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The Relationship Between Future Learning Objectives and Exploratory Motivations and Intellectual Curiosity

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Abstract
In the face of the rapid developments imposed by the changing world, opinions and recommendations have proliferated to improve curricula to keep pace with the era of exploration and equip learners with the necessary skills. Among these new ideas is the utilization of the skill of curiosity. This article invokes scientific accumulations and fundamental concepts that constitute references for the theoretical approach. While its concepts may vary from practices that reduce effort, it may be a choice for teachers to measure the impact of learning. The article presents proposals and adopts options that facilitate its application, a fertile field manifested in its openness to various knowledge sources. The current article attempts to provide a general overview of the theoretical interpretations of curiosity and how both initial and future research has addressed intellectual curiosity as a driving force and hence a personal trait and characteristics that can be developed. Its use may lead to solving some problems and overcoming obstacles. We seek to present its importance and effective applications in the active interactive transformation of teaching and learning, and openness to competence. Awareness of the contexts in which these strategies are used enables the teacher to formulate mental activities, allowing for deep understanding and activation of cognitive acquisition processes. In this paper, we attempt to broaden our understanding of intellectual curiosity by addressing the question: How can this new approach help better understand the mechanisms underlying curiosity-related learning? To what extent can it contribute to future learning endeavors?

Keywords: Intellectual Curiosity, Exploratory Motivations, Future Learning

1. Introduction

Researchers in the problematics of learning and exploration have long linked them to the extent of innate predispositions and educational institutions that strive to equip individuals with preparation and cognitive awareness. There is no doubt that when the conditions are conducive to learning, we owe this acquisition to our intellectual curiosity. However, through preliminary readings, it is observed that research on its strategies is relatively neglected, attributed in our view to negative associations and classifications that researchers have overlooked. Its purpose appears distorted, and research on it seems to fade without experimentation.

The comprehension of its impact on the learning process has been relatively minimal (Matthias et al., 2019). This was evident when there was a negative portrayal of it in children's literature, making it a condemned flaw. This negative portrayal has added further closure to the development of its concept, strategies, or the recognition of its importance. However, Torrance (1965) considered it the primary motivating force for scientific exploration that

should be nurtured and directed in children. He believed that it represents the greatest driving force for the processes of learning and thinking.

Subsequent research interpretations focused on its significance and specificity, indicating that children engage in the process of searching for missing information early on, through inquiry and exploration. Scientific thinking in these young minds is driven by natural curiosity towards research and exploration (Jirout.JJ, 2020).

Additionally, some related studies that discuss less specific concepts do not employ the term "intellectual curiosity." Instead, they focus on specific strategies related to it, such as play-based learning, exploration, and enhanced learning. On the other hand, contemporary studies using the term "intellectual curiosity" define it as the propensity to seek information that has real value to individuals. Cognitive deprivation arises from the perception of a knowledge gap, and information gap is considered one of the active learning strategies (1994).

To ensure the success of active learning, there must be a conducive learning community and an environment that supports and enriches learning processes. This requires implementing projects outside the school environment and addressing environmental issues, forming effective and active learning practices (Mahmoud et al., 2019).

In this context, one of the key factors creating a sense of information gap is the feeling of deprivation, fostering the desire for natural exploration and learning (Markey and Loewenstein, 2014). In light of this, we will attempt to study the problem of employing intellectual curiosity as an aspect of exploration and active learning.

This leads us to ask several questions, including: What makes individuals curious about learning and exploration? Why do they explore the unknown? To what extent can we employ the passion for knowledge in young children to support scientific and future thinking? What are the mechanisms through which curiosity can support active learning and exploration?

The goal we seek is to understand the importance of investing in these connections for intellectual curiosity and exploration conducted by learners, as it represents an approach to active learning that allows for understanding and evoking effective forms of acquisition, all from a future-oriented perspective.

