, and creative expression within technology education. Future research may involve a broader range of participants and educational contexts to further explore how creativity can be fostered through IoT-based learning experiences.

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