"Metacognitive Evolution: Bridging Aristotelian Wisdom and Autonomous Learning in the Digital Age"

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Abstract

This paper deals with the concept of "metacognition" and its roots in Aristotle's philosophy through its modern understanding and application in open and distance education. Here, the components of metacognition, as identified by Aristotle, have been juxtaposed with that of the modern interpretation emphasizing active self-monitoring, reflection, and regulation of one's thoughts in relation to self-awareness, deliberate introspection, and self-control. The role of metacognition is explained in terms of how it has a potential for increasing learner self-initiated behavior, self-monitoring, critical analysis, and adaptation to new approaches. In this regard, metacognitive strategies, through the use of self-regulation, reflection, and goal-setting, have been found to affect distance education positively. This paper highlights the continuing importance and worth of metacognition to education, indicating some future directions for research in and the application of this concept into open and distance learning.

Keywords: Metacognition, Open and distance education, Self-regulation, learners' autonomy

1. Introduction

Metacognition, logically conceptualized as our understanding and awareness of our mental processes, has become a significant aspect in education. This is particularly so in regard to distance and open learning, where students ought to take much more responsibility and more of a role in their education. However, if we are to fully understand the capabilities of metacognition in this regard, we need to discuss the evolution of metacognition from ancient times to day. This paper will address how metacognition developed until the contributions of Flavel, consider their implications for open and online learning, and touch on metacognition strategies and methods in more detail. Research Objective The purpose of this paper is to analyze how metacognition has developed from Aristotle's teachings and contributions by Flavel, and how the same is being used at present in open and online learning.

Over time, through a view of history, the concept of metacognition became a favourite idea for academes and philosophers. For simple understanding of the role played by metacognition in the learning process, Aristotle's ideas have been very helpful in so far his idea and notions about contemplation and self-awareness. In addition, the contribution by Flavel greatly influenced metacognition and its current research, being improved to our understanding of the idea. By

carefully considering the concepts of these historical thinkers, we can work toward a greater understanding of how metacognition might be applied to open education and distant learning. This will provide us important insights to improve these teaching strategies. We will examine the current concept of meta-cognition as applied in education as the work progresses. We will focus on the ability to use meta-cognition for improved learning outcome by citing examples of open and distance learning programs using meta-cognition. We will look into the problems inherent in the application of distance learning using meta-cognition all at once. This research tries to bring out the concept of meta-cognition in open distance learning by bringing into closer scrutiny the merits and demerits of the same.

Further, in order to emphasize the value of further research and incorporation of this concept into education, this presentation will also provide some recommendations for the future direction of the application of metacognition in open and distance learning. There is much potential to even improve on these methods of teaching, as well as to better the experience in the learning process for the students, as we explore and apply metacognition in open and distance learning.

1.1 The Aristotelian notion of Metacognition

The famous philosopher Aristotle coined the word "metacognition," which has been an intrinsic part in his theory of knowing. Metacognition is derived from the Greek "meta" and "cognition," thus defining the capacity of the human mind about contemplating, thinking beyond the mold of thought. This idea is regarded as a basic element of learning and problem-solving and has greatly influenced our understanding of human cognition. One of the staunch proponents of this virtue, metacognition, Aristotle said that this provides a means whereby people can understand the world and themselves better. Indeed, from its very inception, metacognition has always been a matter of heated research and has greatly contributed to the development of philosophy, psychology, and education. Thirdly, as Aristotle holds, metacognition is needed in developing one's practical wisdom with which individuals are to exercise the ability to make moral decisions and to live a moral life.

As for Aristotle, the nature of reflection is considered to be the center of human reason and intellect in his "On the Soul". The philosopher maintained that the mind could turn upon itself to become both the subject and the object of its own thought, what later would be called "metagignoskin" or "metacognition." This particular talent, it is held, is found uniquely in human beings alone among living entities. In the framework introduced by Aristotle, the term "metacognition" applies to a variety of concepts, such as self-awareness, critical reflection, and self-control.

Self-understanding is part and parcel of human development and operations. It is the ability to understand thoughts, emotions, and motivations in incredible detail. It involves a conscious awareness of feelings, values, beliefs, and biases. Self-awareness and self-understanding are the other two constituents of self-knowledge. Self-awareness is the ability to recognize and monitor one's emotional state, while self-understanding refers to the understanding of reasons and sources behind such emotions. Both are features important for learning, actualizing oneself, and growing as a person. Without self-awareness, individuals might find it hard to overcome life challenges and to form good relationships with others. To this regard, self-awareness can be perceived as an element of psychological health and achievement of personal fulfillment.

Among the various essential competencies to be granted to individuals is that which gives them the capacity to re-examine and review their beliefs and ideas. Critical reflection, as described by Richard Rorty, a philosopher, in 1980, is referred to as "the careful and systematic analysis and assessment of one's own ideas and views." It is the act of closely examining reasons for your beliefs

and opinions and their feasibility, together with possible consequences which may come out from them. One of the very important components of intellectual development is self-reflectiveness, for it gives an individual the capacity to look over and enhance his or her own views and reasoning. Critical reflection is important in developing intellectual rigour and enhancing decision-making capabilities within an academic and professional context.

