



# CRITICAL THINKING & in TEACHING LEARNING

A guide for implementing critical thinking  
in lessons and in everyday life occurrences.





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## CRITICAL THINKING IN TEACHING AND LEARNING

### INSTITUTIONAL COLLABORATION

#### About the **Mauritius Institute of Education**

The Mauritius Institute of Education (MIE), established in 1973, received its degree awarding status in 2017 through an Act of Parliament (MIE Act 2017:2). The Institute's primary objectives include facilitating educational research, curriculum development and teacher education to foster the advancement of knowledge and teaching and learning in the field of teacher education.

For more details- <https://web.mie.ac.mu/>

#### About the **Special Education Needs Authority (SENA)**

The Special Education Needs Authority was set up following an act of parliament in November 2018. The SEN A regulates all SEN institutions both public and private and is mandated to promote inclusive education. The Authority is working towards the harmonisation and promotion of programmes and policies for the education and holistic development of persons with special education needs in line with the Convention on the Rights of the Child and the Convention on the Rights of Persons with Disabilities. The SEN A also provides grant in aid and food supplementary programme to all SEN Schools.

For more details- <https://sena.govmu.org/sena/>

#### About **Homi Bhabha Centre for Science Education**

The Homi Bhabha Centre for Science Education (HBCSE) is a National Centre of the Tata Institute of Fundamental Research (TIFR), Mumbai, India. The broad goals of the Centre are to promote equity and excellence in science and mathematics education from primary school to undergraduate college level and to encourage the growth of scientific literacy in the country. HBCSE is the premier institution in the country for research and development in science, technology and mathematics education. It serves as India's nodal centre for Olympiad programmes in mathematics, physics, chemistry, biology, astronomy and junior science.

For more details- <https://www.hbcse.tifr.res.in/>

#### About **Azad College of Education**

Rayat Shikshan Sanstha's Azad College of Education, Satara, India, is located at the foot of the historical fort 'Ajinkyatara.' It is one of the colleges established during the lifetime of Padmabhushan Dr. Karmaveer Bhaurao Patil, the founder of the Rayat Shikshan Sanstha in June 1955.. His dream came into reality in the form of this college. The aim of opening this college was to provide competent, devoted, and committed generations of trained teachers, ready to work in remote areas. It is one of the reputed colleges in the state of Maharashtra, with a tradition of qualitative teacher education. The college is re-accredited by NAAC with an 'A' Grade. Alumni of the college work not only in schools, colleges, and universities but also in the Education Department and various departments of the Government of Maharashtra in distinct positions. For more details- <http://azadcollegesatara.in/index.htm>

#### About **Shri Shivaji Science College**

Shri Shivaji Education Society's Shri Shivaji Science College, Amravati, India, was established in 1958 with a combination of faculties, namely Science, Arts, Commerce, Law and Agriculture. It was later separated as a Science Faculty in 1969. The college takes pride in declaring that it has indeed grown from a seedling into a tree that has not only sheltered thousands of youngsters but has also molded them into great personalities now scattered across the globe. The college has also been identified by the Department of Science and Technology for grants under Fund for Improvement of S&T Infrastructure (FIST). The college is re-accredited by NAAC with an 'A' Grade.

For more details- <https://www.shivajiscamt.org/index.php>

## FOREWORD

In today's rapidly changing world, the need for critical thinking skills has become more vital than ever. As technology progresses at an unprecedented rate, educators must rise to the challenge of preparing students for a future full of uncertainty and complexity. In this context, the Mauritius Institute of Education is presenting its ground-breaking booklet on critical thinking in teaching and learning. This comprehensive resource is intended to help educators develop critical thinking skills among students. The booklet serves as a valuable guide not only for those engaged in the standalone module on critical thinking but also for educators eager to enhance their understanding and application of critical thinking principles in the classroom.

By engaging with the content presented in this booklet, educators will acquire the necessary tools and knowledge to develop their own critical thinking skills and effectively foster them among their students. The booklet goes beyond theory and offers practical strategies, examples and exercises that can be implemented in different learning and real-life settings. Its inclusive approach focuses on both mainstream and special needs education, ensuring that educators are equipped to meet the needs of students with diverse abilities. One of the highlights of this booklet is its holistic view of critical thinking. It not only explores the specific module on critical thinking but also delves into its broader implications and applications across different spheres of life, underscoring the relevance of critical thinking as a life skill that extends beyond the confines of the classroom. The aim is to empower students to critically analyse information, evaluate arguments and generate independent and innovative ideas, allowing them to become active, informed and engaged members of society.

The importance of critical thinking is well-established through extensive research. It has been demonstrated that it is positively correlated with academic achievement, problem-solving skills, creativity and independent thinking. In addition, critical thinking plays an integral role in decision-making processes, effective communication and transformative learning. By promoting critical thinking skills, educators can help students navigate complex issues, make informed decisions and engage in intellectual discourse. The Mauritius Institute of Education, in collaboration with a team of dedicated professionals led by Professor (Dr) Yashwantrao Ramma, has produced this booklet to empower educators in their mission of developing critical thinking skills in their students. The team has leveraged its expertise and research to create a resource that will no doubt transform teaching and learning practices in teacher education at the Mauritius Institute of Education.

We commend the team on their dedication and commitment to providing educators with this invaluable resource. Their efforts in conceptualising practical strategies, examples and exercises will undoubtedly have a lasting impact on the education landscape. We encourage all educators to seize this opportunity to deepen their understanding of critical thinking and embark on a journey to enable their students to become critical thinkers.

It is our sincere hope that this booklet serves as a catalyst for positive change in education, fostering a generation of critical thinkers who will shape the future with their analytical minds, innovative ideas and sound judgement. Let us embrace this opportunity to revolutionise teaching and learning and empower our students to thrive in a world where critical thinking is the key to success.

**Dr Hemant BESSOONDYAL**  
Director, MIE

**Dr Jayantee NAUGAH**  
Chairperson, MIE Council

## PREFACE

In his book “Finnish Lessons 2.0: What the World Can Learn from Educational Change in Finland?”, Pasi Sahlberg (2015) highlights the fact that schools, in general, may struggle to equip students with the necessary skills for the future due to the rapidly evolving and unpredictable nature of the world, largely influenced by advancements in technology, particularly in the field of artificial intelligence (AI). Sahlberg’s key message is that educational systems should prioritise the development of skills such as critical thinking, problem-solving, creativity, adaptability and collaboration. The ultimate goal is to empower students to operate independently by effectively applying the knowledge, skills and attitudes they have acquired in any given context. These skills are crucial for students to successfully navigate an unpredictable future influenced by continual technological advancements.

This booklet has been intentionally designed to provide comprehensive support for PGCE trainees who have chosen the standalone module “Critical Thinking in Teaching and Learning”, as well as educators who are eager to develop their understanding of critical thinking and its application in lessons. Its primary objective is to foster a profound understanding of the concept of critical thinking, both within the context of the standalone module and in a broader sense. The booklet aims to equip educators with the necessary tools and knowledge to develop and enhance their critical thinking skills. By engaging with the content of this booklet, educators will be able to cultivate a deep comprehension of critical thinking principles and learn how to apply them effectively in educational settings.

Moreover, this resource aims to empower educators by providing practical strategies, examples and exercises that foster critical thinking in various educational and real-life settings. It underscores the significance of integrating critical thinking into teaching and learning practices to enhance students’ abilities in analysis, evaluation and problem-solving. The scenario-based approach for identifying and assessing critical thinking has been piloted and tested during the implementation of the critical thinking project in three teacher education institutions, two in Maharashtra, India, and one in Mauritius. Furthermore, the booklet goes beyond addressing the specific module on critical thinking and adopts a holistic approach. It explores the broader implications and applications of critical thinking across different spheres. In doing so, it encourages educators, and consequently, students, to develop critical thinking as a lifelong skill that extends beyond the classroom. This skill equips individuals to engage critically with information, make well-informed decisions and navigate complex challenges in both their personal and professional lives.

By embracing the content presented in this booklet, educators, both in mainstream and special educational needs settings, can significantly enhance their ability to develop critical thinking among students of diverse abilities. Furthermore, educators will be better equipped to cultivate an inclusive environment that nurtures curiosity, open-mindedness and intellectual growth, thereby facilitating transformative learning experiences. The ultimate objective is for learners to develop the necessary skills not only to excel academically but also to independently navigate complex everyday life situations. By integrating the concepts and strategies presented in this booklet, educators can empower students to think critically, analyse information, evaluate arguments and generate independent and innovative ideas. These skills are vital for students to become active, informed and engaged members of the society.

For feedback, please feel free to email the Team Leader at:  
<https://forms.office.com/r/ipVGsWfLJf>

**Professor (Dr) Y. RAMMA**  
August 2023

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## ACKNOWLEDGEMENTS

Writing this booklet has been an incredible journey, and we couldn't have done it without the unwavering support and encouragement from the amazing people who have crossed our paths. Their contributions, both big and small, have left an indelible mark on this work, and for that, we are deeply grateful.

First and foremost, we want to express our heartfelt appreciation to Mr Pritam Parmessur, Mr R. P. Ramlugun, Professor (Dr) Vassen Naeck, Mr Vickren Narrainsawmy, Dr Savita Sabale, Dr Megha Gokhe, Dr Anasaheb Kumbhar and Mrs Dipti C. Singh Bisht whose inspiration and dedication have driven us to create this valuable resource material for educators as well as for students which is aligned with the requirements of the Post Graduate Certificate in Education standalone module "Critical Thinking for Teaching and Learning".

We express our heartfelt appreciation to Mr Leveen Nowbotsing who has masterfully crafted an aesthetically pleasing layout for this booklet. His artistic prowess and meticulous attention to detail have significantly elevated its visual appeal. We would like to extend our sincere gratitude to Mrs V. Sagum for her exceptional coordination with the team members, ensuring smooth follow-up actions and Mrs. R. R. Baichoo, the proof-reader, for her diligent efforts in meticulously reviewing every word and sentence.

We also express our sincere gratitude to Dr H. Bessoondyal, Director of the MIE, Mr O. Saraye, Registrar and Dr J. Naugah, Chairperson of the MIE Council, for their continued support in bringing this booklet to fruition.

Last but certainly not least, we want to express our profound gratitude to the educators, students, and every reader who will embark on this critical journey of understanding and developing critical thinking. Their curiosity and engagement with this booklet will make all the hours of thinking, discussion, writing and research worthwhile. We sincerely hope that this work resonates with you and provides you with valuable critical insights that will enrich your critical thinking learning experience.

### **The Team Members**

August 2023



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## 1.0 INTRODUCTION

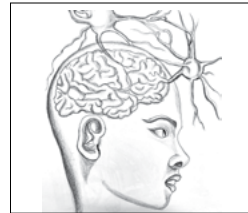
In this introductory section, we aim to provide a concise and insightful discussion on the current research findings pertaining to critical thinking. Critical thinking is a **cognitive process** that involves analysing, evaluating and synthesising information in a thoughtful and logical manner. While there are many definitions of critical thinking, we align our understanding of critical thinking with that of Scriven & Paul (2007):



A cognitive process refers to any mental operation or activity related to acquiring, processing, storing, and using information. It involves the way our mind thinks, perceives, remembers, reasons and solves problems.

*Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.*

This operational definition provides a broad and valuable framework for comprehending the essence of critical thinking, as it encompasses a range of cognitive processes and activities inherent to critical thinking.



Now, let's explore in greater detail the various facets mentioned within this definition:

**Conceptualising:** Critical thinking involves the ability to form and develop ideas, **concepts** and **mental frameworks**. It requires individuals to think abstractly, make connections between different pieces of information and understand the underlying principles and concepts.

