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Stepping Forward: Enhancing Cognitive Learning Outcomes through Hybrid RCCR-Based Learning on Circulatory System Material

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ABSTRACT

The time constraints at the end of the semester often lead to suboptimal delivery of circulatory system materials, which consequently affect students' learning outcomes. Hence, this research aims to delve into the impact of applying the RCCR (Reflect-Collaborate-Convey-Record) approach based on Hybrid Learning on enhancing cognitive learning outcomes. This study utilizes a quasi-experimental design, encompassing a control group with pretests and posttests, though they are not equivalent. Evaluation of cognitive learning outcomes involves multiple-choice questions in both the pretest and posttest phases. The data from these evaluations are quantitatively analyzed in-depth. After the learning process, the average posttest score for the control group reached 71.61, while the experimental group achieved a score of 81.25. Statistical analysis indicates a significant difference in posttest results between the experimental and control groups. The analysis of change scores (N-gain) also shows a significant difference between the experimental and control groups ($p<0.05$). These findings highlight a strong connection between cognitive learning outcomes and metacognitive skills mastery ($r=0.83$). Consequently, this learning model presents a valuable alternative for overcoming classroom time constraints and effectively enhancing cognitive learning outcomes.

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1. INTRODUCTION

In a remote corner of Tangerang Regency, a vocational school has taken a bold step by unlocking the gateway to the virtual world through widespread Wi-Fi facilities encompassing the entire school premises. While the 2013 curriculum has acted as a guide, with group discussions taking center stage, there still exists an unfilled crevice. As the semester draws to a close, time occasionally assumes the role of a tailor stitching subjects

that haven't been sewn together seamlessly. To recover every strand that was left behind, a strategy capable of transcending space and time is needed – a method that extends beyond the confines of the classroom.

Today, the winds of technology have unfurled a new chapter. The Wi-Fi reverberating through the corridors of the school is not merely a tool, but a window to a boundless world. In the quest for knowledge, there are no classroom walls to constrain. Wi-Fi is not just a device, but a key to the gate of knowledge beyond. In this age of connectivity, students have the opportunity to hack into learning, transcending the boundaries of the classroom.

Hybrid Learning allows students and teachers to utilize technology for active learning, enabling them to exchange information (Tanisha Jowsey, 2020). In the Hybrid Learning model, students will venture into the realm of course materials via the digital sphere, crawling within and soaring beyond the classroom to absorb knowledge [1]. In the realm of Hybrid Learning, the potency amplifies when orchestrated in the symphony of groups. Students weave discussions and question-and-answer scenes with their teammates, crafting the core of existing knowledge into a more exquisite masterpiece. Hence, emerges a need for a collaborative learning model, known by the acronym RCCR (Reflect-Collaborate-Convey-Record) [2]. RCCR represents a collaborative learning approach derived from the fusion of Reflect-Convey-Collaborate and Reflect-Interaction-Record. Embracing the RCCR (Reflect-Collaborate-Convey-Record) learning model can hone students' critical thinking skills. Cooperative learning also prompts students to learn from each other, ensuring that every individual within the group grasps the discussed concepts.

In the captivating journey of biological knowledge, we will explore an intriguing realm within the human body: the circulatory system. Here, we will delve into the secrets of blood clotting, navigate the intricacies of organs within the circulatory system, and investigate the enigmatic lymphatic network. Like scientific detectives, we will piece together fragments of information to form a comprehensive picture [3].

However, this journey does not stand alone. In the era of a novel learning approach known as RCCR, we are not merely passive observers, but also co-designers of our learning path. In this realm of hybrid learning, we will engage in conversations with fellow explorers, independently seek the treasures of information in the vast ocean of the internet. The teacher, serving as a wise guide, has provided a roadmap in the form of websites that direct our steps towards valuable knowledge [4].

Crafting an education that resonates with the 21st century requires us to grasp one key element: nurturing metacognitive skills. Like conducting a symphony of high-order thinking, metacognitive prowess is a seed that must be sown within the minds of students. Just as a captain steers the ship, metacognition empowers individuals to helm their own course, steering, regulating, and charting their learning voyage [5].

In essence, metacognitive skills are the rain that nourishes the garden of knowledge, and their impact on students' mastery of subjects cannot be ignored. Learning outcomes rooted in the cognitive realm are the battlegrounds of intellect that are inseparable [6].