An important part of human psychology is self-regulation, which expresses the ability to handle and direct thoughts and behaviors. It is a process in which one has to monitor and govern his behavior in order to achieve the desired outcome. The theory of self-regulation is highly elaborated in psychology and is considered to be one of the significant life skills in successful functioning within each domain of life, including schooling. According to Nussbaum, self-regulation is a complex concept that borders on being an integral part of human development because it cuts across to almost all factors of emotional, social, and cognitive development. It also bears a very close relationship with other psychological concepts such as self-management, self-control, and self-discipline since it is a varied concept that includes behavioural, emotional, and cognitive processes. Self-regulation has been taken to be the key to attaining academic and personal goals and making appropriate adaptations in changing circumstances and good decisions during life. In fact, self-regulation is one of the most basic factors in human functioning with profound effects on social life, academic and professional achievement, and personal welfare.

Such metacognitive exercises allow people to be more conscious of their thoughts and emotions and thus make more purposeful and knowledgeable decisions. Such methodology contributes not only to enhancing the critical re-evaluation of knowledge and ideas a person creates independently but also assists in increasing a person's level of self-awareness and ethical thinking. Thus, metacognition can rightly be asserted as being part of the essence of education and general well-being since it shapes people's whole psychological and moral development.

1.1.1 From the "Aristotelian Metacognition" to contemporary Metacognition

An interesting and remarkable parallel has been noticed between Aristotle's notion of "metacognition" and modern conceptions of the concept. In relation to self, Aristotle's notion of metacognition includes the ability for self-reflection, self-awareness, and self-control. These components are commensurate with modernist conceptions of metacognition, which focus on the processes involved in observing, analyzing, and regulating one's own mental processes. Metacognition aspects were recognized thousands of years ago by Aristotle—a truly relevant and useful idea to our comprehension of human cognition today. This underlines the continuing meaningfulness of ancient philosophical ideas for the formation of our knowledge about the human mind and lines up with the modern point of view that metacognition belongs to the most important constituents of human learning and development (Lloyd, 1968; Ackrill, 1981; Adler, 1997 · Besedin et al., 2021).

The concept of "metacognition," a more recent version of Aristotle's "self-awareness," was first coined by Brown in 1987. This refers to the ability to identify and understand one's own thinking styles and strategies. It embodies awareness and understanding of one's own mental capabilities and the capability of monitoring and guiding one's own mental processes. In simple words, metacognition can be defined as people understanding their own mental processing better and gaining insight into how they think. This idea has modified over time and is now considered an important ingredient in learning and cognitive development.

The ideas of Aristotelian self-regulation and metacognitive regulation bear a very close resemblance. According to Schraw and Moshman, 1995, this notion enhances the necessity for monitoring the activation of one's own cognitive processes. Along the same lines, Aristotelian self-

regulation stresses the fact that there has to be active supervision and governance over one's behaviors and ideas. These two concepts emphasize the need to personally regulate and control one's mental activities by pointing out the significant position self-regulation is recognized to have in the cognitive sphere. To that effect, it identifies the conceptual proximity between the two concepts, identifying that self-regulation has, for a very long time, been considered to be a very important factor in the achievement of optimal cognitive performance, with both traditional and modern perspectives identifying it as an important element for consideration (McClelland et al., 2018).

Metacognitive experiences, according to Efklides (2006), refer to the purposeful examination and reflection of one's own cognitive and affective processes. A notion by Aristotle regarding critical reflection meant a very close and purposeful scrutiny of one's ideas. Intentional involvement on the part of an individual in his or her evaluation, together with consciousness regarding thought processes, is prerequisite to deriving value from metacognitive experiences and critical reflection. It therefore facilitates not only a deeper understanding of one's mental processes but also makes it easier to recognize and evaluate any possible biases and limitations to one's thinking. In enhancing a better level of self-awareness and self-regulation in the cognitive and affective domains to a higher level of learning, metacognitive experiences therefore share the same objective as that of critical reflection. That is, acknowledging this with respect to open and remote learning can lead to the development of more efficient teaching methods to assist students in independent learning based on their critical thinking.

Thereby, some kind of intellectual virtue can be developed among students to self-evaluate, monitor, and regulate their own learning through metacognitive approaches that can be utilized while designing the curriculum. More specifically, under remote learning circumstances, it is significant to develop such skills among students through the incorporation of metacognitive approaches into curriculum design.

1. Metacognition in Open and Distance Education
1.1.The Importance of Metacognition in Open and Distance Learning

Building on this comprehension of the metacognitive role in open and distance learning, it thus becomes obvious that metacognitive skills not only help but are important in securing a successful academic outcome. Metacognitive abilities clearly become a keystone to be acquired as far as open and distance education is concerned in securing academic success. These skills are pervasive in planning, monitoring, and reviewing one's learning adequately for its performance to become very important in realizing optimal academic results within a non-traditional learning environment. Precisely, learners need to use appropriate metacognitive strategies so that they may execute their learning effectively in the wake of open and distance education challenges and opportunities. A sound knowledge of metacognitive skills, therefore, enables students to think clearly about the use of time, setting realistic goals, and evaluating their understanding of course materials. Moreover, with developed metacognitive skills, students acquire the skills for self-regulation, critical thinking, and problem-solving abilities that are relevant to succeeding in open and distance learning environments.

Ultimately, metacognitive skills in the teaching of open and distance education are an important factor in student success because it provides learners with the capacity to control and manage their learning process in the achievement of their academic goals. This paper considers the role of metacognition in open and distance learning and its potential to improve learner autonomy, self-assessment, critical analysis, and adaptability to new methods. This paper will further review the

empirical evidence for the integration of metacognitive strategies, among which are self-regulation, reflection, and goal-setting, into open and distance education.

2. Overview of studies on the role of metacognition in ODE
2.1 Research Evidence on Metacognition in Open and Distance Education

Research in the field of open and distance education has highlighted the critical role of metacognition in the learning process. Several studies have examined how metacognitive skills can be cultivated and enhanced in digital learning environments.