**Gathering & Evaluating Information:** Critical thinking involves the active process of seeking out relevant information from diverse sources including observation, experience and research. It necessitates individuals to possess curiosity, open-mindedness and a willingness to explore various perspectives. Additionally, it requires individuals to evaluate the credibility, relevance and quality of information, arguments or evidence. They must make informed decisions by considering the strengths and weaknesses of an argument, while also taking into account alternative viewpoints making reasoned and evaluative judgments, as stated by Tai, Ajjawi, and Boud (2018).



A mental model or framework is an interconnected set of beliefs that inform and guide a person's course of action, aiding him/her in comprehending and navigating the workings of the world more effectively (Holtrop, Scherer, Matlock, Glasgow, & Green, 2021)

*Applying:* Critical thinking goes beyond mere knowledge acquisition; it involves the practical application of information and ideas. It requires individuals to transfer their knowledge, understanding and skills to real-world situations, solving problems and making decisions.

*Analysing:* Critical thinking involves the systematic examination and breakdown of complex ideas, arguments or situations. It requires individuals to identify the components, evaluate their relationships and understand the underlying assumptions and implications. Analysing helps to uncover biases, logical fallacies or faulty reasoning.

*Synthesising:* Critical thinking entails the ability to integrate and combine different pieces of information, ideas or perspectives to help for a coherent and comprehensive understanding. It involves constructing a holistic view by identifying patterns, connections and relationships across various sources and disciplines. In the revised version of Bloom's Taxonomy, "synthesis" has been replaced by "create". This change reflects the higher cognitive level of thinking involved. "Create" emphasises the ability to not only synthesise information but also to generate original and innovative ideas, products or solutions. It involves putting different elements together to form a novel and coherent whole (Krathwohl, 2002).

*Reflection:* Critical thinking necessitates self-reflection and introspection. It involves examining one's own beliefs, biases and assumptions and being aware of how they influence one's own and others' thinking (Shandomo, 2010) for decision-making. Reflection allows individuals to refine their thoughts, challenge their own ideas and recognize areas for improvement.

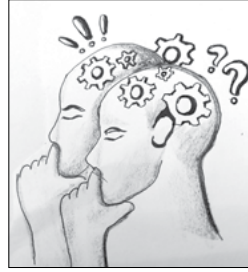


"... it is crucial for teachers to carry out reflective thinking themselves and eventually become a model to their students, demonstrating the process of such thinking" (Choy, Lee, & Sedhu Saljeet, 2019, p. 37).

*Reasoning:* Critical thinking is a cognitive process that relies on logical reasoning to make sound judgments and draw valid conclusions (Storey, 2013). It relies on a well-structured framework (Masnick & Morris, 2022) and involves constructing logical arguments, identifying premises and conclusions, detecting logical fallacies and applying principles of deductive and inductive reasoning.

*Communication:* Critical thinking extends beyond individual cognition; it encompasses the proficient communication of ideas, arguments and conclusions through connected knowledge (Fries, Son, Givvin, & Stigler, 2021). It necessitates individuals to articulate their thoughts with clarity, listen actively to others, participate in constructive dialogues and provide logical and coherent explanations.

Critical thinking is widely recognised as a crucial skill for individuals to navigate complex problems, make informed decisions and engage in intellectual discourse effectively. Extensive research has been conducted to understand the nature of critical thinking, its components and its applications in various domains. Numerous studies (Kuhn & Moore, 2015; Pollarolo, Storksen, Skarstein, & Kucirkova, 2023; Ramma, et al., 2021; Pasquinelli, Farina, Bedel, & Casati, 2020) have underscored the significance of critical thinking in education as it equips students with the ability to reason not only in academic settings but also in social and interpersonal contexts, where effective problem-solving and decision-making skills are required on a daily basis (Ku, 2009). Research has found a positive correlation between critical thinking skills and academic achievement across different subjects and grade levels (Selvarani & Saroja, 2002; Abbasi & Izadpanah, 2018). Furthermore, students who are adept at critical thinking demonstrate enhanced problem-solving abilities, **creativity** and independent thinking. This not only contributes to their academic success but also prepares them for future challenges in the workforce and beyond (Joynes, Rossignoli, & Amonoo-Kufi, 2019).



To be creative, an idea must be both novel and useful (Llyod-Cox, Pickering, & Bhattacharya, 2022)

Moreover, critical thinking plays a vital role in decision-making processes and transformative learning, whether in a normal setting or in an inclusive or special needs context. Research (Murawski, 2014; Pasquinelli, Farina, Bedel, & Casati, 2020; Ramma, et al., 2021; Southworth, 2022) suggests that individuals who engage in critical thinking are more likely to objectively evaluate information, consider multiple perspectives and make well-informed choices. This is particularly valuable in professional and everyday life settings where complex decisions need to be made based on limited or conflicting data. Critical thinkers “are more willing to take intellectual risks, to be adventurous, to consider unusual ideas and to use their imagination while analysing problems and issues” (Murawski, 2014, p. 26). Furthermore, critical thinking has been shown to promote effective communication and interpersonal skills. Individuals who possess strong critical thinking abilities are better equipped to articulate their thoughts and ideas clearly, engage in constructive debates and navigate disagreements with civility and respect. This fosters a collaborative and inclusive environment that encourages diverse viewpoints and enables collective problem-solving.



While the importance of critical thinking is widely acknowledged, there is ongoing research aimed at identifying effective strategies and interventions to enhance critical thinking skills in learners. Some studies have explored the role of metacognition and self-reflection in developing critical thinking (Bensley & Spero, 2014), while others have investigated the impact of educational interventions and instructional approaches on critical thinking (Abrami (del P.C.), et al., 2008). By further advancing our understanding of these factors, we, educators and policymakers can design targeted interventions to foster critical thinking abilities in individuals of all ages and varied educational settings.



“Critically discuss” in academic writing requires that one carefully think, analyse and evaluate an issue in depth.



### Activity 1 – Withdrawing Cash at the ATM

To develop a comprehensive understanding of the eight cognitive processes that underpin critical thinking, let us initiate a critical discussion focused on a hypothetical event from our daily lives. By employing a scenario as a means of exploration, we can delve deeper into the subject. It is important to note that in the context of discussing critical thinking, we will often utilise hypothetical situations to facilitate the development of well-founded arguments.



“Arguments” will be introduced and thoroughly discussed in Section 2.0. It is worth noting that hypothetical arguments are crucial for initiating and developing substantive arguments.

## ▶ Scenario A – Withdrawing Cash at the ATM



Joanna made her way to the automated teller machine (ATM) with the intention of withdrawing cash to purchase a variety of fresh local fruits from a roadside merchant. As she approached the ATM, she noticed unclaimed cash left behind in the withdrawal section, presumably forgotten by a previous client. With no one in sight who could have potentially just used the ATM, Joanna, being a conscientious and law-abiding citizen, promptly decided to take the responsible course of action. She resolved to bring the money to the nearest police station and inform the media to facilitate the tracing of the rightful owner.

There are other concepts that can be considered subsidiary, such as ‘fruits’, ‘merchant’, ‘citizen,’ ‘responsible,’ and so on. These concepts are deemed subsidiary because they may not directly contribute to the specific situation under consideration. However, it is important to note that while they may not be central to the immediate context, they can still play a role in shaping broader perspectives and understanding, depending on the course of action of Joanna.

In the **conceptualisation** process, it is important to consider various key concepts when discussing a specific situation, such as the issue of forgotten money at the ATM. These concepts play a crucial role and include ‘cash’, ‘money’, ‘purchase’, ‘ATM’, ‘withdrawal section’, ‘client’, ‘conscientious’, ‘law-abiding’, ‘police station’, and ‘media’. In this context, the mental framework is influenced by an individual’s past experiences with withdrawing cash from an ATM.



In the process of **Gathering & Evaluating Information**, Joanna employed observation skills to identify a sum of money. By physically holding the money, she deduced that someone else had inadvertently left it behind. The reasons behind this oversight could be speculative and varied.

In the process of **Applying, Analysing, Synthesising, Reflection, Reasoning** and **Communicating** the gathered information, Joanna decided to take responsible **action** regarding the forgotten money. She considered the potential consequences and implications of her decision, taking into account the key concepts previously mentioned [**applying**]. Firstly, Joanna realised that the money belonged to someone else, and it was important to respect their property rights owing to her family upbringing. She understood the concept of being conscientious and law-abiding, recognising that keeping the money for herself would be morally and ethically wrong. Secondly, Joanna considered the concept of the ATM and its purpose. She understood that the ATM serves as a secure and convenient way for clients to withdraw cash [**analysing, synthesising, reasoning**]. Since the money was left in the withdrawal section, it was reasonable to assume that it was accidentally forgotten. Next, Joanna thought about the potential actions she could take. She weighed the pros and cons of different choices [**reflection**]. She understood that keeping the money without attempting to return it would be unfair to the rightful owner and goes against her principles [**reasoning & reflection**]. Therefore, she decided to take the money to the nearest police station, ensuring that it would be handled properly.



Under application, there is transfer of knowledge to a new situation.



Analysis, synthesis and reasoning are integral components of problem-solving, often intertwined and interdependent. Therefore, delineating them as separate processes can be challenging.



The act of engaging in reflective thinking involves considering ideas and concepts from different angles and continually refining them for improvement.

Joanna also considered the concept of media and its impact. She realised that since she had found a large sum of money, it might attract attention from the media, potentially causing unnecessary complications for both her and the rightful owner. By involving the police, she aimed to maintain confidentiality and protect the interests of all parties involved [**communicating**].

Joanna formulated a coherent mental model in this situation, drawing upon her past experience of withdrawing money from an ATM and her acquired values and proceeded the way she did.

How far do you agree that Joanna had recourse to the use of her previous mental model of use of ATM as well as acquired values in this current situation?

How would you have proceeded if you were in Joanna's place? Provide sufficient insight with justifications of your thinking processes.



Withdrawing Cash at the ATM  
<https://forms.office.com/r/4Vy9SgJcTq>





## Activity 2 – Displaying Autonomy at the Supermarket

We often tend to primarily associate critical thinking with mainstream educational settings, inadvertently overlooking the fact that learners in Special Educational Needs (SEN) settings possess the capacity to actively engage in critical thinking as well. However, it is essential to recognise and acknowledge that critical thinking is not exclusive to any specific learning environment. Learners with Special Educational Needs (SEN) have the potential to develop and demonstrate exceptional critical thinking skills when provided with appropriate support, while considering the principles of Vygotsky’s Zone of Proximal Development (ZPD). In this context, teachers are responsible for tailoring their lessons in a manner that challenges the learners slightly beyond their individual capabilities, while ensuring that the tasks become manageable with assistance (Wass & Golding, 2014).

By creating an inclusive learning environment that fosters critical thinking, educators have the opportunity to empower students with Special Educational Needs (SEN), depending on their levels of disability, to effectively analyse, evaluate, and apply their knowledge in various real-life situations. Moreover, it is important to remember that critical thinking can manifest differently for each individual student, irrespective of the learning setting. Each learner, regardless of their abilities or challenges, possesses unique strengths and perspectives that can enrich the critical thinking process. Therefore, embracing diversity and promoting inclusive practices will enable learners in both mainstream and SEN settings to enhance their critical thinking abilities and reach their full potential.





## Scenario B – Autonomy at the Supermarket

Reshma and Robin, who are siblings with autism, are not only students in a special education needs school, but also strong proponents of their own empowerment. They wholeheartedly believe in their ability to accomplish tasks independently and function autonomously to a certain extent. Fortunately, their parents share the same conviction and provide unwavering support for their children's autonomy.



“Autism” refers to a developmental disability significantly affecting verbal and non-verbal communication and social interaction.