Based on problem analysis, to uphold 21st-century education and enhance cognitive learning outcomes, there is a call for research on the implementation of RCCR based on Hybrid Learning. The aim of this research is to dissect the influence of implementing RCCR based on Hybrid Learning on cognitive learning outcomes. This study is anticipated to provide an alternative learning model to tackle the challenges posed by limited face-to-face interaction time.

2. METHOD

2.1. Research Location and Time

This research was conducted at one of the Vocational High Schools in Tangerang Regency, taking place from February to July 2023.

2.2. Research Subjects

The research subjects consisted of 54 students from two classes: XI TKJ 1 with 32 students as the control group and XI TKJ 2 with 22 students as the experimental group.

2.3. Research Instruments

The tools in this exploration encompass multiple-choice quizzes, captivating student activity sheets, heartfelt student response questionnaires, and teacher interview guidelines. The multiple-choice quizzes are crafted to delve into cognitive domains A4, A5, and A6.

2.4. Research Procedure

This study employs a Quasi Experimental design with a Nonequivalent Pretest-Posttest Control Group approach. Before commencing the learning process, a pretest is administered to both classes. The control class adopts a conventional teaching model involving lectures. Meanwhile, the experimental class engages in learning through the RCCR-based Hybrid Learning model. Throughout the learning journey, the students' engagement in both classes is keenly observed by an observer. At the conclusion of the learning period, a posttest is administered to both classes. Students in the experimental class express their perspective on the learning model via questionnaires, while teachers provide insights through interviews [7].

2.5. Data Analysis

The evolution of cognitive attainment is analyzed through the N-gain test and categorized into three groups: superior ($0.70 < g \leq 1.00$), moderate ($0.30 < g \leq 0.69$), and low ($0.00 < g \leq 0.29$). Student activity data, student responses, and outcomes of interactions with educators are analyzed in a descriptive manner. The level of student engagement is delineated into four tiers: highly active (81.26-100), active (63.51-81.25), moderately active (43.76-63.50), and minimally active (25.00-43.75). Meanwhile, student perceptions conveyed in questionnaires are gauged by scores. Following the assessment process, the range of student perspectives is divided into four categories: highly satisfactory ($76\% < x \leq 100\%$), good ($51\% < x \leq 75\%$), adequate ($26\% < x \leq 50\%$), and less adequate ($0\% < x \leq 25\%$).

3. RESULT AND DISCUSSION

Embarking on the journey through cognitive learning outcomes, the data analysis paints an intriguing picture: the posttest scores of the experimental class students soar higher than their control class companions. The experimental class witnesses a remarkable rise in their learning achievements, courtesy of the RCCR-based Hybrid Learning model [8]. Likewise, the control class, navigating the seas of conventional teaching, also charts an upward trajectory in their cognitive progress, although the waves aren't as exhilarating as those in the experimental class's voyage (Figure 1). This unveils a fascinating truth—the experimental class students hold a tighter grip on the intricacies of the circulatory system compared to their fellow learners in the control class.

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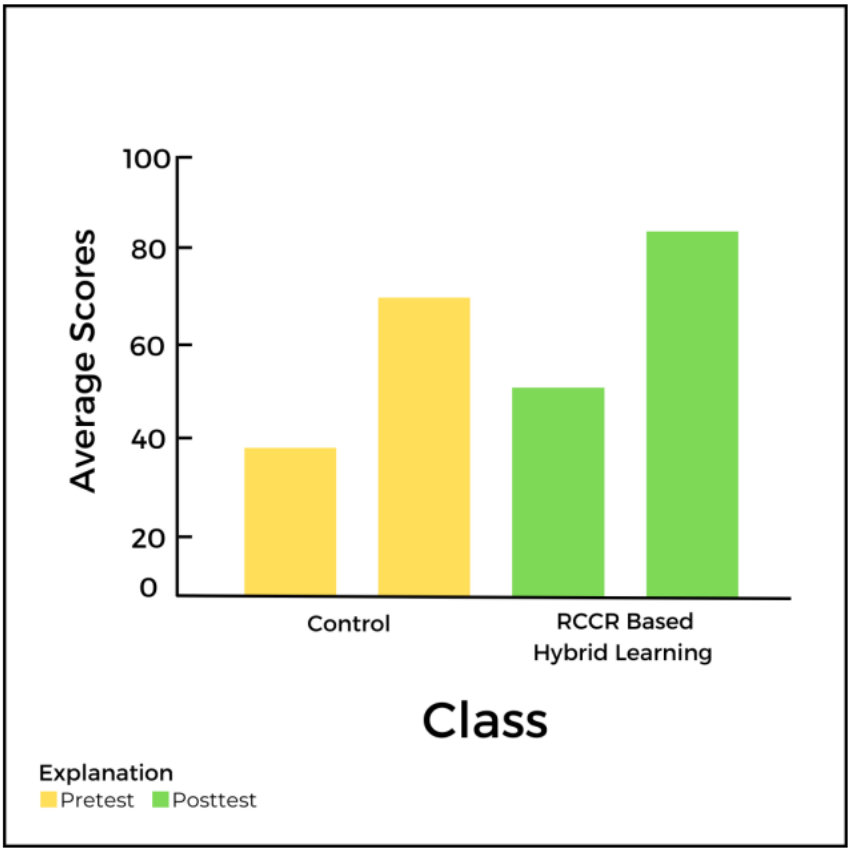