Let us now examine some key studies that illustrate the impact of metacognition on learning outcomes in open and distance education settings.

E-portfolios and Reflective Practice

Hatzipanagos and Warburton conducted a study in 2009 to determine whether there are any possible advantages to using e-portfolios in remote learning environments. In this research, the authors aimed to explore how far the use of structured reflection and self-assessment through an e-portfolio intervention would affect students' awareness about their own capacities and regulation of their learning. They importantly note the role of reflective practices in stimulating metacognitive skills. Results showed improved metacognitive ability among students due to the use of e-portfolios, as portrayed by their improved ability to understand learning processes and increased self-control. These results indicate the usefulness of e-portfolios in fostering metacognitive development and reflective practice within a distance learning environment.

Self-Regulated Learning in E-Learning Environments

Dabbagh and Kitsantas provide a theoretical framework for their paper, which discusses the specifics of how to support self-regulated learning within e-learning environments. This paradigm brings out the use of diverse technology tools, including social media, in enabling essential metacognitive processes like self-monitoring, goal-setting, and reflection. Their proposal highlights that metacognitive concepts are highly contextual relevant and applicable in the present time and most relevant in an age that has been afflicted with rapid changes in educational systems and on-going technological evolution. These solutions result in triggering pathways that allow learners to become self-regulated active participants, which advance academic performance and provide personal development in e-learning contexts. It goes along with the way metacognition is currently understood, and puts an emphasis on how adaptable it can be to a modern learning environment.

Self-Regulated Learning Strategies and Academic Achievement

The Broadbent and Poon review in 2015 on the effects of self-regulated learning strategies on academic achievement, contextualized within online education, was pretty interesting. Of relevance here, their careful study showed that good correlations existed between learning outcomes and methods such as time management, effort regulation, and self-regulation, underlining the critical role metacognitive development has in promoting effective learning. The current research underlines the role of metacognitive awareness and control in an increasingly common online learning environment. It also points out the benefits that accrue from incorporating strategies for self-regulated learning into instructional design within online courses.

Self-Efficacy and Goal Orientations in Online Learning

Cho and Shen (2013) assessed how self-efficacy and goal orientations influence self-regulation in online and remote learning settings. Their results underline that there is a real need to facilitate self-efficacy and goal orientation as a way to support developing metacognitive ability. This places priority on the need to support these elements if there is to be better development of self-regulated learning within online environments. Such an approach will grant the students an overview of the learning process and allow them to make necessary adjustments to meet their set

goals. In relation to the online education context, self-efficacy and goal orientations thus become very essential in facilitating self-regulation.

Self-Regulated Learning Instruction in Hypermedia Environments

Azevedo and Cromley indeed did some research with a view of addressing the issue on the impact of integrating self-regulated learning instruction in hypermedia environments. The findings indicated that students' understanding of challenging concepts was improved significantly after having gone through training in strategies of self-regulation. This therefore depicts that the inclusion of self-regulated learning instruction to hypermedia learning situations is what can positively influence the outcome of students' learning. These strategies of self-regulation will help students to develop metacognitive abilities within themselves. These metacognitive abilities include goal setting, monitoring, and reflection of working zone, which are very necessary factors for efficient learning. Therefore, these findings will make a huge difference in designing instructional strategies that support self-regulated learning in technology-based learning environments.

Reflection Prompts in Online Learning

The study by Lehmann et al. (2014) tested whether the inclusion of reflection prompts in online learning environments would affect learning outcomes and levels of metacognitive engagement involved. Their results showed that some methods of prompt addition increased the level of metacognitive engagement and, through this, learning outcomes. These findings suggest that, if used as a learning strategy, focused reflection questions may be an effective means to promote metacognitive processes that will eventually lead to enhanced learning in virtual environments. These findings add important implications both for developing metacognitive skills within the context of online learning and for instructional design.

Metacognitive Abilities and Academic Achievement in MOOCs

Tsai et al. (2018) focused their research on the relationship between academic success in MOOCs and metacognitive skills. With the growing popularity of MOOCs as self-paced learning instruments, the study further pointed out how crucial metacognitive strategies would be for individuals to attain success in these online learning environments. The study outcomes demonstrated the importance of supporting metacognitive strategies in optimising academic outputs and fostering meaningful learning experience in MOOCS. The results will have a tremendous impact on the research and practice of developing and delivering MOOCs and the model devised by the authors to teach MOOCs and facilitate learning through metacognitive skills. Therefore, this study adds up to the already available body of knowledge in relation to metacognition and academic success.

Metacognition in Virtual Learning Communities

Garrison and Akyol (2015) conducted a full-spectrum study with the objective of developing a complete framework that captures the dynamic interplay between social presence and cognitive presence in metacognitive awareness development at online collaborative settings. This is aimed at enhancing our understanding of metacognition within virtual learning communities. In this type of approach, the researchers needed to employ a qualitative research design supported by literature review to come up with a synthesized conceptual model that highlights the crucial interplay of these two organisms. This model may likewise serve as a useful tool to instructional systems designers and teachers in facilitating the creation of electronic learning communities that facilitate the growth of metacognition on the Web.