2. Conceptual Framework

Among the fundamental concepts we will attempt to review are:

2.1. Concept of Intellectual Curiosity

Curiosity is defined as the desire to seek information to address cognitive gaps resulting from uncertainty, lack of knowledge, or mystery (Loewenstein, 1994; Jirout and Klahr, 2012). Curiosity can manifest in various types of information characterized by mystery and uncertainty. It is similar to critical thinking in knowledge and active learning fields and problem-solving (Gopnik, 2012; Klahr et al., 2012; Saylor and Ganea, 2018).

2.2. Concept of Future Learning

Mat Mathews' L0 K (2006) sees active learning as an effort to make the learner exert effort in classroom activities rather than passively receiving information from others. Active learning encourages students to interact and participate in group work, ask various questions, engage in discovering concepts, and participate in problem-solving-based exercises. The aim of training students for deep analysis of works and engaging them in activities is to impart creative and investigative thinking skills and problem-solving skills.

In conclusion, our understanding of future learning is to induce a change in individual behavior through the impact of discovery learning, supported by guidance, and the acquisition of skills that become a behavior paving the way for achievement.

3. Theoretical Background

There are varied perspectives when it comes to conceptualizing intellectual curiosity, and most initial research results have relied on theoretical approaches that recent readings have highlighted and strengthened by associations linked to cognitive development, research, and exploration. In this presentation, we will provide a general overview of the theories built upon it.

When Williams (1957) sought to classify curiosity as an essential element of perception and as a motivator and influencer in learning and decision-making, Berlyne (1960) surpassed that by presenting it through multiple dimensions, including cognitive and perceptual curiosity. The former relates to the motivation and desire for knowledge, while Hunt (1963) claimed that curiosity refers to motivations underlying information processing, asserting that it is a blend of perception and motivation.

The initial breakthrough included introducing new interpretations. Interest in curiosity, especially after Galileo's telescope discoveries, emphasized the importance of exploratory curiosity as one of the fundamental goals of education (Blumenberg, 1983). Subsequent research described it as exploratory behavior with a significant role in promoting cognitive development (Spielberger, 1994). In light of this, questions arise: What makes individuals have a curiosity for learning and exploration? Why do these individuals explore the unknown? Susan Edelman (1997) adopted these formulations, attributing curiosity to being a motivation or the motivation for exploration.

What is striking is the endorsement of curiosity as a key factor in building and maintaining cognitive functioning by researchers such as Cagle (1985), Gibson (1988), Kagan (1978), Singer & Singer (1990), and Voss & Keller (1983). It is of great theoretical and practical importance to clarify the motivational and cognitive determinants of future exploration goals. Individual differences in curiosity traits have been observed to show their relationship and impact on learning and academic success. Curiosity is also evident as a significant element in the "openness to experience" trait and interest in non-traditional ideas related to exploration and roles in active learning (Deyoung et al., 2007).

A unique series of explanations for the importance of intellectual curiosity was presented by Day (1982). It was considered the foundation for excellence and progress, representing a valuable asset for any society. Interestingly, individual differences in curiosity traits may show their relationship and impact on learning and academic success. It is also understood as an influential element in the trait "openness to experience" and interest in non-traditional ideas related to exploration and roles in active learning (Deyoung et al., 2007).

Professor Litman (2008) conducted a study on the impact of curiosity on the process of development and cognitive evolution, relating it to exploration. Curiosity was identified as a motivator for research and exploration, and the study indicated that curiosity is associated with various learning goals. The study emphasized that curiosity stimulates positive learning effects and diverse exploration. Unique correlations were found between curiosity and different learning goals, including general exploration and specific exploration, completely learning something new, performance-oriented learning, and reducing uncertainty.

4. Exploration-Based Approach

4.1. Curiosity's Connections to Exploration

One of the most significant approaches to understanding the trait of curiosity in research is the exploration-based approach. Clark (2012) emphasized this approach, considering it a characteristic of the gifted. The approach sees high intellectual curiosity as evidenced by a child's abundant probing questions, which educators should be attentive to, understanding the methods that can be employed to develop this skill to the fullest. Clark also affirmed that the gifted have diverse interests and unusual curiosity, which ignites questioning skills, a component of creative thinking that stimulates idea generation. Langevin (1971) believes it is impossible to separate intellectual curiosity from exploration.