Figure 1. Average Pretest and Posttest Scores of Circulatory System Material Control Group and RCCR-Based Hybrid Learning Group

Through the classical posttest scores analysis, the cognitive learning outcomes comparison between the control and experimental groups is scrutinized (Figure 2). It becomes evident that the achievement percentage in the experimental group shines brighter in contrast to the control group [9]. This not only fulfills the effectiveness criteria of the learning model in achieving cognitive learning outcomes but also leaves an extraordinary impression [10]. When the two-tailed t-test analysis of the posttest scores between the control and experimental groups is conducted, the statistical universe pulls back the curtain, revealing a significant difference in the cognitive learning achievements of both groups ($p < 0.05$).

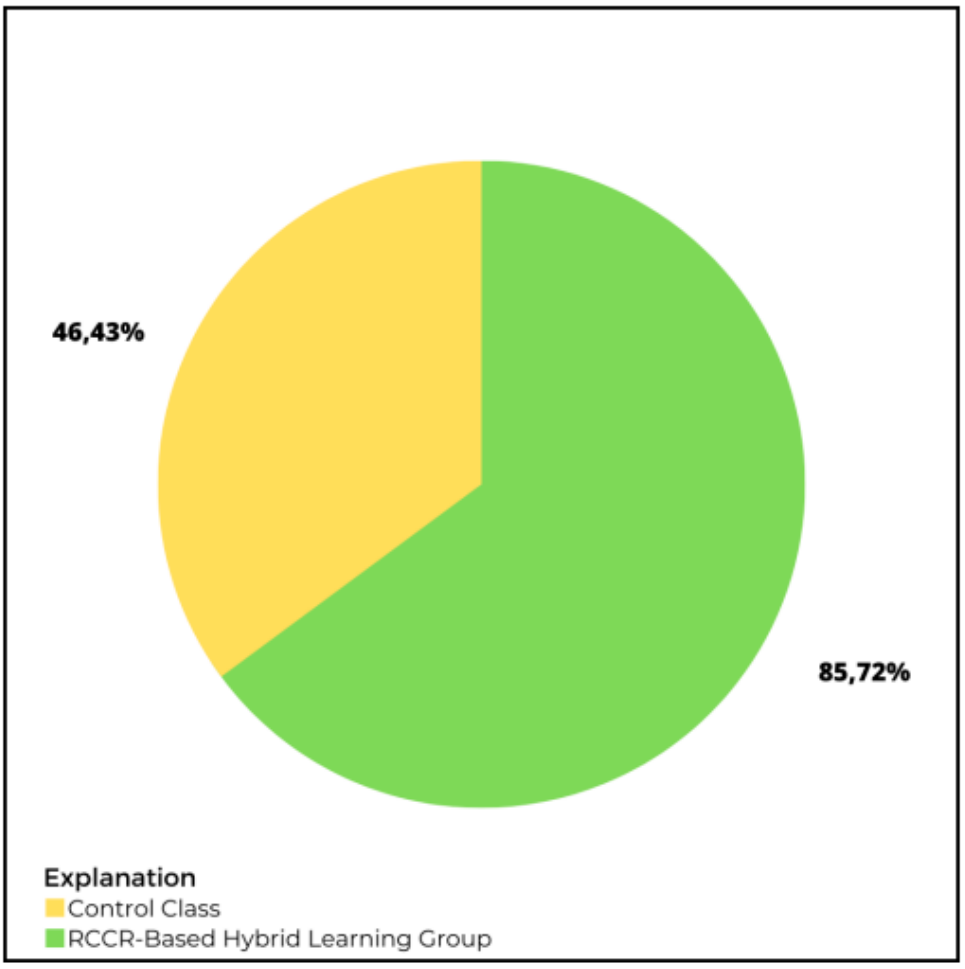

Figure 2. Percentage of Classical Mastery Achievement in Posttest Scores of Circulatory System Material Control Group and RCCR-Based Hybrid Learning Group

In the experimental class, the application of the RCCR-based Hybrid Learning approach has led to superior cognitive learning outcomes compared to the control class [11]. This aligns with the findings of Surayya et al. (2014), which highlight that the average learning outcomes in RCC-enhanced classes tend to outperform those in control classes. This discovery underscores the effectiveness of this model in fostering discussions that stimulate students' thinking processes, thereby positively influencing their learning achievements [12]. By combining the teaching model with the Hybrid Learning approach, students are able to learn more flexibly, unbound by constraints of time and space, while benefiting from multimedia enhancements that enrich their learning experiences [13].

RCCR-based Hybrid Learning is an engaging learning activity that unfolds with meticulous planning and a well-structured approach [14]. The Reflect phase comes to life through a combination of autonomous learning and classroom interaction. Offline self-guided learning tasks require students to download materials uploaded by teachers on the website to build foundational knowledge. During the face-to-face Reflect phase, students engage in observation, inquiry, and data gathering, employing both direct interactions and multimedia elements (images, animations, and videos). The art of questioning serves as students' endeavor to conquer uncertainties and pave their way towards complete understanding. The questions crafted by students stand as reflections of their cognitive abilities, serving as benchmarks for their comprehension of the subject matter. By reading and viewing videos that visualize the human circulatory process during the data collection phase, students effectively weave together a tapestry of concepts to formulate preliminary answers to earlier inquiries [15].