All the above shows that, in general, metacognition has a huge influence on learning outcomes in digital and hybrid learning environments. From e-portfolios by Hatzipanagos and Warburton in 2009 to self-regulated learning strategies by Broadbent and Poon in 2015 and Dabbagh and Kitsantas in 2012, the digital learning interface demands huge metacognitive skills. In

spite of very convincing argument to show that the metacognitive treatments are effective, the findings of this study should be viewed considering its applicability as the study environments and methodologies vary besides the different sizes of the samples. Moreover, further research will be warranted to validate and renew these findings as the rate of development in designing online learning spaces and the use of technology increase.

More studies are needed about the introduction of new technologies, cross-cultural adaption and ultimately the influence this will have to complete the comprehension of how metacognition needs to be introduced in open learning/ distance learning. Nevertheless, the many studies that also validly reveal a strong relationship between academic performance and metacognition strategies suggest that fostering these abilities should remain a top priority when designing and implementing effective distance learning initiatives.

2.1.1 Suggestions for improving the integration of metacognition in distance education
The strong data that underlines the critical role played by metacognition in learning outcomes insists on the need for research into workable methods of incorporating metacognitive techniques within online learning environments. In this section, some useful practical suggestions are made to help educators and instructional designers succeed in integrating metacognitive features into their remote learning programs. By following these recommendations, educational institutions can evolve more complete curricula that further enhance the skills of students with respect to critical thinking, self-management, and self-attention besides knowledge enhancement. These are all important competencies for online and remote learning, fields that are becoming increasingly common.

Structured Activities for Self-Reflection
One of the ways to induce reflection into learning, according to Moon in 1999, is through the use of planned exercises. These exercises assist in developing conscious and systematic reflection on ideas, emotions, and behaviors on the part of the student. Those learners who go through this kind of activity will find themselves more aware of themselves and their learning from involvement in an activity that requires learners to actively explore their experiences and process of learning. The technique allows students to gain the skill of self-reflection, which is one of the integral features in the promotion of lifelong learning and personal development. In particular, learners who find it hard to reflect can access and manage self-reflection more easily, since structured activities create a more systematic way of going about this process. Therefore, teachers can include guided exercises within the scope of their courses to enable students to practice self-reflection (Silvia & Phillips, 2011; Lew & Schmidt, 2011).

Learning Journals
Perhaps the most famous instrument used for recording and commenting on personal ideas and experiences in the process of learning is a learning journal. They log personal, professional advancement, maturation, and difficulties faced throughout a certain learning process. When actively documenting an individual's experiences of learning, commenting on them enhances the depth of understanding and makes meaningful links between concepts and ideas. Furthermore, learning journals provide a means for the individual to get in touch with their own ideas and actions, which leads to the development of self-awareness and metacognitive skills. Learning journals are employed at educational institutes as a complementary tool to traditional forms of evaluation, in which the process and progress of a student's education can be comprehensively assessed individually. All things considered, learning journals have shown to be a useful way through which educational process improvement and the promotion of independent, thoughtful, and self-directed learning could be achieved.

Guiding Questions for Deeper Reflection

Reflection is an integral part of the learning process, for it enables one to think over experiences critically and take a better view of one's self and the world. Guiding questions are an exceedingly useful tool in such an endeavor for digging deeper. These questions serve as provocations by which people expand on their thoughts, emotions, and behaviors further and explain the best they can be what might lie behind them. Guiding questions provide a point of focus for reflection: it enables the person to spot what is not working right, to notice perhaps what has been overlooked, and to gain an improvement in the process of learning. Guiding questions are an important tool in generating reflective, contemplative thought, a critical professional and personal development feature.

Integration of Theory and Practice

Teaching only involves more than the theoretical approach; an individual has to be capable of applying theory in practice. In developing educational assignments, emphasis has to be placed on linking theory and practice if it is to genuinely build skills and knowledge of competence. This can be achieved by introducing assignments that involve students in abstract ideas related to practical applications. Such activities that get students thinking and acting critically in problem-solving help grasp theoretical themes in depth and allow the putting of theory into practice, in which they learn important life skills that will leave them triumphant in their academic and work life. Thus, educators must engage relentlessly in establishing projects and class assignments that get the students linking the theory with the practice.

Group Discussions for Reflective Thinking

Another useful approach in encouraging reflective thinking while engaging in group discussions is the provision of time for participants to exchange ideas and insights with each other. These processes allow individuals to reflect on their respective personal experiences and perspectives as well as those of others through open and sincere interactions. In this way, it is possible to explore multiple perspectives and viable solutions in thinking that characterizes criticality. Group discussions can create a sense of community and impart teamwork since individuals might support and improve each other's ideas or learn from one another. This approach, therefore, is very useful in academic settings since it involves critical thinking, which furthers knowledge production and deeper thinking.

Varied Monitoring and Assessment Strategies

It is really important for teachers to take part in different tactics to effectively monitor and assess learning. For instance, one of the tactics is self-monitoring, where learners are encouraged to go through processes that assess their own learning, thereby trying to find their strengths and weaknesses, laying down objectives, and planning to take different steps that will develop their understanding. Another way is through peer evaluation, wherein students are engaged in assessing and commenting on each other's work; this, in return, creates a cooperative learning environment. For example, teachers may receive constant feedback about student understanding and, therefore, make changes in instruction using the formative assessment techniques of exit tickets, quizzes, and class discussions. Summative assessments can give teachers an overall snapshot of students' learning, and therefore, summative assessments, like exams or projects, can identify where problems and successes are. Teachers are, therefore, able to make informed decisions about their teaching and get a better overall picture of their students' learning through putting a variety of monitoring and assessment processes into practice (Topping, 1998; Reinholz, 2016).