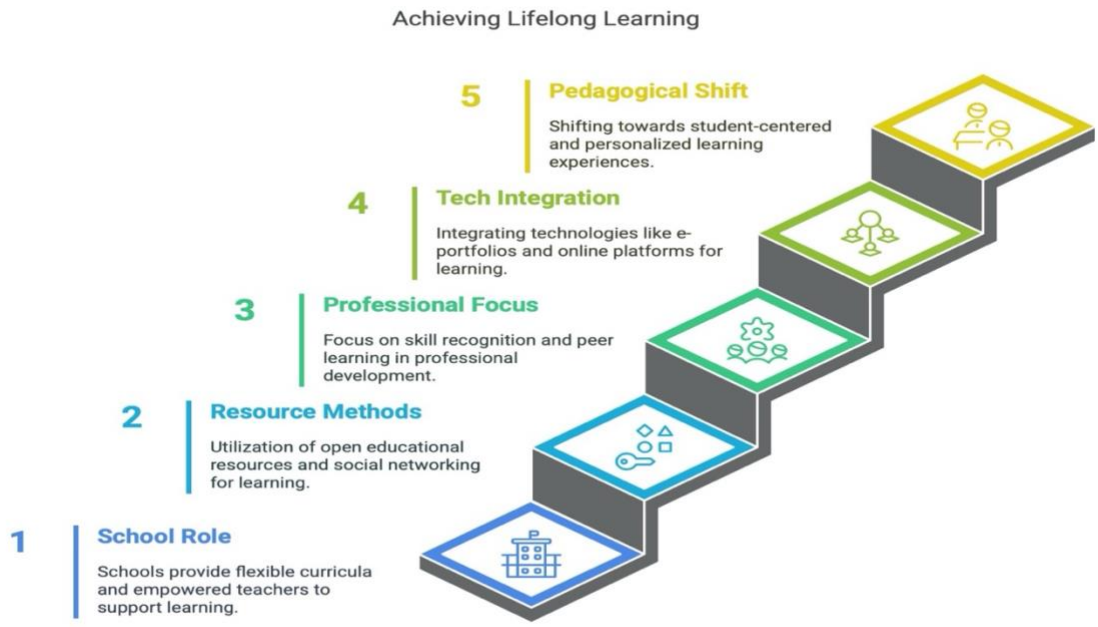
Day (1982) clarified that scientific curiosity, or what he called deep curiosity for exploration, arises due to the presence of uncertainty, mental mystery, and cognitive gap about an issue. Day's characteristics stimulate individuals to develop research and exploration capabilities by enhancing excitement and directing attention. They are closely related to strategies of creative thinking that adopt strategies for breaking away from traditional ideas toward active learning.

This was confirmed by Oudeyer (2018) in his study, finding the profound impact of curiosity on development and evolution. He observed that curiosity driven by the search for learning and exploration led to robot learning and its embodiment in tools for various uses.

4.2. Future Learning and Its Objectives

The concept of future learning involves delving into the philosophy of teaching active, participatory learning, problem-solving, creativity tools, and authenticity. In parallel, it becomes a requirement due to the rapid challenges of technological advancement and the countless opportunities it presents for human development (Redecker et al., 2011). Technological evolution and rapid changes in the twenty-first century have necessitated the adaptation of education to these continuous developments (Almaqbali, 2021). Accordingly, the change that needs attention is the emergence of individuals in this rapidly informational specificity, enabling them to navigate between what they receive in their schools and virtual reality. Among these principles outlined by Yeoman (2018) are:
- The student should be the focus of the learning process.
- Teaching roles should be authentic in simulating the learning environment.
- Utilizing problem-solving and negotiation strategies.
- Employing the skill of openness to experiences and accepting others' perspectives.

In the same context, Redecker et al. (2011) emphasized that education and training programs, including educational policy planners, need to respond more effectively to the changing needs of societal trends, future job requirements, and collaboration. They advocate adopting future learning strategies for lifelong learning, as depicted in the proposed figure (1), providing an overview of future lifelong learning strategies.