During the Collaborate phase of this instructional model, students will be paired with their desk mate to collaboratively tackle and dissect the Student Discussion Sheet (SDS). In this phase, students exchange viewpoints to accurately address the questions [16]. The Collaborate phase also serves as a platform to enhance students' social skills. Students with varying abilities come together to mutually support one another, fostering a more self-directed learning process. Questions that emerge during the Reflect phase can be discussed, supplemented by internet access to bolster information. Engaging in group discussions with peers provides the necessary stimuli for students to become more attuned to their cognitive processes, thereby influencing their cognitive learning outcomes [17].

In the Convey phase of this instructional model, students will convey the outcomes of their discussions with their partners. During this stage, discussions expand further; students are free to express opinions, justifications, and corrections regarding their paired discussions. Diverse responses and varying results shared by each student during the discussions will interlace to form a comprehensive new understanding. Moreover, students will gain insights into the material they've comprehended and areas where understanding is still lacking, thus laying the groundwork for further learning evaluation.

In the ultimate phase known as record, the RCCR-based Hybrid Learning model takes shape through the act of maintaining a learning journal. Employing learning journals in the context of circulatory system education essentially cultivates a habit of reflection and self-evaluation at the culmination of each learning process, imbuing it with more profound significance. Students will pen down the learning experiences they've encountered as a means of information gathering. The information contained within holds the concepts they've delved into, how comprehensively they grasp those concepts, and which concepts remain veiled in the overall subject matter disseminated during the classroom learning process. The learning journal acts as a medium for students to self-reflect. The act of self-reflection during learning leads students to engage with events, activities, or newfound knowledge on a deeper level, aiding them in further comprehending the subject matter. necessitates not only understanding but also vivid visualization of the tangible processes at play. The conventional lecture-based teaching approach often leaves students merely absorbing information, void of any meaningful learning process. This, in turn, fails to ignite the spark of enthusiasm and motivation for learning. Yet, the fire of enthusiasm and the drive to learn exert substantial influence over cognitive learning outcomes. Low levels of learning motivation lead to subpar learning outcomes that fail to satiate the hunger for knowledge.