Checklists and Self-Assessment Rubrics

It has been shown that checklists and self-assessment rubrics are an effective means to prompt students' self-regulated learning and raise metacognitive skills. This is how students can

trace their development and find out what needs improvement; eventually, through this approach, a deeper understanding of the material is gained, which leads to better academic performance. If pupils are to use such resources effectively, it is important to instruct them on their proper use and interpretation. It should also include training in effective introspection techniques, setting objectives, and monitoring results through checklists and rubrics. Students can engage in key self-evaluation skills—those important to academic performance and lifetime learning alike—through being involved with checklists and self-assessment rubrics as part of their learning process.

Self-Questioning Techniques

In the past years, instructional strategies have increased the use of questioning techniques, like the Socratic and reflective questioning methods, to engage students in active learning. These techniques, instead of feeding students with knowledge, would encourage students to create questions of their own about the subject matter being taught. Students, through this process, are in a position not only to evaluate their degree of understanding of the subject matter but also to enhance critical thinking. In this, students who reflect on themselves can locate their mistakes and accordingly take necessary action, which eventually leads to a deeper and deeper understanding of the material. Hence, it is agreed that the induction of strategies of self-questioning into instructional strategies is a helpful way to foster the learning and academic achievement of students.

Visual Aids and Concept Maps

This can be done by using visual learning aids that improve their understanding and memory of the subject matter. Pedagogies that stress this aspect of visualization of information, such as concept mapping, have largely been recognized as effective means for learning and retention. A concept map is a visual aid that is used to describe the relationship between different ideas or concepts. It increases the students' critical thinking and better understanding through the actual organizing and grouping of ideas involved in this approach. Add concept mapping into the process of teaching to help students actively create meaning and make a relationship between new material and prior knowledge. As such, concept maps can aid in enhancing learning outcomes and promoting deeper understanding among the students of the subject matter being taught Schroeder et al. (2018).

Target Setting and Planning of Learning Strategies

In the field of education, planning learning strategies and facilitating goal setting form the primary mandates. It encompasses the development and designing of particular plans and aims with the objective of realizing positive outcomes in learning for the students. Through this method, students are able to discern their academic strengths and weaknesses easily, which can be a great help in the organization of their studies. More importantly, engagement with the learning process places the onus on the learners to take responsibility for their learning by setting targets and planning learning strategies. This would foster critical thinking, organization, and time management skills, aside from self-discipline and motivation. It is, therefore, a prime factor that promotes students' achievement, both academically and in personal development, deploying target setting and learning strategy planning, as defined by York et al.

Encouraging Critical Thinking and Self-Evaluation

For the past two years, the role of developing critical thinking skills in children has played a major role in education. Specifically, educators have become aware of the role that self-assessment plays in the formation of critical thinking. An excellent example of this can be drawn from the work of Kuhn and Dean, 2004, who note the need to establish a learning environment in which students will be motivated and encouraged to think critically and self-assess their ideas and opinions. It helps students to have a better degree of comprehension and analysis of the course material, besides contributing to the appreciation of the mental processes involved. In obtaining these skills, students will be better prepared for higher-order thinking and problem-solving and, finally, more

independent reflective learners. The encouragement of critical thinking and self-reflection within the classroom is important in children growing up into whole, inquiring persons.

Problem-Solving Activities with Multiple Solutions

Problem-solving exercises that have several solutions challenge and nurture a student's problem-solving skills. As students weigh the options that give different views and techniques toward the solution, they are actually forced to think critically and creatively. By engaging in this kind of activity, learners are able to gain the skills of creative thinking together with the capacity to evaluate, analyze, and come up with the best option out of the many different alternatives. More generally, allowing students to work on problems with many solutions tends to enhance their autonomous self-efficacy because they think they are more capable of undertaking hard problems and coming out with creative solutions. All things considered, these are the kinds of activities whose insertion into schools can help students acquire important skills needed for success beyond school at both the academic and professional levels.

Evaluation of Information Sources and Arguments

The development of critical thinking skills should occur during one's university education. People apply critical thinking when viewing, evaluating, and considering data from various sources, distinguishing between fact and opinion, drawing well-informed conclusions, and making decisions. As educators, it is our charge to drive kids to think critically, pecking away at the material to raise questions to understand difficult material better. Moreover, the urge to develop students who are critical estimators of arguments and sources of information is one that creates independent ideas and views, not mere receivers of information. By implementing critical thinking in our teaching methodologies, we are providing learners with the abilities that will propel them through a variety of informational sources toward the adoption of well-reasoned decisions. In this way, students can become better-educated and involved citizens who have the ability to act in a morally responsible way (Mason, 2007).

Debating Techniques

For centuries, debating techniques in the construction of arguments have been recognized as useful ways to move arguments forward in many different disciplines. These strategies merge the art of logical reasoning and analysis of ideas based on supporting evidence with compelling language flow that persuades others to a particular point of view. Arguing strategies in the classroom prove to be one useful approach for promoting higher-order thinking skills and engaging students in meaningful dialogue. By applying these strategies, individuals are able to write logical and valid arguments that are also relevant and convincing within the sphere of their disciplines. Arguing strategies in an academic setting thus foster a culture of critical thinking and robust discussion.

Self-Assessment through Comparison with Quality Standards

One of the effective tools to measure an organization's performance and to identify areas of development is self-assessment. One tool is to compare oneself with quality standards. Standards of quality are measures or comparisons used to judge the excellence of goods, services, or procedures. This allows the organization to understand better its strengths and weaknesses and enable necessary change to enhance its performance, basing on measures taken regarding set quality standards. The methodology supports systematic and objective measurement and, therefore, may be more accurate and reliable. Further, benchmarking one's self against quality standards supports a culture of continuous improvement and helps to sustain business competitiveness within specific marketplaces. Hence, organizations have to use self-assessment for top performances in search of excellence (Sharma et al., 2016; Harris & Brown, 2018; Ross, 2019).