What distinguishes this approach is giving learners the appropriate frameworks to solve problems positively. This involves reflecting on how teachers interact through this training, encouraging learners to research, define problems, and negotiate solutions in their environments. The teacher, on the other hand, commits more to the facilitating role than being traditional. In these interactive environments that allow students to apply their knowledge in unknown and sophisticated conditions, students need to employ imagination, flexibility, and self-organization. They also need curiosity and appreciation of others' ideas and perspectives. This teaching style can equip learners with a wide range of skills, including cognitive and knowledge-based skills such as critical thinking, creative thinking, learning to learn, and self-organization.

The question that may arise is: How can educational systems effectively develop these knowledge and skills? To achieve personal and collaborative learning goals, comprehensive changes are needed, initiating mechanisms that make flexible, lifelong learning a reality. It is essential to recognize skills acquired informally. Opportunities given to students who are better prepared for the future are likely to be the agents of change, positively impacting their environment and the future (OECD, 2018).

4.3. Exploration and Future Learning Objectives

Studies agree that exploratory scientific research generally represents intellectual curiosity (Litman, 2008). Therefore, some individuals devote much time and effort to discover knowledge, driven by scientific research curiosity. There are two types of perceptual curiosity that lead to increased stimulus awareness. Some information strongly influences curiosity (Zigler and Kreiter, 1974).

Caroline B.'s conclusions (2016) in this context suggest that understanding and explaining curiosity enhance significant effects on educational interventions and learning strategies for children in the classroom. She indicated that the absolute value of information is not what drives learning but rather the mystery and knowledge gap. This may align with Loewenstein's theory of information gap (1994), suggesting that curiosity results from an imagined gap between what one knows and what one wants to know.

If we consider this information valid, curiosity seems to emerge from information vagueness and uncertainty. Survey and scientific curiosity may work to prepare the mind for learning and make the senses ready to explore cognitive stimuli. Al-Jaghiman (2018) outlines another framework, believing that a logical connection exists between the urgent mental need to explore the new and the knowledge of justifications. He emphasizes that this connection occurs when rejecting accepting a statement or claim without mental scrutiny or questioning. Being attentive to new ideas and being open to addition and modification is an advantage for students, making the learning process more effective and enjoyable. This contribution maintains mental activity positively.

In general, questions starting with what if, how, why, and why not tend to stimulate new thinking patterns. This confirms that scientific research curiosity is an important tool for promoting active learning. The question that arises in this context is: What are the mechanisms through which curiosity can support active learning and exploration?

Some of the topics that can develop through curiosity include:
- Stimulating information-seeking behavior, leading to asking questions or engaging in behaviors seeking information, which can
- Activate relevant prior knowledge and support deep learning.

For example, when a child sees that some butterflies have open wings while others have closed wings and may be unsure of the reason, it leads to more cautious observations and the possibility of learning and investigation (Jirout JJ, 2020). While the presence of uncertainty or ambiguity leads to increased participation (Howard-Jones and Demetriou, 2009).

In addition to all this, a large body of research has shown that mental curiosity and explorations play a significant role in enhancing active learning and creative thinking. Thus, developing productive mental habits contributes to

establishing modern educational paths that prepare generations to possess the necessary skills for life and the future (Al-Amri, 2021).

4.4. Active Performance on Tasks

In his book chapter "The Place of Exploratory Behavior," Jum C. Nunnally and Charles Lemond (1974) discussed curiosity as the inclination to acquire new knowledge, such as concepts, ideas, and facts. It is expected to stimulate intellectual interest or eliminate conditions of deprivation. Cognitive curiosity, the first type, seems to be significantly activated when individuals encounter opportunities to explore entirely new things. In contrast, epistemic curiosity is optimally stimulated when people lack specific information they wish to integrate into their existing knowledge. Activation results in a degree of both types of curiosity, varying based on individual differences in personality traits (Litman, 2008). Loewenstein (1994) explained curiosity as an innate passion for learning and knowledge, an authentic motivational desire. This aligns with Posnock's (1991) assertion that curiosity involves a love for inquiry and exploration.