Remember that constructing a mental model or framework or representation is not only a crucial first step in the thinking process, but it also serves as the foundation for effective critical thinking when attempting to undertake any problem-solving task.

During one of their classroom lessons, the teacher conducted an engaging activity that encouraged Reshma and Robin to unleash their creative imagination and develop their critical thinking skills, which are essential for fostering autonomy, with a particular focus on short term decision-making (Sellars, et al., 2018). The teacher presented them with a scenario to imagine: It is a Saturday afternoon, and their parents have entrusted them with an urgent task. They need to swiftly proceed to the nearby supermarket and purchase bread, as they are expecting guests for lunch who will be arriving soon.



Before heading to the supermarket, there are several preliminary considerations that both Reshma and Robin should engage in.

The following questions raised by Reshma and Robin before proceeding to the supermarket are important for them to construct a mental representation of the task they need to fulfil.

*Should they confirm with their parents which supermarket they should walk to? Why is this piece of information important?*

*Why do you think they should seek information from their parents about the quantity and type of bread they should purchase?*

*Do you think that it is important for them to agree on who should safely carry the money and handle the change after the purchase?*

*Do you think they should confirm which road is the best route to take to reach the supermarket? Why?*

Now Reshma and Robin are at the supermarket, and to avoid any delay, how will they find out in which section bread is kept? Suggest a few possibilities.

*Once they have chosen the right type of bread and proceeded to the cashier, how can they complete their transaction?*



Autonomy at the Supermarket  
<https://forms.office.com/r/sfFQGGxi37>

## Summary

In this section, you have gained an understanding of the concept of critical thinking and its various components. Critical thinking is a cognitive process that involves several important elements. It encompasses the ability to conceptualise, gather and evaluate information. Additionally, critical thinking requires the application of analysis, synthesis, reflection, reasoning and communication in a logical and systematic manner.



Critical thinking enables us to recognise and address unconscious practical inconsistencies, like saying one thing and doing another. By doing so, it enhances our awareness, enabling us to approach them consciously and rationally.



The significance of critical thinking is particularly emphasised in the realms of education and decision-making. Extensive research has indicated a positive correlation between critical thinking skills and academic achievement. Developing strong critical thinking skills not only enhances problem-solving abilities but also fosters creativity and independent thinking. These skills are invaluable in both educational settings and everyday life, including mainstream and Special Education Needs (SEN) environments.

By developing critical thinking skills, students can excel in both their studies and personal life. Critical thinking equips students with the ability to impartially assess information and explore various perspectives on academic or real-world issues. This objective evaluation enables them to make well-informed decisions, which is crucial when facing unforeseen circumstances. Moreover, critical thinking fosters effective communication and interpersonal skills. It empowers students to articulate their thoughts clearly and respectfully, while also remaining open to different ideas and viewpoints.

## 2.0 CONCEPT OF CRITICAL THINKING: NOTION OF ARGUMENT

The Collins English Dictionary defines an argument as “*a statement or set of statements that you use in order to try to convince people that your opinion about something is correct*”. Thus, an argument can be coined as a persuasive discourse aimed at presenting logical reasoning, evidence and supporting information to sway others to align with a particular viewpoint or conclusion. It involves the art of constructing a coherent and compelling case by employing facts, examples, expert opinions and deductive or inductive reasoning. Regrettably, various educational stakeholders, including policymakers, students and parents, are increasingly raising concerns that schools are failing to meet students’ needs and neglecting the development of higher-order thinking skills (Kuhn & Moore, 2015). The authors further emphasise that although curriculum policy documents highlight the importance of teaching these skills, they do not provide specific methods or guidelines for teaching them effectively.

In our daily lives, we all engage in argumentation, whether consciously or unconsciously. Argumentation plays a significant role in education as well. It serves as a means to foster critical thinking, promote understanding and develop effective communication skills among students. A well-crafted argument effectively communicates information by presenting a coherent line of reasoning, providing supporting evidence, utilising **persuasive techniques** and addressing opposing viewpoints. By doing so, it aims to convince others of the merits of a particular claim or position.



Some commonly used persuasive techniques include social influence, which encompasses various strategies employed in online communication (Ta, et al., 2022). These techniques leverage the power of language and other factors to sway opinions, attitudes, and behaviours.

### 2.1 THE CONCEPT OF RHETORIC

Before we embark on the next section about the structure of an argument, let us delve into the terminology of rhetoric. The statement, “*I would die if you asked me to sing in front of my class teacher*” can be seen as an example of rhetoric used to persuade others not to force someone to do something they don’t want to. This statement serves as a vivid claim intended to evoke a strong emotional response. By expressing an extreme outcome (“I would die”), the emphasis is made on the aversion of the student to singing in front of his/her teacher and aims to dissuade others from pressuring or coercing him/her into doing so.





### Concept of Rhetoric

*Can you recall a rhetorical statement that you have encountered in relation to everyday life occurrences?*

<https://forms.office.com/r/DpZqDtK5Tp>

An **argument** differs from **rhetoric** in the sense that the former focuses on presenting logical reasoning and evidence to support a claim or position, while the latter emphasises the use of persuasive techniques to influence someone's beliefs or attitudes. In an argument, the primary aim is to provide sound reasoning and evidence to convince others of the validity of a particular claim or viewpoint. It relies on logical structure, factual evidence and rational discourse to persuade and engage with someone. The goal is to present a well-supported case that withstands scrutiny and promotes critical thinking.



Do not confuse argument with rhetoric. Rhetoric focuses on persuasive techniques and the use of certain words to influence your beliefs and feelings (Bowell & Kemp, 2010).

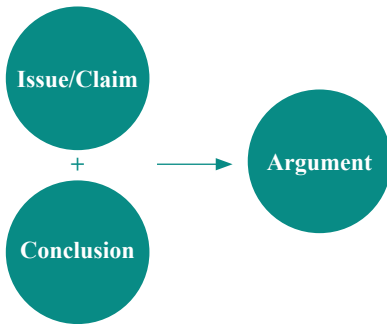
### Summary

This section delves into the concepts of argumentation and rhetoric across various contexts. It provides a definition of an argument as a persuasive discourse that aims to convince others of a specific viewpoint by employing logical reasoning and supporting evidence. The section highlights concerns regarding the neglect of higher-order thinking skills in education and underscores the significance of teaching effective argumentation. Furthermore, it explores the use of rhetoric as a tool for persuasion and influence. Lastly, the section concludes by drawing a distinction between argumentation and rhetoric, emphasising that argumentation prioritizes logical reasoning and evidence, while rhetoric places emphasis on persuasive techniques and shaping beliefs or attitudes.

### 3.0 STRUCTURE OF AN ARGUMENT

In this section, we will explore the concepts of issues, conclusions and justifications in the context of an argument, highlighting their significant impact on the development of critical thinking skills. By examining these elements and understanding their interplay, we can better comprehend how their application within specific contexts fosters the cultivation of critical thinking abilities.

An **argument** is a statement that consists of two components: an *issue* (or claim), and a *conclusion* (Mercier & Sperber, 2011; Bowell & Kemp, 2010).



In the field of philosophy, argument relates to a set of reasons offered in support of a claim. In the context of an argument, a conclusion refers to a claim or position being asserted.

### 3.1 ISSUE, CONCLUSION, JUSTIFICATION

An *issue* (or claim) within an argument represents the central topic or question under consideration, around which different perspectives and viewpoints can emerge. Identifying and understanding the issue at hand is crucial for effective critical thinking, as it lays the foundation for analysing and evaluating the various arguments and evidence presented.

*Conclusions* are the claims or statements put forth as answers or solutions to the issue. Conclusions are typically derived from reasoning, **premise** and evidence and aim to persuade others of their validity. Developing the ability to recognise and formulate sound conclusions is a fundamental aspect of critical thinking, as it involves assessing the logical coherence and strength of arguments.

*Justifications* play a pivotal role in supporting and defending conclusions within an argument. Justifications consist of evidence, reasons or logical



By developing understanding of issue, conclusion and justification, learners can engage in more robust and rational analysis, leading to enhanced decision-making, problem-solving, and the ability to navigate a world of diverse perspectives with greater intellectual capability.



Premises are reasons or pieces of evidence that support the conclusion.  
“A premise is an idea or theory on which a statement or action is based.” *Cambridge Dictionary*

explanations that provide a rational basis for accepting a particular conclusion. Teaching and learning critical thinking involve fostering the skills to critically assess justifications, scrutinising their reliability, relevance and sufficiency in supporting the conclusions they accompany.

If someone presents a conclusion in a conversation without providing any supporting justifications or reasons, it can be considered as a mere statement or assertion. Thus, in order for an argument to be valid, it is essential to provide reasoning, premise or evidence that supports the stated conclusion.

When constructing a strong argument, it is crucial to frame the issue either as a question or a statement. For example,

In question form: ‘Is writing a booklet of this form engaging?’

In statement form: ‘Writing a booklet of this form is engaging.’

Presenting the claim or issue in this way clarifies the focus and provides a clear starting point for the argument. Additionally, it allows for a more structured and coherent presentation of supporting reasons and evidence.

Overall, when engaging in a discussion or debate, it is important to provide a well-constructed argument with sound reasoning and evidence to support any conclusion being presented.

### **Example of an Argument**

#### Example 1

*Claim (Issue): Faculty members in a higher education institution should publish.*

*Premise 1: By publishing, faculty members demonstrate their commitment to scholarly inquiry and contribute to the intellectual growth of the institution.*

*Premise 2: Publications serve as a measure of excellence and scholarly achievement.*

*Conclusion: Therefore, faculty members in a higher education institution should publish.*



“An argument may be about any subject and have any number of premises, but it will always have only one final conclusion” (Bowell & Kemp, 2010, p. 12)



So long we accept premise 1 & 2, we must also accept the conclusion.



### 3.2 ARGUMENT MAPPING



Argument mapping helps to formulate a mental representation of an argument.

To gain better understanding of how to engage in critical thinking and develop critical thinking skills, we can utilise a strategy known as *argument mapping*.

Argument mapping helps to visually represent the structure and relationships of arguments. It involves breaking down complex arguments into their individual components, such as premises and conclusions. These components are then organised and connected in a tree diagram. The purpose of argument mapping is to make the structure of an argument more explicit and easier to understand. By visually representing the relationships between premises and conclusions, argument mapping helps to identify the strengths and weaknesses of an argument, reveal any missing or unsupported premises and highlight any logical fallacies or inconsistencies.

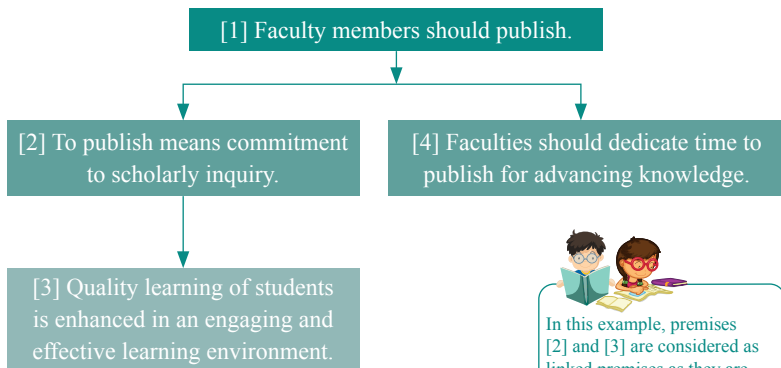
Consider the following arguments:

[1] Faculty members should publish.

[2] To publish means commitment to scholarly inquiry.

[3] Quality learning of students is enhanced in an engaging and effective learning environment.

[4] Faculties should dedicate time to publish for advancing knowledge.