The average N-gain of the experimental class surpasses that of the control class (Figure 3). The variance in the average N-gain is attributed to the divergent teaching models that impact cognitive learning outcomes. Both the control and experimental classes exhibit a "Moderate" category of average N-gain. Despite this shared category, the N-gain t-test analysis from both classes indicates a notable disparity.

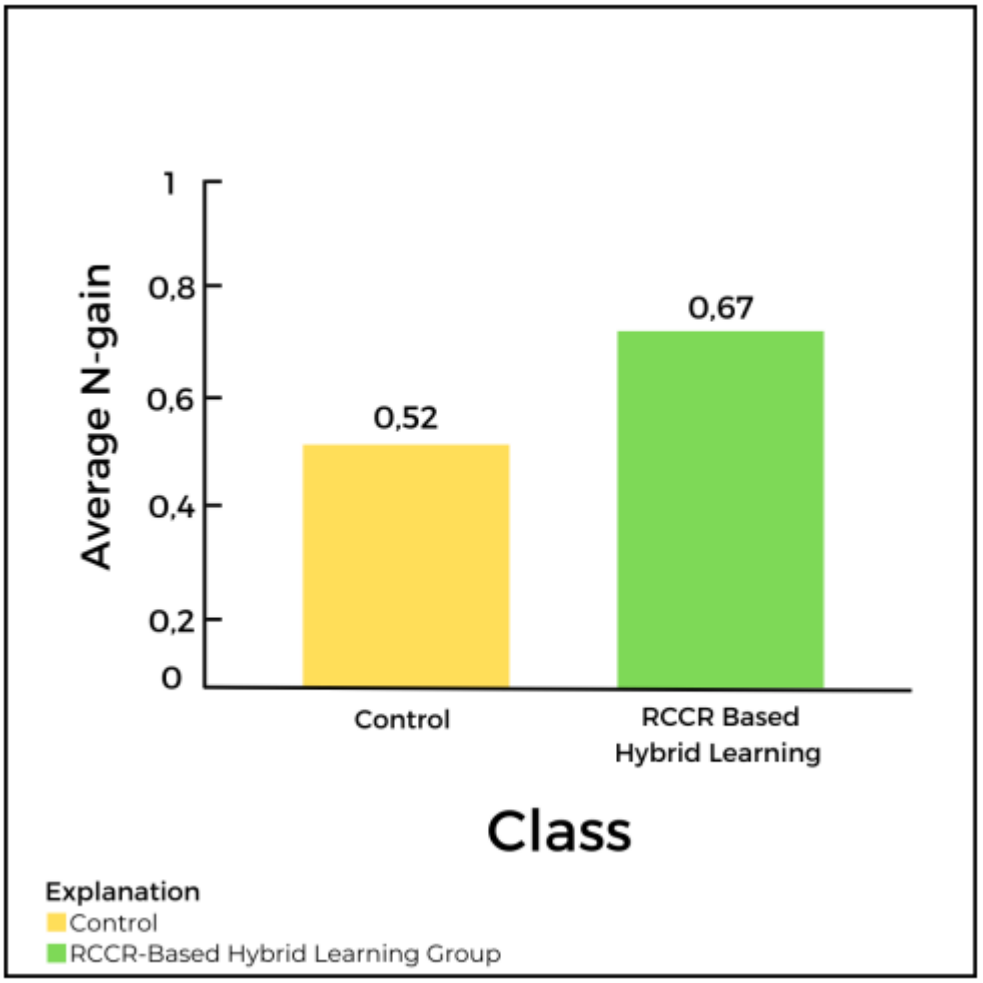

Figure 3. The average N-gain of Cognitive Learning Outcomes in the Circulatory System Material for the Control Class and TPSW Based on Hybrid Learning

The t-test analysis of N-gain in the control and experimental classes reveals a significant difference in the N-gain values of both classes ($p<0.05$). Posttest results indicate that the RCCR learning model based on Hybrid Learning yields better cognitive learning outcomes compared to not implementing this learning approach. The significant improvement in the experimental students' cognitive learning outcomes is attributed to their application of metacognitive skills during the recording phase, such as journal writing. The implementation of learning journals as a metacognitive skill provides intellectual satisfaction for students in their endeavor to rectify previously misguided learning processes. In contrast, the control class students who did not incorporate learning journal writing into their study activities lacked meaningful learning experiences.