Christopher Powell (2017) delved into discussions regarding curiosity's impact on academic performance in his thesis, raising the question: Does curiosity predict academic performance? When interest and thinking are stimulated, curiosity is naturally enhanced. Initial curiosity might be substantially inhibited when individuals become familiar with opportunities to discover entirely new things. Performance on such tasks and active exploration for inquiry lead to forms of cognitive exploration and learning (Forestier et al., 2017). For example, a study by Cook et al. (2011) investigated how children build musical toys with sensitivity to obtaining or deriving information. The study showed that ambiguous cues prompted children to actively seek and explore causal relationships. (Denison et al., 2013; Gopnik, Meltzoff, & Kuhl, 1999; Gweon et al., 2014; Schulz, Gopnik, & Glymour, 2007; van Schijndel et al.2015 ،).

4.5. Open-mindedness and Learning New Things

What does it mean to be open-minded? Do some individuals truly stand out for their broad thinking and acceptance of differences? Open-mindedness reflects a mindset of curiosity, exploring the external and internal world, gaining experiences, welcoming new ideas, having a broad perspective, and a curiosity for learning and knowledge (Smith & Canger, 2004).

Experiments in psychology and personality studies demonstrated that open-minded individuals exhibit a desire to think about both familiar and unfamiliar things, utilizing positive and negative emotions more than closed-minded individuals. Open-mindedness involves two dimensions, namely, "process" and "operations." Process refers to sequential stages in executing a procedure, with sub-components named "desire for new intellectual challenges" and "desire to master current knowledge areas." Operations reflect a person's preference for engaging in various intellectual activities, including "thinking," "learning," and "creating." Notably, these operations align with aspects of intelligence theory, extending into conceptual and creative spaces, covering:

- Search for learning
- Search for thinking
- Search for creativity

Recently, El-Abbasi and others (2019) interpreted Rokeach's cognitive openness theory, suggesting that this trait reflects an individual's acceptance of interests and unconventional ideas. Open-mindedness is judged by an individual's flexibility in dealing with challenges, both mentally and psychologically, openness to ideas, and avoidance of extremism. These factors are linked to students' characteristics and personalities, predicting their performance and scientific behavior. Therefore, curiosity is associated with openness, and it is necessary to develop an interest in studying these traits in students to guide them and help them adapt their thinking toward cognitive openness. Additionally, educators can use these factors to promote students' research and exploration abilities (Hama et al., 2005). Consequently, we can say that curiosity is linked to openness, and it is essential to develop an interest in studying these traits in students to guide them and help them adapt their thinking toward

cognitive openness. Additionally, educators can use these factors to promote students' research and exploration abilities (Hama et al., 2005). Furthermore, it allows for understanding new reasons, making it crucial for their passion for achievement, following developments, and experimenting with new methods (Al-Quraiti, 2000). "On the other hand, openness to experience, as proposed by Howard and Howard (1995), serves as a measure of depth, breadth, and diversity in an individual's imagination, as well as the desire for experiences. Regarding the factor of thought openness and openness to new ideas, cultural interests, educational competence, and creativity, as well as an interest in diverse sensory and cognitive experiences.

From the dimensions of this personality trait, there is a love for exploring both the internal and external worlds, and the individual is enriched with experiences and has a desire to think about unfamiliar things. Individuals with a passion for exploring new and unconventional ideas tend to reflect a factor of accepting others, with a focus on growth and development (Costa & McCrae, 1988). Their concentration is characterized by seriousness, determination, strong will, continuous effort, and a commitment to achievement through goal-directed activity (Howard & Howard, 1995). They overcome challenges with traits of seriousness, determination, and a strong will to work continuously, and they are determined to achieve goals through goal-directed activity (Costa & McCrae, 1988).

In conclusion, openness is a characteristic in an individual that drives them to learn new things, reflecting an interest in exploration. They are self-achievers, enriched by experience and the ability to persist, perceiving the world in a fascinating way, and embracing new experiences."