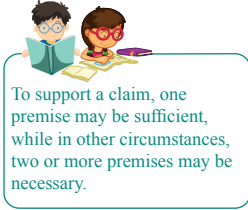
In this example, premises [2] and [3] are considered as linked premises as they are dependent on each other or there is a connection between them.

## Example 2

*Claim (Issue): Adequate lesson preparation is crucial for educators before entering the classroom.*

*Premise 1: Preparation enables educators to teach in a structured manner and anticipate questions from students.*

*Conclusion: By dedicating time to prepare their lessons, educators can enhance the quality of their teaching and foster a more engaging and effective learning environment for their students.*



### Activity 3 – Constructing an Argument 1

Use Example 2 to draw an argument map to illustrate the argument put forward.

Step 1: Number the argument and premises.

Step 2: Draw the argument map similar to the one in Example 1.

### Activity 4 – Argument Map

Use the following claim and premises to complete the argument map after discussion with your peers.

[1] All students, in both mainstream and SEN settings, should study critical thinking.

After all,

[2] Critical thinking is necessary for developing independent thinking.

as

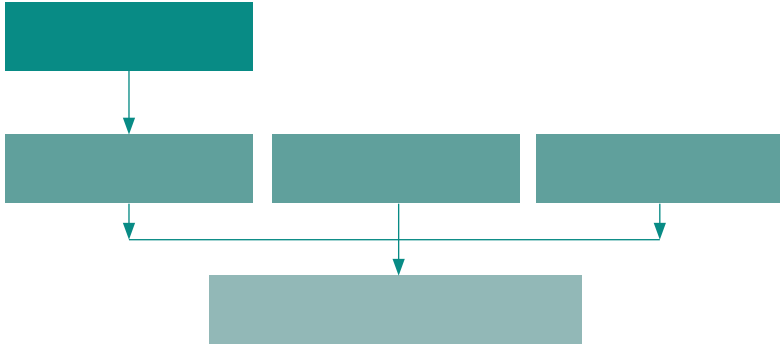
[3] We need to adapt to rapid changes and make critical use of information in making sound decisions.

Also,

[4] Critical thinking can help us reflect on our values and purpose in life.

Finally,

[5] Critical thinking helps us improve our study skills and solve everyday life problems.



### Activity 5 – Constructing an Argument 2

This activity is intended to be completed as a group work within the same discipline or across multiple disciplines (transdisciplinary).

In Group 1, Task 2 is dependent on the completion of Task 1.  
 In Group 2, Tasks 1 & 2 are independent.

- a. Write down a strong argument about an issue you consider necessary to enable you to better perform your duty.
- b. Write the premises depending on the group task..
- c. Construct the argument map.



Constructing An Argument 2  
 Activities 3-5: <https://forms.office.com/r/3H8TP4myHs>

### **Summary**

In summary, understanding the concepts of issues, conclusions and justifications within an argument is crucial for cultivating critical thinking skills in teaching and learning. By recognising and analysing the issue at hand, we can engage in effective critical thinking by evaluating the various arguments and evidence presented. Formulating sound conclusions based on reasoning, premises and evidence is fundamental to the development of critical thinking, as it involves assessing the logical coherence and strength of arguments. Justifications



When all think alike, no one thinks very much – *Walter Lippmann*

play a vital role in supporting and defending conclusions, providing a rational basis for accepting a particular claim. Teaching and learning critical thinking involve the ability to critically assess justifications, scrutinising their reliability, relevance and sufficiency in supporting the accompanying conclusions. When constructing a strong argument, it is essential to provide supporting justifications or evidence that lend credibility to the stated conclusion. An argument without sufficient justifications may be considered a mere assertion. The use of argument mapping can aid in visually representing the structure and relationships of arguments, making the underlying reasoning more explicit and facilitating the identification of strengths, weaknesses and potential fallacies.



## 4.0 BASIC LOGICAL CONCEPTS

With the advent of technological development, in particular, artificial intelligence (AI), teaching and learning are bound to undergo significant transformations and utilise various technological tools to enhance students' learning experience. This shift in the educational landscape opens up new avenues for students to develop their reasoning skills. One aspect of reasoning that can be fostered is higher-order thinking skills, such as critical thinking (Bronkhorst, Roorda, Suhre, & Goedhart, 2022). Developing critical thinking skills in students is crucial in the age of technological advancement and easy access to information. While students now have the ability to access a vast amount of information from various sources, the challenge lies in their capacity to analyse and evaluate diverse perspectives on a given topic. By cultivating critical thinking skills, students can become discerning consumers of information and develop the ability to make well-reasoned judgments.

### 4.1 LOGICAL REASONING

Multiple studies, including research conducted by Liu, Ludu and Holton (2015), Bronkhorst, Roorda, Suhre and Goedhart (2022), and Raghavan, Sena, Berthelmy and Liu (2008), have consistently found that college students often struggle with making logical connections between examples, counter-examples and the concepts or theorems being taught. This struggle to connect specific instances to abstract concepts can impede their ability to develop a profound understanding of the subject matter. A potential reason for this challenge is that students may perceive examples and counter-examples as isolated occurrences, overlooking their relevance to the broader conceptual framework or to specific subject matters. Consequently, they may struggle to generalize and apply the principles they have learned to different contexts or problem-solving situations, as evidenced by Seif's recent study (Seif, 2023).

According to researchers such as Liu, Ludu and Holton (2015), logical reasoning is recognised as a fundamental aspect of critical thinking. Although there is no universally agreed-upon definition for logical thinking, various scholars have provided insights into its nature and characteristics. For instance, Inhelder and Piaget (1958) describe logical thinking as the mental operations individuals employ when faced with certain problems. Similarly, Lawson (1992) defines it as a resolute thinking process that leads to conclusions. Expanding on this, Demirel (2003) offers a more detailed description of logical thinking, encompassing activities such as finding scientific solutions, classifying, generalizing, calculating, generating hypotheses and effectively using numbers while understanding conceptual differences.

As stated by Baserer (2020), logical thinking is recognised as a cognitive skill that involves advanced cognitive abilities and is considered a universal human characteristic. This aligns with the viewpoint expressed by Bronkhorst, Roorda, Suhre and Goedhart (2022), who emphasise the importance of teachers supporting students in developing strategies to enhance their logical reasoning abilities. When discussing critical thinking in research, the term “reasoning” or “logic” is frequently employed. In line with this understanding, we can adopt a definition of logical reasoning as the cognitive process of drawing valid conclusions or inferences based on evidence, facts and the principles of logic. It is important to note that various types of reasoning exist, including deductive, inductive and others. Each type of reasoning is suitable for specific situations and plays a role in the critical thinking process. By understanding and employing different types of reasoning appropriately, students can enhance their ability to analyse information, make informed judgments and reach logical conclusions.

## 4.2 DEDUCTIVE REASONING

Deductive reasoning is a type of reasoning in which a conclusion is reached based on a series of premises (Prado, Chadha, & Booth, 2011). The premises are assumed to be true, and the conclusion is drawn logically from them (Grote-Garcia & Loveless, 2011). Deductive reasoning is most often used in mathematics and logic, but it is also used in everyday life. For instance, when considering a triangle, three areas come into play: Theory, Premises and Conclusion.

- \* All triangles have three sides. (Theory)
- \* This shape has three sides. (Premise)
- \* Therefore, this shape is a triangle. (Conclusion)



Figure 1: Flow diagram for deductive reasoning



## Activity 6 – Deductive Reasoning - Sitting Arrangement



### Scenario C – Sitting in a Row

Three students, Jane, Rohit and Chris, seated in a row, are engaged in a discussion about their relative positions.

Premise 1: Jane is sitting to the right of Rohit.

Premise 2: Rohit is seated to the right of Chris.

Conclusion: Therefore, Jane is seated to the right/to the left of Chris (delete the incorrect one and identify in the picture, by writing the name of Jane, Chris & Rohit).



Based on the given premises, it can be deduced that Jane is indeed seated to the right of Chris. Some thinking is required to make a deduction. By combining the information that Jane is sitting to the right of Rohit and Rohit is to the right of Chris, we can logically infer that Jane occupies the rightmost position among the three students.

During this activity, it is essential to guide students in constructing a mental model that accurately represents the given situation using diagrams or visual aids. By using visual aids such as pictures or diagrams, teachers can effectively illustrate



the logical interpretation of the situation. In inclusive settings, it is important for teachers to emphasise the significance of simulating the scenario, allowing students to actively participate in the process. Through the application of deductive reasoning, students can establish logical connections and develop a clear visualisation of the seating arrangement. This process enables them to draw accurate conclusions that follow logically from the provided premises. By engaging in deductive reasoning, students can enhance their ability to think critically and make informed judgments based on logical reasoning.



Refer to section 1.0 to recall on mental model or mental representation.



## Activity 7 – Deductive Reasoning – Winning a Prize



### Scenario D – Winning a Prize

The teacher informed all students that the one who scores the highest mark in the English mid-semester examination will get a prize. After the examination, I scored the highest mark in English. Will I get the prize?

- Write down Premise 1:
- Write down Premise 2:
- Draw the argument map to help you come up with the conclusion.
- Write down the Conclusion:



Deductive Reasoning

<https://forms.office.com/r/s5u0NHsetY>

By employing deductive reasoning, students can enhance their critical thinking skills and develop the ability to draw logical conclusions based on established premises. It is an essential cognitive process that allows us to make accurate deductions and reach informed judgments in various contexts of both academic and everyday life. By employing deductive reasoning, students can enhance their critical thinking skills and develop the ability to draw logical conclusions based on established premises. It is an essential cognitive process that allows us to make accurate deductions and reach informed judgments in various contexts, both academic and everyday life.

### 4.3 INDUCTIVE REASONING

To grasp the concept of inductive reasoning, let's delve into the following scenario:

#### Scenario E – Drawing Conclusion from Observation

Joanna has a fondness of shellfish; however, at home, this particular food is seldom prepared or served. This is due to her observation that whenever her parents consume shellfish, they both experience an allergic reaction, characterised by symptoms like itching.



It's important to note that while Joanna's observations suggest a correlation between shellfish consumption and the allergic reaction (itching) in her family, further investigation or consultation with medical professionals would be needed to establish a definitive cause-and-effect relationship. Nonetheless, Joanna's inductive reasoning helps her to make an informed decision for her parents to avoid serving shellfish at home.

Based on these repeated observations, Joanna concluded that there is a correlation between consuming shellfish and experiencing allergic reactions in her family. The consistent pattern of both parents developing symptoms after consuming shellfish suggests a link between the food and the allergic reactions.

Joanna has been engaged in inductive reasoning which has allowed her to draw a general conclusion based on her observations. In this case, Joanna's observation of her parents' consistent allergic reactions to shellfish provides evidence for the general conclusion that consuming shellfish may result in allergic reactions in her family.

Inductive reasoning, distinguished from deductive reasoning, involves deriving a general principle or conclusion based on existing knowledge, observations or other forms of evidence (Sarsani, 2007; Davidson, 2019). This type of reasoning relies on a series of observations to reach a conclusion. Unlike deductive reasoning, where conclusions are based on assumed truths, inductive reasoning assumes the observations to be true and uses them to form a general conclusion as illustrated in Figure 2.





Figure 2: Flow diagram for inductive reasoning

Inductive reasoning is often used in science, as well as in everyday life. Inductive reasoning allows us to move beyond specific observations and make broader conclusions based on patterns or evidence. It serves as a valuable tool for expanding our understanding and making informed judgments, both in scientific investigations and in our day-to-day decision-making.

### ▶ Scenario F – Identifying Swans in a Pond


After an extended and exhausting study session, Kevin decided to take a much-needed relaxing break and visited a nearby pond to enjoy the scenery. While at the pond, his attention was captured by a group of swans and other birds gracefully gliding across the water. During this serene moment, Kevin made several observations:

Observation 1: The first swan he spotted had a pristine white plumage.