When associated with the learning process, metacognitive skills are employed by students to steer their learning journey, starting from the planning phase, selecting appropriate learning strategies, and then reflecting upon and monitoring their progress in learning, thus enabling a deeper grasp of concepts. Each student possesses a unique level of comprehension and accomplishment, which means that not all students will achieve the same outcomes in its application. Moreover, learning outcomes are influenced by favorable input factors, the learning process itself, self-directed learning, students' interest in learning, as well as the school's supportive environment. The impact of cognitive learning outcomes on metacognitive skills is analyzed through correlation (Figure 4).

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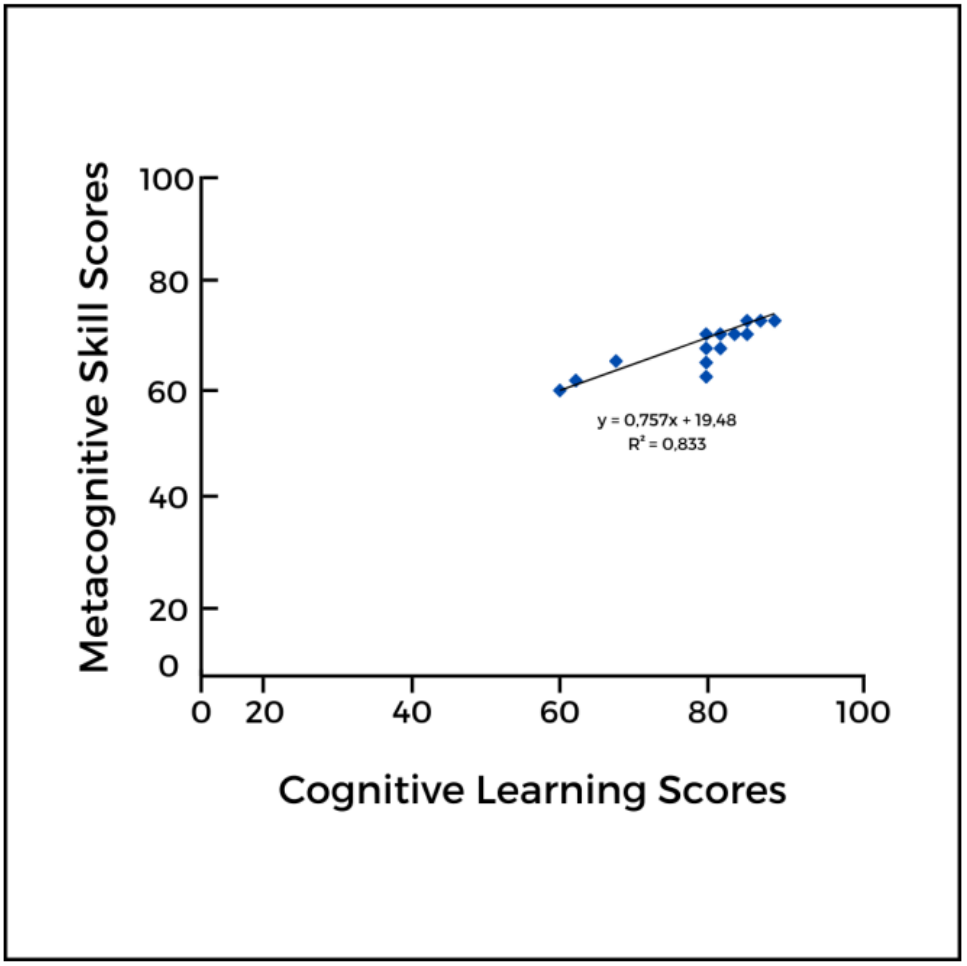

Figure 4. Correlation between Cognitive Learning Scores and Metacognitive Skill Scores

Much like the dance of life, the correlation between metacognitive skills and cognitive learning outcomes unfolds like a graceful duet of stars. In this inquiry, the analysis results resemble a score from the garden of knowledge, displaying figures of r=0.91; i=0.5, as the enchanting connection's notation. With these numbers, the illumination of knowledge reveals that cognitive learning outcomes (X) and metacognitive skills (Y) share a captivating bond. Then, the waves of understanding ripple with an r2 value of 0.833, illuminating the path towards 83% of the changes that arise in cognitive learning outcomes, primarily due to the presence of metacognitive skills. The surge in learning achievements is instigated by students skillfully embedding metacognitive skills, controlling the surging waves of knowledge.