4.6. Cognitive Gap and Curiosity

The modern view of learning reflects a focus on developing cognitive curiosity as the foundation for fostering research and exploration in learners. When it comes to the principles, there is general agreement on how to achieve this. One of the important issues proposed by research to activate cognitive curiosity is the "cognitive gap," which stimulates mental processing and the inevitable development of creative abilities and exploration. Wright et al. (2018) discussed its development, emphasizing that the first step in activating curiosity is creating an ideal cognitive gap and helping students realize it. They suggest a simple way to achieve this by introducing cognitive contradictions immediately after providing students with basic knowledge of a specific subject. This introduces an exception, deviating from previously acquired knowledge, surprising learners and leading them to seek further clarification (i.e., curiosity). Incorporating it into classroom activities can stimulate students' interest, promote research, and enhance exploration. Moreover, it contributes to deeper exploration and learning for some.

In a recent study on the impact of implementing the information gap in educational curricula, a study by Maikhan (2020) confirmed a positive effect of the information gap strategy on improving academic achievement among middle school students compared to traditional teaching methods. Additionally, it contributed to raising the level of social intelligence among the examined students. The study recommended adopting this strategy in science curriculum teaching.

This suggests that working on presenting undefined problems or implementing problem-based learning are also effective strategies that can generate a cognitive gap. Teachers can ask provocative questions that challenge learners' certainty and previous solidified knowledge or intentionally withhold crucial information instead of presenting it all at once, prompting learners to search for missing information (Cordova & Lepper, 1996). On the contrary, if learners are aware of the cognitive gap, they will not pursue curiosity unless they believe the missing information is valuable.

Therefore, questions that enable students to work progressively can increase the value of accessing answers at each step (Coenen, A., Nelson, J. D., & Gureckis, T. M. ,2018)., emphasizing the importance of acquired information for all educational subjects. Familiarity with cognitive gaps or practical applications of materials may achieve high learning goals for students in terms of cognitive exploration and active learning (Song, 2015). Based on this strategy and its refinement, we must instill the desire to develop exploration and learning beyond the

classroom, fostering discussions that enhance learners' ability to build knowledge, communicate, ask inquiry-based questions, and think relevantly to active learning and the efficiency and authenticity of the learning process.

4.7. Knowledge Exploration and School Readiness Skills

Children's curiosity is associated with the construction of intrinsic motivation, promoting independence, feelings of competence, and communication. Haith (1980) believes that children recognize their environments through simple inferences but need guidance to direct their attention to certain features. Most children have a strong desire for exploration and inquiry, needing support to make the skill they want to enhance successful.

In the same vein, a recent study by Prachi E et al. (2018), the first longitudinal study investigating cognitive curiosity in early childhood and kindergarten, addressed academic achievement in mathematics. This study sought to investigate and monitor 6200 children from early childhood to kindergarten. The study provided some evidence of increased curiosity in the early childhood sample, which included direct assessments of reading and mathematics, as well as a behavioral questionnaire for parental reporting. The study indicated a link between early childhood reading curiosity and academic achievement in mathematics. Curiosity may have an important contribution, though unrecognized, to academic achievement. Encouraging early childhood curiosity and fostering a love of reading, with the goal of promoting early reading and academic development, are recommended.

The study also included several associations related to the sample that educators should enhance in early childhood, believing that curiosity has an important contribution to building self-motivation and enhancing feelings of competence.

The foregoing makes it clear to us that children are inherently curious, and the passion for learning drives them to continue the process of learning, questioning, and exploration. It is a positive motivational factor for the growth of knowledge in this age group, encouraging research and active learning. It may lead the child to learning paths that enhance their latent characteristics and talents, sparking creativity when ignited early. This leads us to the question:
To what extent can we harness the curiosity for knowledge in young children to support scientific and future thinking?

Reflecting on this, it is recognized that there is another challenge hindering our children's access to these outcomes and the development of these habits. Therefore, it is necessary to propose new learning ecosystems in these stages to fulfill that engagement.

A study by Jirout JJ (2020) discussed curiosity as likely encouraging the application and development of scientific learning within the individual's culture and environment. However, the methods and strategies employed may contract, while it remains an important field for research in future science. The study emphasized the need to discuss the impact of peers, teachers, parents, and others in children's environments, focusing efforts on promoting curiosity-inspiring potentials to support children's learning and enhance their abilities, even when children express curiosity about things outside of school.