Observation 2: The second swan he observed exhibited the same brilliant white colouring.

Observation 3: The third swan he noticed also possessed the unmistakable white appearance.

- Write down Premise 1.
- Write down Premise 2.
- Draw the argument map to help you come up with the conclusion.
- Write down the conclusion.



It is important to note that inductive reasoning has its limitations. The conclusions drawn through inductive reasoning are not guaranteed to be true, as future observations or evidence could potentially challenge or refine them. For instance, if we have observed that our washing machine starts reliably all the time we set it on, we may infer that it will continue to do so in the future based on this pattern. However, this inference may not necessarily be true.



By employing inductive reasoning, Kevin might be inclined to conclude that all swans are white. However, it is crucial to acknowledge the limitations of inductive reasoning. Kevin's conclusion is based on a limited number of observations and does not account for potential variations in swan coloration in different regions or species.





Identifying Swans in a Pond  
<https://forms.office.com/r/cbj74Q1KLU>

#### 4.4 FALLACY

A fallacy is a term used to describe errors in reasoning or flawed conclusions, often stemming from deficiencies in critical thinking (El Khoiri & Widiati, 2017). Fallacy can be intentional or unintentional (Walton, 2011). Intentional fallacies refer to attempts to deliberately mislead or persuade others, like the use of rhetoric, false propaganda or deceptive tactics. On the other hand, unintentional fallacies occur due to errors or flaws in reasoning, often without the deliberate intention of influencing or deceiving others.



By clarifying the nature of the fallacy, we can help students understand the importance of critically evaluating causal claims and avoiding hasty generalisations. It is crucial to consider alternative explanations, gather additional evidence and analyse the logical connection between the supposed cause and effect before making conclusions.

This argumentative scenario highlights a specific fallacy, known as a “false cause” fallacy.

#### Scenario G – False Cause

Lakshita: “Hey Lakshana, it’s raining outside. You should take an umbrella with you.”

Lakshana: “I don’t think it’s raining. The road is wet though.”

Lakshita: “Well, if the road is wet, then it must be raining.”

Lakshana: “Not necessarily. The road could be wet for some other reason than rain.”

Here, Lakshita is committing the fallacy by assuming that if the road is wet, then it must be raining. However, as we discussed earlier, this is not necessarily true and there could be other reasons why the road is wet as pointed out by Lakshana.



## Scenario H – Hasty Generalisation

Two mothers, Jane and Ania, are having a discussion about autism and vaccines.



Anecdotal evidence, such as personal stories or individual experiences, can be compelling and emotionally persuasive. However, it is important to recognise that anecdotal evidence is not reliable for drawing general conclusions or making informed judgments about cause-and-effect relationships.

Jane: “I heard that vaccines can cause autism.”

Ania: “That’s not true. I have not come across any link between vaccines and autism.”

Jane: “Well, my cousin’s friend’s child got vaccinated and then developed autism, so it must be true.”

- Who is committing the fallacy: Jane or Ania?
- What is the fallacy in this case?
- Why is your statement in (b) a fallacy?
- Write down the Conclusion:

Understanding both intentional and unintentional fallacies is crucial for developing strong critical thinking skills. By being aware of these fallacies, individuals can enhance their ability to evaluate arguments, identify flawed reasoning and engage in more effective and rational discourse.

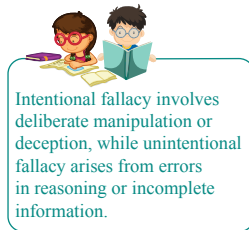
Identify which item in Table 1 is an example of an intentional or unintentional fallacy. Place a tick (✓) in the appropriate box.

Fallacy	Intentional	Unintentional
A student, who habitually wears his watch on the right hand, wears it on the left hand during the examination and gets a good grade. He attributes his success to wearing the watch on the left hand.		
During a departmental meeting, one staff member consistently attacks her/his colleague's professional integrity instead of addressing the opinions presented regarding the item under consideration.		
A group of tourists visits a place and has a negative experience of a few locals. They conclude that all people in that region are unfriendly.		
A teacher notices that students who sit in the first row in the classroom tend to get the best scores in the tests. The teacher concludes that sitting in the front row directly improves academic performance.		

Table 1: Intentional and Unintentional Fallacy



Hasty Generalisation  
<https://forms.office.com/r/4evh7SdmUT>



## 4.5 OBJECTIVITY

The concept of objectivity according to the American Psychological Association<sup>1</sup> involves making judgements and interpretations relying on external data rather than on subjective factors, such as personal feelings, beliefs and experiences. Stamenkovic (2022, p. 2) further emphasises the significance of objectivity by arguing that “Objectivity is a characteristic feature of science – probably the most important one alongside that of truth”. This definition highlights the importance of objective thinking and its association with scientific endeavors, where the reliance on empirical evidence and impartial analysis helps ensure unbiased conclusions. The significance of objectivity in critical thinking cannot be overstated. It empowers us to comprehensively explore multiple aspects of an issue and arrive at well-founded conclusions guided by evidence, rather than our own predispositions. When we approach a situation objectively, we remain receptive to fresh insights and are open to revising our beliefs should the evidence warrant such adjustments. Embracing objectivity fosters intellectual growth and enhances our ability to make informed decisions.

Objectivity and critical thinking are closely intertwined, with the former serving as an essential component of the latter. These concepts work together and complement each other in the pursuit of sound reasoning and informed decision-making. By incorporating objectivity into critical thinking, we can more effectively assess the validity and reliability of evidence, recognise logical fallacies, and make well-founded judgments. Objectivity encourages open-mindedness and a willingness to consider different viewpoints, leading to a more comprehensive analysis of complex issues.



Objectivity empowers us to constantly refine and improve our critical thinking skills, ensuring that our decisions are based on a thorough examination of the available facts and logical reasoning.

By firmly embedding objectivity into our critical thinking process, we significantly elevate the integrity of our actions and amplify the potential impact of our decisions. This unwavering commitment to impartiality is exemplified through our consistent reliance on evidence-based reasoning, ensuring that our conclusions are well-founded and reliable. Embracing objectivity not only strengthens the credibility of our actions but also paves the way for more accurate and insightful outcomes. While remaining objective can be challenging, we must continuously strive to be mindful of our biases and actively mitigate their influence, as this dedication to objectivity underpins our pursuit of knowledge and truth.

<sup>1</sup><https://dictionary.apa.org/objectivity>



## Scenario I – Teaching Styles

A group of students gathered during the lunch break is engaged in an interesting discussion about their teachers and their teaching styles. Two students engage in the following conversation:

Lisa: “I hate Ms. Smith’s class. She’s such a bad teacher.”

Bobby: “I don’t think she’s that bad. I learned a lot in her class.”

Who is demonstrating non-objectivity in their thinking: Lisa or Bobby? Justify your answer.

Who is demonstrating objectivity in their thinking? Justify your answer.

What is your conclusion?



Teaching Styles

<https://forms.office.com/r/6dp07miP8N>

### Summary

Critical thinking, a higher-order thinking skill, is crucial in the age of easy access to information, as it enables students to analyse and evaluate diverse perspectives. Logical reasoning, a fundamental aspect of critical thinking, is often challenging for college students, as they struggle to connect specific examples to abstract concepts and generalize their knowledge. By cultivating logical reasoning skills, students become discerning consumers of information and can make well-reasoned judgments. Deductive reasoning is a type of reasoning where conclusions are drawn logically from a series of premises assumed to be true. Inductive reasoning involves deriving general principles or conclusions based on observations and evidence. It allows us to make broader conclusions based on patterns or evidence. Fallacies are errors in reasoning or flawed conclusions that can occur intentionally or unintentionally. Understanding fallacies is essential for developing strong critical thinking skills, as it enables individuals to evaluate arguments and engage in rational discourse.

## 5.0 CRITICAL THINKING STRATEGIES

### 5.1 ARGUMENT ANALYSIS

### 5.2 ENGAGING WITH ARGUMENTS

### 5.3 REFUTATION BY COUNTER EXAMPLE



Claim, premise, conclusion, and reasoning are the key ingredients of the structure of an argument. Premises serve as the supporting statements or evidence that contribute to the establishment of the conclusion. Reasoning demonstrates how premises lead to the conclusion, thus forming a coherent and persuasive argument.

Critical thinking should not be seen as an approach which is exclusive to certain academic disciplines or professional fields. Instead, it should be embraced as a fundamental skill that is applicable across all aspects of life. Critical thinking goes beyond the boundaries of specific subject matter and encourages individuals to analyse information, question assumptions and make well-reasoned judgments. It encourages us to seek out diverse viewpoints and engage in respectful dialogue, as we understand that our own perspectives may be limited or incomplete. Through critical thinking, we become more receptive to new ideas, less susceptible to manipulation and better equipped to engage in constructive debates. By applying critical thinking skills across different domains, we can bridge the gaps between disciplines and leverage a broader range of insights to develop innovative and effective solutions.

In section 3.0, a comprehensive discussion on the structure of an argument has been presented. Recognising and understanding the structure of an argument is a crucial undertaking for effective critical thinking and persuasive statement. However, it is important to acknowledge that the structure of an argument can indeed vary depending on the specific context of the issue in discussion and the intended purpose of the argument. In this current section, two strategies are proposed for analysing an argument in relation to critical thinking: **examining logical connections within arguments** and considering **counter arguments**. When analysing an argument, it is crucial to begin by consciously setting aside personal biases. This step lays the foundation for objective evaluation and promotes fair and rational assessment of the argument's merits. By doing so, we prevent our preconceived notions, beliefs or emotional attachment from clouding our judgement.

One effective strategy to mitigate biases is to actively listen to others' points of view in the argument. In addition to listening, it is important to carefully examine the **logical connections within the argument**. This involves critically evaluating the relationship between the premises and the conclusion and assessing whether the argument follows a sound and coherent structure. By focusing on the logical reasoning presented, we can evaluate the argument's strength and identify any potential flaws or gaps in



reasoning. Furthermore, engaging with **counter arguments** is an effective way to challenge biases and strengthen the analysis. By actively seeking out opposing viewpoints and considering counter arguments, we expose ourselves to alternative perspectives and potential weaknesses in the argument being analysed. This process encourages us to think critically and evaluate the argument from multiple angles, allowing for a more robust assessment.

### Activity 8 – Analysis of an Argument

In this activity, you will engage yourself in analysing an issue and pay particular attention to logical connections within an argument and counter arguments.

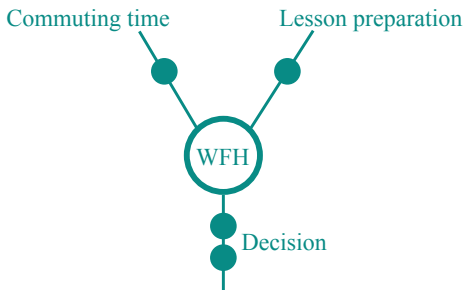
#### Scenario J – Work-from-home Policy

A group of teachers is discussing whether their school should make a case for adopting a flexible work-from-home policy.

Logical connection: Teacher T1 presents a persuasive argument in favour of adopting a flexible work-from-home policy. T1 clarifies that commuting time for teachers will be saved and they will have additional time to effectively prepare for their upcoming lessons.



The logical connection is directly related to the claim.



In this figure, a logical decision must be made based on the two ideas. To come up to a decision, each idea has to be weighed against existing regulations, policies, etc.