Technology-Supported Metacognitive Processes

Recently, much attention has been given to the integration of metacognitive processes into the learning process, which proves to have the potential to improve learning outcomes. The capacity for monitoring and assessing one's own thought process is called metacognition and results in self-regulated learning. In this regard, technology has turned out to be a very powerful tool that can facilitate metacognitive processes in several ways. First and foremost, learners would be able to monitor their progress or reflect on learning experiences—or, quite simply, maintain some type of digital diary about their learning. This supports self-assessment and setting future learning goals. Other capabilities offered by various types of software include note-taking, development of a record of learning patterns, and analysis of the data to show strengths and weaknesses. Those are, according to Azevedo et al. (2018), the tools that would help learners understand more of their learning processes and make decisions that would improve such learning methods. In this manner, the use of technology in metacognition could effectively support learning and achieve more efficient self-directed learning.

Data Visualization for Metacognitive Awareness

Data visualization approaches can successfully promote metacognitive awareness. Much about the strengths and shortcomings of a learner may be realized by provision of visual representations that show their progression and learning patterns. This thus gives an individual better decisions regarding study habits and techniques but provides an in-depth self-assessment of their own learning. Moreover, visual representation of data can enable structuring and understanding of information, thus helping learners trace their process more effectively and make relevant adjustments. According to empirical studies, data visualization tools introduced in the process of learning could potentially enhance metacognitive awareness and increase overall learning outcomes (Bodily et al., 2018; Healy, 2018).

Collaborative Metacognition

It has been demonstrated that practicing critical thinking about one's own thinking in a group setting—collaborative metacognition—is an effective practice in enhancing individual metacognitive ability. Teachers should integrate group projects and class discussions to promote such metacognition. Students may learn from one another and deepen their knowledge of their own cognitive processes if they can discuss such metacognitive experiences with one another. If they can do this, it may enhance their self-awareness and self-regulation, two major components of metacognition. Group discussion may facilitate critical thinking and learning to make decisions about ideas and approaches to learning. More profoundly, such collaborative metacognitive assistance can help students learn more effectively and independently in the classroom.

AI-Powered Adaptive Learning Systems

Artificial intelligence has changed the scene in education with the many options available for personalized learning. One example is the development of adaptive learning systems that meet the needs and preferences of each student in a unique way. These systems adapt to the information and data from students' profiles and produce a learning environment that has its major emphasis on the development of metacognitive abilities. This can be continuously adapted to the learning content, pace, and approach by monitoring and analyzing the student's progress. In this way, the system will be better placed to provide relevant and timely support for the development of metacognitive skills. Supporting self-regulated learning activities, this approach takes students at large from a more productive and efficient engagement in the learning process to a higher level by giving them power over their education. This is why the deployment of artificial intelligence-driven adaptive learning systems has huge potential for enhancing students' metacognitive abilities and overall academic performance.

The wide range of approaches described in this section provides a rich toolkit for educators and instructional designers to effectively incorporate metacognition into remote learning. These strategies, when put into practice, will help build a rich learning environment at the institutional level, better supporting the development of metacognitive skills. These range from AI-driven adaptive learning systems to structured exercises of self-reflection. These are techniques that enhance not only the delivery of information but also the development of self-control, critical thinking, and lifetime learning abilities. Provided that explicit metacognitive techniques are purposively built into the fabric of remote education, learners would then have a greater wherewithal to become more self-aware, reflective, and successful in their academic pursuits. Ultimately, metacognition embedded into eLearning can substantially improve learning outcomes and enable learners to succeed in an increasingly complex, fast-changing world.

3. Discussion and Conclusions

The study of metacognition—from its intrinsic Aristotelian philosophical origins to what it has become, an idea about the mode of understanding human cognition and learning—is here to demonstrate life. In line with this development, we might peg continuity with improvement of our understanding of human cognition and learning.

In what respects the contemporary metacognitive concepts, there are many points of given paralleling with those of Aristotelian views. Aristotle's emphasis on self-awareness is consistent with modern theories of metacognitive awareness; his claims regarding self-regulation and self-criticism are consistent with contemporary notions of metacognitive controls. The historical continuity that defies time and educational paradigms is one of the central reasons metacognition has to play a central role in human cognition and learning.

Metacognition becomes pronounced in the context of open and distance learning as an element without which students can hardly be able to perform. Metacognitive skills gain added significance given the special difficulties entailed in the context of distance learning, including requirements for self-directed study and increased learner autonomy. Second, metacognitive strategies are found in an equally very good effect on academic attainment in online or remote learning environments as suggested by available research findings. The general learning outcomes of learners improve when learners engage in metacognitive processes, as supported by research in self-regulated learning styles, reflection prompts, e-portfolios, and other metacognitive interventions.

Introducing metacognition into distance learning comes with several benefits. It helps students to manage and self-regulate their learning, allowing for more autonomous and self-assured realization. The construction of metacognitive skills also facilitates critical thinking and problem-solving abilities necessary to get along in an online learning environment. Moreover, the development of metacognitive awareness provides students with general learning skills for transfer beyond the classroom.