Not to be missed in the spotlight is the value of learning journals, a shining star in the metacognitive sky. Radiant scores adorn those who navigate post-learning assessments seamlessly. Conversely, students who face challenges in assessments also find their learning journal scores not as radiant. This melody of values sings the same story as the research drawn from Coutinho (2007) about the interplay of metacognition and academic excellence. Like reflections in a mirror, students who echo high metacognitive abilities will achieve victories more resplendent, outshining those who timidly recall their metacognitive experiences.

Like witnessing a spirited dance on the stage of learning, the results suggest that students in the experimental class display a more remarkable enthusiasm. The rhythmic steps of the experimental class students on the learning arena, with the 'highly active' label (50%), outshine the cheers of the students in the control class (7.14%). On the same stage, the control class performs with grace, showcasing the most captivating moves in the 'active'

category (57.4%). Students in the experimental class exhibit livelier movements compared to their counterparts in the control class, who still adhere to the conventional pattern with lectures as the main focal point.

Drawing inspiration from the adventure initiated by Yulianingsih (2017), the Reflect-Collaborate-Convey learning approach places the spotlight on the performance of student engagement and self-assurance throughout the learning stage.

Like an exhilarating festivity, students are captivated and brimming with enthusiasm to embrace the journey of learning. As the final act unfolds on the stage, the experimental class takes the lead towards a more multi-dimensional discussion, bringing them together in a grand collective arena—the class itself. The reflections from their small group endeavors are poured forth before the audience, within the expansive realm of the learning space, igniting discussions that resonate.

Amidst the symphony of discussions in the experimental class arena, the voices of students fill the room, resounding with ideas and stories shared. The RCCR learning model based on Hybrid Learning sets the stage for collaboration, inviting students to actively unearth information and construct their own knowledge, much like a heartfelt contemplation in a synchronized dance.

Like a refreshing current, students in the experimental class respond brilliantly to the RCCR-based Hybrid Learning model. Their responses, harmoniously woven into each statement, are picked up on the percentage stage with the label 'Very Good'. They testify that, by adopting the RCCR-based Hybrid Learning, their minds open wide, adorned with soaring questions and constructive answers amid lessons. They heartily agree that, when it comes to grasping the concepts of the Circulatory System, learning that incorporates the RCCR concept through Hybrid Learning flows smoothly into a rounded understanding. The cause lies in the poetic fusion of internet access as a pillar of Hybrid Learning, aiding them to unravel the hidden, and assembling the most relevant pieces like a customized puzzle.

However, amidst the control class stage, the murmur of voices tends to fade, occasionally hearing whispers of boredom in the rhythm of often monologue lecture-based learning. Activities under the spotlight of the control class can be translated as a chronicle of stagnation. The other side of the stage, personifying textual teaching, struggles to ignite the flames of student engagement. They choose to listen attentively, though at times, their gaze drifts away from the sea of words. Surges of enthusiasm alternate with the teacher's verbal monologue, temporarily halting the dance of words to calm the classroom commotion [18].

Within the reach of interview flights, teachers recall moments that bring forth cheerful stories of the RCCR-based Hybrid Learning model. Painted in words of warmth, the teachers depict impressions of how students come alive and exude enthusiasm in the learning ballet. The students in the experimental class, now the center of attention, courageously enter the arena with loud voices, creating a wave of effects that brings back home impressive learning achievements. This model breathes life into the froth of learning activities, transforming them into interaction waves that spark fresh ideas [19].

However, the stage of the control class seems to fall silent, grasping only a hint of the spotlight. This story unfolds in a monologue that no longer captivates the students' hearts. They become spectators in a dance of words choreographed by the teacher, in a dance that has grown familiar. In the flow of mundane words, some of them wander into daydreams, while others linger in the clutches of boredom [20].

Yet, in the culmination of the narrative, a glimmer of hope emanates from this learning model. An alternative framework extends its hand, offering solutions to the challenges of time and face-to-face interactions in the learning arena [21].

4. CONCLUSION

In the arrangement of this research, the magical curtain unveils that the RCCR (Reflect-Collaborate-Convey-Record) learning model based on Hybrid Learning foundation carries a positive essence in the journey towards cognitive enlightenment for students in the realm of material about systems.

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