Figure 3: Logical Connection & Decision

Counter argument 1: In response to T1's argument, Teacher T2 comes with a counter argument, expressing concerns about the potential negative impact on student-teacher interactions. T2 highlights the importance of face-to-face interactions in fostering the affective domain of learning, as proposed by Krathwohl's theory of educational objectives.



Counter argument 2: Teacher T3 presents a persuasive argument in favour of adopting a flexible work-from-home policy. T3 argues that technology nowadays is versatile enough to enhance student engagement, even in a remote learning environment.

Technological innovation

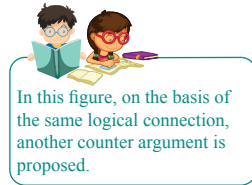


Figure 4: Counter Arguments & Decision



Discuss in groups the issue put forward in the scenario, the logical connection 1 and the two counter arguments for coming up with a reasonable and informed decision.

The first counter argument raises concerns about the potential negative impact on student-teacher interactions. This counter argument emphasises the importance of face-to-face interactions in fostering the affective domain of learning. In response to counter argument 1, the group should consider the value of in-person interactions in building relationships, establishing rapport and creating a supportive learning environment. They should discuss the specific ways in which face-to-face interactions benefit student engagement, motivation and overall learning outcomes. It is important to explore whether alternative methods, such as video conferencing, virtual classrooms or other online tools can adequately replicate the benefits of in-person interactions. Additionally, the group should consider the potential challenges and limitations of implementing such alternatives.

a. What are your views about counter argument 1?

The second counter argument highlights the potential of technology to enhance student engagement in a remote learning environment. The group should discuss the different ways in which technology can be used to promote interactive and immersive learning experiences. They should explore specific examples and evidence supporting the effectiveness of technology in engaging students, both in the mainstream and in inclusive settings. Additionally, it is important to address any potential limitations or disparities related to technology access and ensure that all students have equal opportunities for engagement. The group should also

consider the potential drawbacks of relying solely on technology for student engagement and discuss strategies to mitigate these drawbacks.

- What are your views about counter example 2?
- Upon carefully weighting the pros and cons of the two counter arguments, what is the ultimate decision in the long term?



Work-from-Home Policy  
<https://forms.office.com/r/86XPy81bcN>



## Activity 9 – The Dilemma of Inclusive Education



### Scenario K – Inclusion for Some or Inclusion for All

Leijen, Arcidiacono & Baucal (2021) initiated a thought-provoking discussion in their article titled “The dilemma of inclusive education: Inclusion for some or inclusion for all” open up a discourse in relation to “inclusion for some” and “inclusion for all”. Their work explores the contrasting concepts of “inclusion for some” and inclusion for all”. They propose a potential resolution, suggesting that a common ground could involve ensuring that all children with special needs are fully integrated into regular (mainstream) schools.

This approach aims to enable and empower these students, fostering their active participation and equal status as future citizens. However, the authors also advocate for the retention of special schools and special education teachers as supplementary resources. These specialised institutions would serve as an additional support system for students with diverse needs, whether on an occasional or long-term basis (Leijen, Arcidiacono, & Baucal, 2021).



- a. Write down the claim.
- b. With respect to the claim, formulate the logical connection with diagrammatic illustration.
- c. Using argument maps, write down two counter arguments and the ultimate decision.



Inclusion for Some or Inclusion for All  
<https://forms.office.com/r/2Tdjjfjfcw>

## Summary

Critical thinking is a fundamental skill that applies to all aspects of life, not just in specific academic disciplines or professional fields. It involves analysing information, questioning assumptions and making well-reasoned judgments. Critical thinking encourages us to seek diverse viewpoints, engage in respectful dialogue and be receptive to new ideas. By applying critical thinking skills across different domains, we can bridge disciplinary gaps and develop innovative solutions. Understanding the structure of an argument is crucial for effective critical thinking and persuasive statements. The structure of an argument may vary depending on the context and purpose. Two strategies for analysing arguments are presented: examining logical connections within arguments and considering counter arguments. Setting aside personal biases is essential to objectively evaluate arguments and avoid clouded judgment. Active listening and examining logical connections help in evaluating the strength and coherence of an argument. Evaluating the relationship between premises and conclusions enables critical assessment. Engaging with counter arguments challenges biases and strengthens the analysis by considering alternative perspectives.

## 6.0 CRITICAL THINKING IN EVERYDAY LIFE

Critical thinking should be taught within specific contexts, as emphasised by Willingham (2008), and its application is contingent upon the given context. This implies that while a student may exhibit critical thinking skills in one domain, that same student might not be able to demonstrate the same level of proficiency in relation to critical thinking in another domain due to limited knowledge in that specific area. It is important to recognise that critical thinking is not a universal skill that can be effortlessly applied across all subjects or situations. Rather, it is a skill that necessitates domain-specific knowledge and understanding to effectively analyse and evaluate information within a given context. By acknowledging this context specificity, educators can tailor instruction and provide the necessary background knowledge to enable students to apply critical thinking skills more proficiently across various domains.

Daily life experiences encompass the wide array of activities, situations, and events that we consistently encounter in our day-to-day lives. While these experiences are subject to considerable variation, influenced by factors such as personal circumstances, cultural backgrounds and individual preferences (UNESCO, 2021), they all demand the application of critical thinking skills to navigate the challenges and opportunities they present. By engaging in critical thinking, individuals can effectively analyse, evaluate and synthesise information, thereby facilitating informed decision-making, problem-solving and intellectual development (Facione, 2020).

Critical thinking plays a crucial role in our daily decision-making processes by enabling us to conduct thorough evaluations of situations, analyse the sources of information and carefully consider potential courses of action. By incorporating diverse perspectives into our analysis, thoughtfully exploring multiple solutions and strategically planning evidence-based actions, we as critical thinkers can greatly enhance our ability to make choices that are aligned with our values, goals and the unique context in which we find ourselves. This approach empowers us to make informed decisions that yield meaningful outcomes and contribute to our personal growth and success.

It is crucial to cultivate critical thinking competencies in students (Ramma, Samy, & Gopee, 2015), enabling them to understand and make well-informed decisions in their lives. According to Emily Lai (2011), the development of critical thinking competencies encompasses the nurturing of cognitive skills as well as dispositions characterised by attitudes or habits of mind, such as open-mindedness, fairness, curiosity, adaptability, a tendency to seek rationality, a thirst for knowledge and respect for diverse perspectives. Empirical research indicates that students can be taught to think critically through planned activities that make use of their everyday experiences as contextual frameworks for fostering the necessary cognitive skills and dispositions. By placing students at the core of the learning process, these activities facilitate the development of critical thinking competencies. This section presents some situations of context-based activities/scenarios that teachers can use to enhance students' critical thinking competencies.



## Activity 10 – A Local Mauritian Tasty Dish



### Scenario L – Preparing the “rougaille” dish

Jaya, an aspiring chef, is currently participating in a school cooking competition, showcasing her culinary skills by preparing a traditional tomato-based dish called “rougaille”. After adding some herbs as a final touch, she eagerly tastes her creation. To her dismay, she finds that the dish is excessively sour. Disappointed but determined to salvage her creation, she begins contemplating what might have caused the problem. She starts by carefully analysing the possible reasons for the excessive sourness, recalling each preparation step one by one with particular emphasis on the types and amounts of ingredients she used. Jaya reflects on the ripeness of the tomatoes, the precise amount of lemon juice added, and the spices that could have contributed to the dish becoming too acidic and thus sour. She is convinced that she added the right amount of lemon juice as she used a measuring device. Taking a deep breath, she decides to address the issue by balancing the acidity of the “rougaille”.



For an insight into the dish “rougaille”, you may visit this website:

<https://www.bonjourmauriti.us.com/mauritian-food-rougaille-recipe/>

Jaya reflects on the ripeness of the tomatoes, the precise amount of lemon juice added, and the spices that could have contributed to the dish becoming too acidic and thus sour. She is convinced that she added the right amount of lemon juice as she used a measuring device. Taking a deep breath, she decides to address the issue by balancing the acidity of the “rougaille”.

Based on the scenario, write down the claim, premises and the conclusion reached.

- What could be the claim in this scenario?
- What could be premise 1 in this scenario?
- What could be premise 2 in this scenario?
- What could be premise 3 in this scenario?
- Draw an argument map with the respective logical connections to help you to come up with a sound conclusion.
- What is your conclusion?



You could alternatively use the term ‘hypothesis’ instead of claims/premises.



Preparing the rougaille dish  
<https://forms.office.com/r/w5bX5v0N3X>

## Summary

Critical thinking is emphasised by Willingham (2008) to be taught within specific contexts, as its application depends on the given context. It is not a universal skill that can be applied effortlessly across all subjects or situations. Context-specific knowledge is necessary for effective analysis and evaluation within a particular domain. Educators should recognise this specificity and provide appropriate instruction and background knowledge to enhance students' critical thinking skills. In daily life experiences, critical thinking is essential for analysing information, making informed decisions and solving problems. By critically evaluating situations, considering multiple perspectives and planning evidence-based actions, we can make choices aligned with our inherent values and goals. Cultivating critical thinking competencies in students involves developing cognitive skills and fostering attitudes and habits of mind such as open-mindedness, curiosity and respect for diverse perspectives. Planned activities that utilise everyday experiences as contextual frameworks can enhance students' critical thinking abilities.

## 7.0 SCENARIO FOR PROVOKING & ASSESSING CRITICAL THINKING

In this section, we will explore the utilisation of scenarios to stimulate critical thinking in learners and delve into the tools available for identifying and assessing critical thinking within a given situation. Using scenarios as a teaching and learning tool has proven to be an effective method for fostering critical thinking skills amongst learners. These scenarios present either real-life or hypothetical situations, requiring learners to observe, identify, analyse, evaluate, apply their knowledge and reasoning and solve problems in the given context. Furthermore, we will introduce the critical thinking (CT) framework (Ramma, et al., 2021) for assessing critical thinking proficiency. The CT framework has been derived from the three levels of thinking postulated by Barnett (1997) for the identification of critical thinking. However, we have associated the three linking levels with the revised Bloom's Taxonomy to enhance the identification and assessment of critical thinking in learners.

### 7.1 EIA CT MODEL

Scenarios are powerful tools for challenging learners to think outside the box by providing a context, whether real-life or imaginary. They engage learners in a variety of processes, including careful observation, identification of **variables**, analysis of variables, synthesis of variables, application to test assumptions, reflection, reasoning, creation and more. The design and conceptualisation of scenarios depend on the learning objectives as well as the level of complexity to solve a given problem.



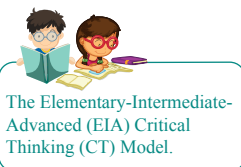
A variable refers to something (element, feature, factor, physical quantity) that is liable to vary or change

With reference to the critical thinking (CT) framework (Ramma, et al., 2021), we have identified three levels of criticality that constitute the foundation of the framework:

**Thinking:** This level involves actively processing information, analysing data and drawing logical conclusions.

**Reflecting:** This level emphasises introspection in relation to the thinking phase, evaluating personal biases and considering different perspectives to develop a well-rounded viewpoint.

**Action:** This level emphasises the practical application of critical thinking, where learners use their insights to make informed decisions and take purposeful action.



To illustrate the application of the CT framework, which we have termed as **EIA CT model**, let us consider a simple scenario but thought-provoking contextual situation (Ramma et al., 2021):

You are watching TV at night at your homeplace and suddenly the power in the room goes out. List all the stages which pertain to your thinking at that instant, in chronological order.



Figure 5: Power Outage

Table 2 shows the intended thinking along the three levels. They are differentiated as *Elementary*, *Intermediate* and *Advanced*.

At the **Elementary level**, learners are encouraged to develop basic thinking skills through activities that focus on observation, identification and simple analysis of information. These activities lay the foundation for critical thinking by promoting logical reasoning and knowledge application in a structured manner.