What stands out in this matter is when curiosity is classified as creating a "passion for knowledge" in young children by early childhood educators and considered "very important" or "essential" for school readiness. They even deem it more important than some academic skills. For instance, information-seeking can lead to new questions, and with the activation of previous knowledge, it can influence how the child searches for information (Heaviside S, Farris E, 1993). Can we then acknowledge that our children are born scientists accompanied by a curiosity for questioning and exploration? Research indicates that cognitive curiosity is important, correlating with learning science and knowledge. Focusing on the skills it achieves begets more of them.

In light of this, Jirout JJ (2020) suggested several strategies that may enhance children's curiosity, including:
1. Encouraging and providing opportunities for children to explore and seek knowledge, emphasizing the value of exploration, as children will not ask questions unless they are notified of the importance of their questions.

2. Allowing them to identify or read about accomplished figures during information-seeking activities, aiming to encourage questioning, discussion, and research.
3. Teachers can encourage deep questioning when children spontaneously ask questions, using clear inquiries that support generating deeper questions. This gives children a hint to practice analyzing what they do not know, fostering the development of effective self-evaluation. These inquiries differ from questions that allow simple "yes" or "no" answers.
4. Part of curiosity is identifying questions that can be asked; children often have an understanding and availability of solutions or multiple ways to do something. Encouraging children's thinking about alternative ideas they seek to present and solve, believed to support creativity, and promote active learning.

In addition to the above, it is expected that creating a supportive educational climate and positively responding to enhance curiosity and learning strategies will increase the value of children's research participation, maintain continuous learning, and support sustainable scientific thinking and active learning. The idea here is that allowing the learner to immerse themselves in their curiosity allows them to focus their efforts on useful information to possess and utilize later. This sustains the passion and curiosity for research and learning. To enhance this learning, it is essential to emphasize to students the enjoyment of performance. Importantly, teachers' feedback can inspire students to present an enjoyable and beneficial experience, enhancing deeper idea generation.

5. Strategies for Developing Cognitive Curiosity

5.1. Practical Aspect

Perhaps the simplest thing a teacher or educational supervisor can do is to stimulate the desire for exploration and cognitive curiosity and encourage questioning and challenging assumptions and common concepts. Some applied strategies have been presented regarding cognitive curiosity in its roles of exploration and investigating knowledge gaps or the desire to acquire new knowledge. The openness to learning and exploration will be discussed in brief points.

Implementing these strategies requires providing sufficient time to identify contradictions or gaps and explore multiple aspects of them, further stimulating the desire for more research and inquiry. Therefore, it is important to allocate enough time for them to explore the topic from various angles. One of the aspects that stimulates exploration and scientific curiosity is providing opportunities for students to choose diverse alternatives. For instance, teachers can allow students to choose topics according to their preferences in the academic field or enrichment program (Aljghiman, 2018).

Through studies, it becomes evident that when (Loewenstein, 1994) proposed the information gap theory for curiosity, a sense of deprivation triggers curiosity. Individuals become aware of the difference between "what they know and what they want to know." Identifying and suggesting certain strategies forms a roadmap to enhance curiosity considering these theories and studies, including:

- First Strategy: Curiosity as a Cognitive Spark

Use curiosity as a fundamental motivator at the beginning of the lesson during preparation. For example, pose a thought-provoking question or make a surprising statement that stimulates investigation of prior knowledge.

- Second Strategy: Conceptual Contradiction

Introduce conceptual contradiction when possible. Learners will feel compelled to explore the contradiction until it is resolved. Upon resolving the contradiction, they will experience a sense of relief.

- Third Strategy: Question-Friendly Environment

Create an environment where students feel comfortable asking questions, testing their hypotheses through discussion and brainstorming. This not only promotes curiosity but also helps build confidence.

- Fourth Strategy: Time

Allow sufficient time to explore a topic. If the teacher has successfully stimulated curiosity, learners will want to continue exploring.