However, there are some challenges that need to be looked at such that the application of metacognitive techniques toward distant learning is successfully implemented. Educators and instructional designers need to think about putting metacognitive elements into online courses in a way that would really engage and benefit diverse learners. This is to say that the faster pace of educational technology also necessitates additional research and rethinking of metacognitive strategies to make them effective and applicable in virtual learning environments. In other words, one of the sustainable approaches to improve the quality and effectiveness of the online learning experience is embedding the factor of metacognition within open and distance education.

Teachers are able to create learning environments that would help the learners acquire two most important skills for success in this century: critical thinking and self-regulation. This would be possible through making use of a century's scientific achievements and establishing relationships between knowledge gained through traditional wisdom and that gained through modern understanding. Deliberate cultivation of metacognitive skills that can help students work through the hurdles of online learning to emerge into becoming effective, life-long learners in an ever-digital world, fueled due to the rapidly rising popularity of distance learning (Veenman, 2015).

From Aristotle's musings to contemporary classrooms, a brief snapshot of metacognition is presented below, signifying its timelessness. We develop further this rich intellectual inheritance by exploring new territories in learning and cognition while breaking new grounds with ideas in terms of understanding and use of the principles of metacognition in online education.

Our capacity to tap into metacognition in producing learning experiences for students the world over: more efficient, more interesting, and more life-changing is bound to, therefore, shape the future of learning, especially in its open and remote variations. The author's highly commendable "Discussion" initiates a dialogue and opens an invitation to all the other scientists involved in issuing their well-founded viewpoints on the discussed items. It is here that the most solid general scientific facts are taken into account, along with the data and analysis that were already presented but also scientific articles of a related field of study that analyze the current status of this problem.

3.1 Suggestions for future research

Some key areas of future research may enhance our understanding of metacognition in open and distance learning, including the long-term effects. Longitudinal studies are required to further examine the effect of metacognitive treatments on student academic performance and lifelong learning skills while learning remotely over a long period of time. Such studies should trace the behaviors of a large number of persons over long periods—possibly years—in order to find out whether and how time changes the effect of metacognitive training. Studies like these will perhaps shed some critical light on the lifelong efficiency of metacognitive techniques and their potential in terms of lifelong learning outside the classroom.

Cultural variables: How cultural influences affect the effectiveness of the metacognitive strategies should be investigated in future research on global distance education settings. There is a need to understand how diverse cultural backgrounds of students can influence their metacognitive processes and how they react to different interventions, especially since online learning is transcending geographical boundaries. This might open a new line of inquiry into culturally sensitive approaches to metacognitive support and instruction in multicultural online learning environments.

Emerging Technologies: With technologies like artificial intelligence and adaptive learning systems increasingly becoming commonplace, it becomes very important to study their potentials for supporting and enhancing metacognitive processes. Future research must start to explore AI-powered tools for individual differences in the facilitation of metacognitive support, real-time feedback, and adaptive educational experiences on the path to reflective and self-disciplined learners. Further research can be done in using augmented and virtual reality technologies to create highly immersive environments for the support of metacognitive skill development.

Personalization: Further research on the personalization of metacognitive interventions based on the needs and preferences of individual online learners can prove to be quite useful. This field of research should aim at testing and developing systems that are at least able to recognize learners' metacognitive strengths and limitations so that they can adapt appropriate support. It could

be ways of examining the effectiveness of individual metacognitive approaches due to a variety of academic subjects, cognitive profiles, and learning styles that may lead to more effective and significant interventions.

Faculty development: Research into the most effective means to prepare and support distance education teachers for facilitating student metacognition is an important future research area. Research must focus on the design and evaluation of professional development programs that better equip online teachers with knowledge and skills to integrate metacognitive teaching into their courses. Studies could also focus on instructor metacognition and its impact on student outcomes, combined with improvement strategies for faculty members' own metacognitive skills.

Assessment—new, validifying—methods: It is still difficult to design new ways of assessment that could validify metacognitive skills in online learning environments. One of the major areas for further research should be the development of valid and reliable instruments that can measure the assessment of metacognitive awareness, knowledge, and regulation in digital environments. These could include the use of learning analytics, natural language processing, and other data-driven methods that record and analyze students' metacognitive processes in real time. Another research line may be how the use of metacognitive assessment can be integrated into pre-existing virtual learning environments and learning management systems.

References

Aristotle. (Μτφρ. 1984*). De Anima (On the Soul)* (R. D. Hicks, Trans.). Cambridge,
     MA: Harvard University Press.

Ackrill, J. L. (1981). *Aristotle: The Philosopher*.

Adler, M. J. (1997). *Aristotle for everybody*. Simon and Schuster.

Aristotle. (Eng. 2016). *De Anima*. Indianapolis, IN: Hackett Publishing.

Azevedo, R., Taub, M., & Mudrick, N. V. (2018). Using multi-channel trace data to
     infer and foster self-regulated learning between humans and advanced learning technologies. In D. H. Schunk & J. A. Greene (Eds*.), Handbook of self-regulation of learning and performance* (2nd ed., pp. 254-270). Routledge.

Besedin, A. P., Volkov, D. B., Kuznetsov, A. V., Loginov, E. V., & Mertsalov, A. V.
     (2021). Introspection: Contemporary Problems and Approaches. *Epistemology & Philosophy of Science, 58*(2), 195-215.

Bodily, R., Kay, J., Aleven, V., Jivet, I., Davis, D., Xhakaj, F., & Verbert, K. (2018).
     Open learner models and learning analytics dashboards: A systematic review. In Proceedings of the 8th International Conference on Learning Analytics and Knowledge (pp. 41-50). ACM.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic
     achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1-13.