Moving to the **Intermediate level**, learners are challenged to enhance their critical thinking abilities through more complex tasks, with overlap at elementary level. They engage in higher-level analysis, synthesis and evaluation of information. This level requires learners to make connections between different concepts, apply critical thinking strategies and develop a deeper understanding of the subject matter.

Finally, at the **Advanced level**, learners are expected to demonstrate sophisticated critical thinking skills. They engage in advanced analysis, synthesis and evaluation, incorporating reflective thinking and creative problem-solving approaches. Learners at this level are capable of independently applying critical thinking across various contexts and demonstrating a high level of proficiency in their ability to think critically.

Process of criticality	Critical thinking stage	Description <i>[regarding the current situation]</i>
Thinking	Elementary [What happened?]	<i>Is it a general power cut in my room/house or my locality? What tool do I need to operate during the power cut?</i>
Reflecting	Elementary [What course of action do I follow?]  Intermediate [How do I confirm my hypotheses? What do I conclude? Do I ask for help?]	<i>How do I confirm that it is in the room/house/locality/?  How do I verify whether it is a general power cut, or it is in this room/house only? What could be the causes of this power cut?</i>
Action	Advanced [If the issue is local, how do I proceed to solve it? If it is not local, what alternatives do I have?]	<i>How do I proceed to clarify the questions raised? What course of action do I take during the power cut period? What technological tools do I access to help me in my course of action?</i>

Table 2: Process of criticality



## 7.2 ASSESSMENT OF CRITICAL THINKING

To facilitate assessment of critical thinking, Blooms Taxonomy is used in conjunction with the CT framework. Blooms Taxonomy, a widely recognised educational framework, provides a hierarchical classification of cognitive processes that align with different levels of thinking skills (Athanassiou, McNett, & Harvey, 2003; Rahman & Manaf, 2017; Lin, Liu, & Pham, 2023). By incorporating Bloom’s Taxonomy into the assessment process, we can effectively evaluate learners’ critical thinking abilities across various dimensions, such as knowledge recall, comprehension, application, analysis, synthesis and evaluation.

When combined with the CT (Table 3), which encompasses the three levels of thinking (thinking, reflecting and action), the use of Bloom’s Taxonomy enhances the assessment of critical thinking by providing a structured approach to measure learners’ depth of understanding, analytical reasoning, problem-solving skills and ability to apply knowledge in different contexts.

		CRITICAL THINKING		
		Thinking	Reflecting	Action
		Elementary	Intermediate	Advanced
B L O O M  T A X O N O M Y	Factual	<b>Remember</b> recognise recall show list select choose	<b>Apply</b> select implement develop choose organise solve	<b>Evaluate</b> interpret compare contrast justify evaluate conclude
		Conceptual		
		Procedural	<b>Understand</b> interpret classify summarise infer compare explain	<b>Analyse</b> differentiate organise compare Distinguish Classify examine
	Meta-cognitive			

Figure 3: Critical Thinking & Bloom’s Taxonomy

The following table and subsequent explanations offer valuable insights into how critical thinking can be identified and assessed within specific contexts.

Table 4 provides key criteria for developing an understanding of how information can be categorised into factual, conceptual, procedural, metacognitive knowledge and drawing conclusions (Star & Stylianides, 2013; Braithwaite & Sprague, 2021; Antharjanam, 2021; Muthukrishnan, Kee, & Sidhu, 2019; Österman & Bråting, 2019).

Knowledge Category	Key Criteria
<p><b>Factual Knowledge</b> The basic elements that must be known about a discipline. It includes isolated pieces of information.</p>	<p>Based on verifiable information and empirical evidence. Can be easily checked for accuracy and correctness. Generally accepted as true within a specific domain or discipline.</p>
<p><b>Conceptual Knowledge</b> The interrelationship among the basic elements within a broader context that enable them to function harmoniously as a whole.</p>	<p>Understanding of abstract concepts, principles and theories. Comprehending underlying frameworks and structures. Recognising and identifying patterns and generalizations.</p>
<p><b>Procedural Knowledge</b> <i>(Logical and Analytical)</i> The ability to perform tasks using skills, algorithm, techniques and methods.</p>	<p>Knowing how to perform specific tasks, actions or procedures. Following established rules or algorithms. Identifying cause-effect relationships and drawing logical inferences. Applying critical thinking and problem-solving strategies.</p>
<p><b>Metacognitive Knowledge</b> Knowledge of cognition as well as awareness of one's own cognition.</p>	<p>Awareness and understanding of one's own thought processes and biases. Ability to monitor and regulate cognitive processes. Being conscious of one's own learning strategies and approaches.</p>
<p><b>Drawing Conclusions</b></p>	<p>Synthesising information from various sources and perspectives. Evaluating the credibility and reliability of sources. Applying logical reasoning and critical thinking. Considering potential implications and consequences.</p>

Table 4: Knowledge Category & Key Criteria

## ▶ Scenario M – Inter-college debate on Inclusive Education

To facilitate the development of argumentative skills among college students, an inter-college debate tournament has been organised for HSC students. The inaugural event centres around the theme of inclusive education. The debate topic that has been proposed for discussion is whether secondary schools should be mandated to implement inclusive education practices in the mainstream setting.



School debates serve as a valuable educational tool to develop critical thinking, communication skills, research abilities, teamwork, and empathy. They provide a platform for students to express their opinions, engage in intellectual discourse and foster the skills and attitudes necessary for informed and active participation in society.

By participating in this debate, students will also gain a deeper understanding of the challenges and benefits associated with inclusive education. Furthermore, the event aims to promote empathy and compassion, as students explore how inclusive practices can create a more equitable and supportive learning environment



for all. To ensure the success of the debate and maximise its impact on the participants, seasoned educators and expert debaters will be invited to serve as judges and mentors. They will provide valuable feedback and guidance to help students refine their argumentative skills and foster a healthy spirit of competition.

With such inter-college debate tournament, we can instill in the young minds the importance of critical thinking, effective communication, and the value of inclusive education in our society. Together, let's create an intellectually stimulating and inclusive environment where students can flourish and make a positive impact on our society.

To participate in this debate tournament, students should cultivate a thorough understanding of the issue of inclusive education and its interconnectedness with related concepts of inclusion. Table 4 serves to categorise specific information pertaining to inclusive education across different knowledge structures.

Concept	Factual Knowledge	Conceptual Knowledge (Knowledge of concepts, including principles and definitions)	Procedural Knowledge (Knowledge of procedures, including action sequences and algorithms used in problem solving)		
		<i>Logical</i>	<i>Analytical</i>	<i>Metacognition &amp; Drawing Conclusion</i>	
Inclusion	The understanding of the meaning of “inclusion” is crucial in distinguishing between “inclusion for some” and “inclusion for all.” Inclusion encompasses the act and practice of accommodating learners who have historically been excluded (as per the Merriam Webster Dictionary). Inclusive education, on the other hand, refers to the concept of having all children attend the same classrooms and schools, regardless of their diverse abilities and backgrounds.	Understanding of the meaning of inclusion in the specific context, that is, in education. Reference is made to school children learning in a school environment, regardless of disability, ability, race, gender, language, etc. There are two schools of thought regarding students with disabilities and their learning environment. One school of thought suggests that students with disabilities may learn better when they are not placed in the mainstream/regular setup, while the other school of thought maintains the opposite view.	Equal opportunity means providing individuals with fair and unbiased access to resources, opportunities, and experiences, regardless of their background, characteristics, or circumstances. It involves removing barriers and discriminatory practices that may hinder certain individuals or groups from fully participating and benefiting from educational, professional, and	Based on the notion of equal opportunity as stipulated in policy documents, to develop and implement inclusive teaching strategies. To ensure equal opportunity is practiced, the learning environments demand a reconfiguration. In weighing the pros and cons of selective inclusion (inclusion for some) versus inclusion for all, it is important to consider the broader benefits to the society. Selective inclusion may provide targeted support to specific students, addressing	It is important for each one to reflect on our personal biases and assumptions in relation to inclusion. In an inclusive set-up, where inclusion is limited to a certain group of students, there is a risk of marginalising students who do not meet the criteria for inclusion. This may result in inadequate support and limited access to resources for those who are excluded from the inclusive framework. Consequently, they may face challenges in achieving their academic potential.
Inclusive Education					

Inclusion for some		<p>mainstream/regular education setting. This indicates that a “one size fits all” approach is not suitable for special education needs (SEN) instruction.</p>	social opportunities in line with equal opportunity requirements.	<p>their unique challenges and maximising their potential. On the other hand, inclusion for all emphasises creating an environment where diversity is celebrated and everyone is given the opportunity to thrive. Both approaches have their merits, and the choice depends on the specific context and the goals of the community.</p>	<p>Research studies can provide insights into the effectiveness and impact of inclusive practices that target specific individuals or groups. By considering these perspectives and engaging in critical thinking, educators and policymakers can make informed decisions about inclusive education and create environments that promote the success and well-being of all students.</p>
Inclusion for all		<p>Those advocating for inclusive education argue that child development is influenced by more than just inherent abilities. It is also shaped by shared social values, access to educational institutions, technologies (including assistive technologies), and other pertinent social resources. The quality of support provided to the child and the opportunities available for them to participate in a community (reference is made to the regular settings) also play significant roles actively and equitably in their development.</p>			

Table 5: The inclusive education dilemma

Table 5 offers a comprehensive overview of the key aspects that should be taken into consideration when utilising the EIA-CT model for assessing critical thinking in arguments. In Table 6, valuable insight is provided on how to effectively conduct the assessment of critical thinking, taking into consideration the issue of concern presented in the scenario, as well as the ideas and concepts communicated in Table 5. This assessment is facilitated through the use of a set of assessment rubrics. Furthermore, Table 6 serves as a practical resource that outlines the specific rubrics to be used for assessing critical thinking within the given context. These rubrics provide a systematic and transparent framework for evaluating the quality of critical thinking demonstrated by the individuals involved.



A rubric is a tool used to evaluate the quality of a task. It typically consists of a set of criteria and a predefined scale or set of levels that describe different levels of achievement or proficiency. Each criterion represents a specific aspect or dimension of the task being assessed.

In the critical thinking process, it is essential to craft arguments that incorporate insightful claims, well-founded justifications and logical conclusions. Additionally, one must establish logical mapping and connections to enhance the coherence and effectiveness of the arguments. This framework is exemplified in sections 2-8, which provide valuable guidance on constructing robust and well-structured arguments.

Process of Criticality	Critical Thinking Stage	Description & Rubrics [regarding the current situation – concept of “Inclusion”]	Assessment Rubrics [some examples]	Marks
<b>Thinking</b>	<i>Elementary</i> [What is the issue/ dilemma?]	What does “inclusion” and its related concepts refer to within the education sector?	– Meaning of inclusion, inclusive education, inclusion for some/all.	

<p><b>Reflecting</b> (During the reflection phase, ideas from thinking phase may be reviewed.)</p>	<p><i>Elementary</i> [What course of action to follow?]</p> <p><i>Intermediate</i> [How to confirm the premises? What to conclude? Is help needed?]</p>	<p>What is the issue of concern? What strategies are available for inclusion and inclusive education for consideration in activities?</p> <p>What are the benefits and drawbacks for considering inclusion for some/all in inclusive education?</p>	<p>– Difference between inclusion and regular/ mainstream education like for instance, preferences to flexible grouping, role play, differentiated instruction to meet individual and not group learning needs.</p> <p>– Use of assistive technology in inclusive set-up.</p> <p>– Refer to examples of best practices in other countries.</p> <p>– Reference to legal policies.</p>	<p>0 – not present ½ – partially present 1 – adequately present</p>
<p><b>Action</b> (During the action phase, ideas from reflection phase may lead to reconsideration.)</p>	<p><i>Advanced</i> [If the issue is local, how to proceed to solve it? If it is not local, what alternatives exist?]</p>	<p>How can I effectively persuade stakeholders to make the right decision by presenting them with evidence-based research supporting the identified strategies for inclusive education and highlighting the associated benefits?</p>	<p>– Developing a proposal on the best system that can be implemented or further improved.</p>	

Table 6: Assessment of Critical Thinking



## Activity 11 – Assessment of Critical Thinking Through Rubrics

This activity is best conducted in groups with the assessment of work being performed by swapping tasks with other groups.