- Fifth Strategy: Choices

Grant students the opportunity to choose topics within the subject area. Allowing them to choose a motivating topic fundamentally helps maintain their curiosity and active learning, developing other areas of interest.

- Sixth Strategy: Elements of Curiosity

Introduce one or more of the following elements in a lesson to arouse curiosity (contradictions, surprises, complexity, uncertainty). Learners will be eager to explore the source of contradictions, surprises, etc., satisfying their curiosity and evolving their knowledge.

- Seventh Strategy: Appropriate Stimulation

Be aware of the level of stimulation during learning. Recognize that there are individual differences in applying curiosity; some learners may become anxious if the stimulation is too complex or uncertain, quickly leaving the "curiosity zone" and entering the "anxiety zone."

- Eighth Strategy: Exploration

Encourage students to learn through active exploration, prompting questions like, "What would happen if..."

- Ninth Strategy: Reward for Exploration

When allowing exploration and research, make the act of exploring a reward in itself. Use external motivation wisely, as some studies suggest that external motivation given for task performance perceived as fundamentally motivating may weaken future interest in the activity.

- Tenth Strategy: Modeling

Model curiosity, ask questions, engage in specific exploration to solve a posed question, and demonstrate enthusiasm (Marilyn P. Arnone, 2020).

5.2. Objectives and Future Directions

The results obtained through a review of studies and research focusing on the pivotal role of enhancing curiosity have shown how to promote research and exploration of curiosity. Active learning and self-learning, in an era demanding contemporary curricula centered around the learner, require the ability to learn. Research has indicated the application of various strategies used by teachers to initiate active learning in their classrooms, aiming to find solutions to environmental problems from a developmental perspective of individual performance in diverse environments (Singh et al., 2010).

These methods suggest that they contribute to helping students understand the structure of the subject matter and its key ideas, leading to the active integration of students in the learning process. The results of applied research confirm the improvement of teaching strategies and the direction of future educational policies. In general, the pursuit of these strategies is likely to function as a mechanism directing individuals toward new knowledge or skills, regardless of their cognitive abilities. The efficiency of using exploration strategies, driven by curiosity and based on goals that provide maximum implementation and learning, is beneficial for life and individuals (Smith, 2013).

Based on the above, to develop strategies that enhance learning, thinking, and research, it is necessary to define them, emphasize their importance, and outline methods for their application. The current results indicate that the benefit is limited to specific cases or groups, as the focus on developing these aspects is not included in educational goals. This study, therefore, sought to investigate the results of research and the conditions under which these variables can be applied. In light of the study's findings, it is believed that the application of curiosity carries strong validity for predicting the quality of future learning.

6. Conclusion

In this article, I describe the specific research position that considers curiosity as an important element related to active learning, presenting several mechanisms for employing curiosity to facilitate the learning process. It is concluded that curiosity, a state of increasing interest resulting in exploration and breaking the rigidity barrier in the learning process, reorganizes the roles of learning to allow the emergence of the learner's researching and thinking personality. It enables them to discover and build learning mechanisms that encourage them to contribute to problem-solving by deepening their understanding and adopting more comprehensive learning methods. The study also contributes to building the confident learner by applying and appreciating their knowledge.

Although the benefits of mental curiosity branch out, we lack an integrated theory and mechanisms for presentation and guidance for its investment. The paper prompts the question: How will this philosophy look when applied to identifying students or young explorers while providing appropriate care and improving the learning environment? The application of mental curiosity appears to hold strong potential for predicting the quality of future learning.

The study emphasizes that achieving positions around mental curiosity strategies, "exploration and openness to experience," requires providing opportunities for collaboration and coordination with school management to invest in these characteristics at the school level. To improve these opportunities, we must study the risks associated with neglecting them.

Teachers should strive to develop programs that foster intellectual openness, expose students to serious activities inside and outside school, and engage in scientific and cultural visits. These roles may be crucial in recognizing their potential, enhancing their personalities, and gaining skills and experience.

7. Recommendations

Further studies are needed to address the challenges of neglecting these strategies as a primary support for future learning.

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