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more
     mysterious mechanisms. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 65-116). Hillsdale, NJ: Erlbaum.

Carter Jr, R. A., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning
     in online learning environments: strategies for remote learning. *Information and Learning Sciences, 121*(5/6), 321-329.

Cho, M. H., & Shen, D. (2013). Self-regulation in online learning. *Distance Education,*
     34(3), 290-301.

Clark, J. T. (2020). Distance education. *In Clinical engineering handbook* (pp. 410-415). Academic Press.

Cook, A., Hammer, J., Elsayed-Ali, S., & Dow, S. (2019, May*). How guiding questions facilitate feedback exchange in project-based learning.* In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (pp. 1-12).

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education, 15*(1), 3-8.

Efklides, A. (2006). Metacognition and affect: What can metacognitive experiences tell us about the learning process? *Educational Research Review, 1*(1), 3-14.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The nature of intelligence* (pp. 231-235). Hillsdale, NJ: Erlbaum.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly, 48*(1), 18-33.

Garrison, D. R., & Akyol, Z. (2015). Toward the development of a metacognition construct for communities of inquiry. *The Internet and Higher Education, 24,* 66-71.

Georghiades, P. (2004). From the general to the situated: Three decades of metacognition. *International Journal of Science Education, 26*(3), 365-383.

Hartman, H. J. (2001). Teaching metacognitively. *In Metacognition in learning and instruction: Theory, research and practice* (pp. 149-172). Dordrecht: Springer Netherlands.

Hatzipanagos, S., & Warburton, S. (2009). Feedback as dialogue: Exploring the links between formative assessment and social software in distance learning. *Learning, Media and Technology, 34*(1), 45-59.

Järvelä, S., Kirschner, P. A., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J., Koivuniemi, M., & Järvenoja, H. (2016). Enhancing socially shared regulation in collaborative learning groups: Designing for CSCL regulation tools. *Educational Technology Research and Development, 64*(4), 601-628.

Kosman, L. A. (1975). Aristotle's definition of motion. Phronesis, 14(1), 40-62.

Kuhn, D., & Dean, D. (2004). Metacognition: A bridge between cognitive psychology and educational practice. *Theory into Practice, 43*(4), 268-273.

Lai, E. R. (2011). Metacognition: A literature review. *Always learning: Pearson research report, 24,* 1-40.

Lehmann, T., Hähnlein, I., & Ifenthaler, D. (2014). Cognitive, metacognitive and motivational perspectives on preflection in self-regulated online learning. *Computers in Human Behavior, 32,* 313-323.

Lew, M. D., & Schmidt, H. G. (2011). Self-reflection and academic performance: is there a relationship? *Advances in Health Sciences Education, 16,* 529-545.

Lionarakis, A. (2006). Distance education theory and the complexity of its multimodal dimension. In A. Lionarakis (Ed.), *Open and Distance Education. Theory, theory and practice:* Prokopos.

Lloyd, G. E. R. (1968). *Aristotle: the growth and structure of his thought* (Vol. 456). Cambridge University Press

McClelland, M., Geldhof, J., Morrison, F., Gestsdóttir, S., Cameron, C., Bowers, E., & Grammer, J. (2018). *Self-regulation. Handbook of life course health development,* 275-298.

Moon, J. A. (1999). *Reflection in learning and professional development: Theory and practice.* Kogan Page.

Moshman, D. (2018). Metacognitive theories revisited. *Educational Psychology Review, 30,* 599-606.

Moussa-Inaty, J. (2015). Reflective writing through the use of guiding questions. *International Journal of Teaching and Learning in Higher Education, 27*(1), 104-113.

Rhodes, M. G. (2019). Metacognition. *Teaching of Psychology, 46*(2), 168-175.

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science, 26*(1-2), 113-125.

Schwarz, N. (2015). Metacognition. In M. Mikulincer, P. R. Shaver, E. Borgida, & J. A. Bargh (Eds.), *APA handbook of personality and social psychology, Vol. 1. Attitudes and social cognition* (pp. 203–229). American Psychological Association.

Silvia, P. J., & Phillips, A. G. (2011). Evaluating self-reflection and insight as self-conscious traits. *Personality and Individual Differences, 50*(2), 234-237.

Son, L. K. (2004). Metacognitive control: Children's short-term versus long-term study strategies. *The Journal of General Psychology, 131*(1), 5-24.

Taub, M., Azevedo, R., Bradbury, A. E., Millar, G. C., & Lester, J. (2020). Using sequence mining to reveal the efficiency in scientific reasoning during STEM learning with a game-based learning environment. *Learning and Instruction, 66,* 101291.

Tsai, Y. H., Lin, C. H., Hong, J. C., & Tai, K. H. (2018). The effects of metacognition on online learning interest and continuance to learn with MOOCs. *Computers & Education, 121,* 18-29.

Tsai, M. J., Huang, L. J., Hou, H. T., Hsu, C. Y., & Chiou, G. L. (2020). Visual behavior, flow and achievement in game-based learning: The effects of game mechanics and challenge level. *Journal of Computer Assisted Learning, 36*(3), 378-391.

Yagli, S., Yaglis, G., & Koutsouba, M. (2010). Autonomy in learning in the context of distance education. *Open Education: the Journal of Open and Distance Education and Educational Technology, 6* (1, 2), 92-105.

Veenman, M. V. (2015). *Metacognition. In Handbook of individual differences in reading* (pp. 26-40). Routledge.

Winne, P. H., & Azevedo, R. (2014). *Metacognition. The Cambridge handbook of the learning sciences, 2,* 63-87.