- With reference to the given scenario, clearly state the central issue, outline the premises that support the argument and clearly identify the conclusion. Make sure that the conclusion you reach is based on logical connections through logical mapping techniques to ensure coherence and consistency in the reasoning process.
- Use Table 6 (4<sup>th</sup> column) to identify all the assessment rubrics that relate to Thinking, Reflecting and Action. Feel free to identify additional rubrics that align with the three domains.
- Now, exchange your work with the other group to facilitate the marking process. By assessing each other's work, you can evaluate the quality of the reasoning. If your score exceeds 70%, it indicates active engagement in critical thinking.



Inter-college debate on Inclusive Education  
<https://forms.office.com/r/XVbyRvbn3v>



### Scenario N – Evaporation & Cooling

Some School Certificate students made an insightful observation regarding the relationship between environmental temperature, physical activity and sweating. They have keenly noticed that when the temperature rises or when they engage in physical activities like playing football or running, they experience sweating, which has a cooling effect on their bodies. By recognising the relationship between this cooling effect and the process of evaporation, a concept they have learnt in their physics studies, they are displaying an initial stage of critical thinking. To further nurture their critical thinking skills, they took the decision to apply their knowledge of the kinetic theory of matter and undertake an experiment aimed at providing a comprehensive explanation for why evaporation causes cooling.



This line of thinking showcases the students' ability to apply their knowledge from one subject area (physics) to explain a phenomenon they observe in another context (physical activity and sweating). It demonstrates a preliminary stage of critical thinking skills by recognising and making connections between different areas of knowledge.





- Based on the scenario, write down the claim and premises.
- What subject areas relate to the issue highlighted in the scenario?
- Draw an argument map with the respective logical connections to help you to come up with a sound conclusion.
- Write down the conclusion reached.
- Use Table 6 (4th column) to identify all the assessment rubrics that relate to Thinking, Reflecting and Action. Feel free to identify additional rubrics that align with the three domains.
- Now, exchange your work with the other group to facilitate the marking process. By assessing each other's work, you can evaluate the quality of the reasoning. If your score exceeds 70%, it indicates active engagement in critical thinking. What is the outcome?



Certainly, mathematics is a subject area that can be effectively interconnected with this situation, when examining relationships.



Evaporation & Cooling

<https://forms.office.com/r/aRWf5wncYH>

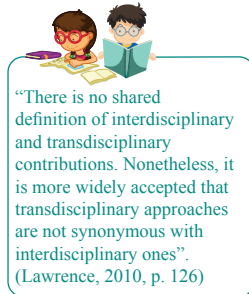
## Summary

In this section, the utilisation of scenarios as a tool for promoting critical thinking skills in learners is explored. Scenarios, whether real or hypothetical, engage learners in observing, analysing, evaluating and problem-solving within a given context. The Critical Thinking (CT) framework is introduced, which consists of three levels: thinking, reflecting and action. These levels align with Bloom's Taxonomy to enhance the identification and assessment of critical thinking in learners. The CT framework facilitates the development of basic, intermediate and advanced critical thinking skills. Bloom's Taxonomy is used in conjunction with the CT framework to assess learners' critical thinking abilities across different cognitive processes. Tables 2, 3, 4 & 6 help to categorise knowledge and criteria for assessing critical thinking in specific contexts. Additionally, rubrics are presented to evaluate the quality of critical thinking demonstrated in arguments. The importance of constructing coherent and well-structured arguments is emphasised.

## 8.0 INTERDISCIPLINARY/TRANSDISCIPLINARY EDUCATION & CRITICAL THINKING

### 8.1 INTERDISCIPLINARY EDUCATION

In previous sections, the processes to achieving critical thinking were discussed. Now, it is important to recognise that within those processes, the knowledge and skills acquired from various subjects come into play. This is actually an example of interdisciplinarity. Interdisciplinary education requires the integration of knowledge, methods and perspectives from multiple academic disciplines to create a more comprehensive and interconnected understanding of a subject or topic (Golding, 2009). Unlike traditional teaching and learning that focuses on individual subjects, interdisciplinary education promotes collaboration, critical thinking and the exploration of relationships and connections between different fields of study. By embracing an interdisciplinary approach, learners are encouraged to think critically and make meaningful connections across diverse disciplines.



On the other hand, the transdisciplinary approach to teaching extends beyond the mere integration of different disciplines. It encompasses educators from various fields collaborating not only with one another but also with other stakeholders to establish an interconnected framework within the curriculum (Lawrence, 2010). This approach offers students with the opportunity to collaborate and work together in solving complex problems that involve multiple facets, not necessarily learnt at school.

Real life problems often call on us to use our knowledge and skills from multiple subjects we have learned at school and experiences we had in life. According to Klein (2010), interdisciplinary education involves the integration of knowledge and methods from multiple disciplines to address complex problems or explore topics that cannot be adequately addressed within a single disciplinary framework. This approach promotes the development of a broader and more holistic



understanding by fostering connections and interactions between disciplines. Such an educational approach aligns well with the orientations outlined in our National Curriculum Framework (NCF, 2015).

Let's consider the case of Robin and Reshma from Activity 2 in Scenario B, Section 1.0 and their dilemma of locating independently the bread section in a large supermarket. While this task may appear straightforward for many people, it can be perceived as a complex problem for young children with autism or for someone who is making a first purchase at a supermarket. To navigate to the bread section in the supermarket, they will probably use their sense of sight to identify images of bread displayed. They can also rely on their sense of smell to guide them towards freshly baked bread. But since these steps may not suffice, they will simultaneously use the knowledge of languages learned in the English, French or Kreol classes to read any signage indicating “*Bread/Pain/Dipin*”. In case of difficulty, they may also ask customers or the supermarket staff for directions. Therefore, they will use their communication skills to politely ask their question and thank the people who have helped them. It is likely that when people are going to indicate the direction to the bread section, they will use words like ‘left’/gauche’ or ‘right/droit’. Robin and Reshma will then include their knowledge of these two orientations learned in the English/French classes. This example showcases Nissani’s (1997) assertion of the importance of interdisciplinary education in equipping students with the necessary skills for real world complexities that often require multidisciplinary perspectives and collaboration.

When it comes to students’ learning, Beane (1997) highlights the benefits of interdisciplinary education, emphasising its potential to enhance student engagement, critical thinking and problem-solving skills. Interdisciplinary education allows students to see the relevance and interconnectedness of different disciplines, providing them with a more comprehensive understanding of the subject matter. Interdisciplinary approaches help students to develop the ability to navigate and contribute to diverse fields and contexts, fostering adaptability and

creativity. The scenario below will illustrate the practical use of interdisciplinary education in a SEN classroom.

### Scenario O – Heavy and Light

Mrs Lugun teaches Mathematics in Grade 3 at a SEN school for children having learning disabilities. There are 12 students in this class who are between 10 to 17 years old but have the mental age of 7 years' old children. In the scenario below, Mr Lugun's class on the concept of heavy and light is described.

Mrs Lugun gathered her students in a circle and introduced the topic of weight. She explained that weight refers to how heavy or light an object such as a book or a pen is and informed them that they will explore this concept together in class.



She began by employing a practical example using a book and a pen, rather than relying on visual aids, which could potentially be abstract to some students. As she described these objects, the book and the pen, she introduced words related to weight, such as 'light', 'heavy', and 'weight', both verbally and by displaying them on the interactive board. Each student was then provided with a flash card featuring an object on it. They took turns standing up, showing their card and providing a description of the object. The students were encouraged to use the newly introduced words while describing their respective objects. Here, we can see that to open the lesson, the teacher made use of concrete objects that are familiar to the students to introduce the topic. This approach demonstrated the teacher's use of familiar, tangible objects to introduce the topic and effectively engage the students' sensory skills and language abilities in familiarising them with the content.

- Based on this scenario, write down the claim and premises.
- What subject areas relate to the issue highlighted in the scenario?
- Draw an argument map with the respective logical connections to help you to come up with a sound conclusion.
- Write down the conclusion reached.
- Use Table 6 (4th column) to identify all the assessment rubrics that relate to Thinking, Reflecting and Action. Feel free to identify additional rubrics that align with the three domains.

- f. Now, exchange your work with the other group to facilitate the marking process. By assessing each other's work, you can evaluate the quality of the reasoning. If your score exceeds 70%, it indicates active engagement in critical thinking.



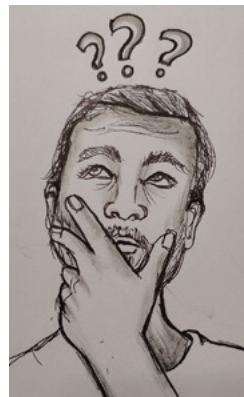
Heavy & Light  
<https://forms.office.com/r/MMi7Sb9BZF>

## Summary

This section discusses the importance of interdisciplinary education and its role in promoting critical thinking, collaboration and a comprehensive understanding of subjects. Interdisciplinary education involves integrating knowledge, methods and perspectives from multiple academic disciplines to address complex problems and explore topics that cannot be adequately addressed within a single discipline. It goes beyond traditional teaching by emphasising collaboration and the exploration of connections between different fields of study. On the other hand, the transdisciplinary approach to teaching extends this integration by involving educators from various fields and other stakeholders to create an interconnected web within the curriculum. This approach allows students to collaborate and solve complex problems that involve multiple facets and is not restricted to what is learnt at school. The section highlights the benefits of interdisciplinary education in developing student engagement, critical thinking, problem-solving skills, adaptability and creativity.

## 9.0 RESEARCH ON CRITICAL THINKING

It is important to recognise the significance of critical thinking in helping us solve problems effectively. Critical thinking involves deliberately inferring information and calculating different possibilities while steering all of them to make decisions that are appropriate and thoughtful in a particular context. In this booklet, all the presented scenarios explicitly outline the thinking process used to evaluate different outcomes. Evaluation plays a crucial role because real-life problems are often intricate and chaotic, requiring purposeful, logical and goal-oriented thinking to achieve desirable outcomes. Throughout this process, it may be necessary to adjust strategies and redefine the problem multiple times before arriving at a



solution through a carefully crafted course of action and feedback. Hence, the importance of evaluation cannot be overstated. The complexity of real-world problems, which often deviates from routine situations, justifies the educator's responsibility to foster critical thinking skills in his/her students.



“Virtually everyone would agree that a primary, yet insufficiently met, goal of schooling is to enable students to think critically.”  
(Willingham, 2008, p. 21)

In their study, Toy and Ok (2012) suggest a positive correlation between students' academic success and their critical thinking skills. They emphasise the importance of incorporating critical thinking in various subjects simultaneously, rather than focusing on a single subject. The authors emphasise the need for students to practice critical thinking in a “variety of educational settings continuously, consistently and for a longer period of time” (p. 52) to achieve the desired outcomes. Darling-Hammond's (2006) work predates Toy and Ok's research and sets the stage for their recommendations by highlighting the expectations placed on teachers to prepare students for higher-order thinking and performance skills that align with the demands of 21st-century education. In order to address contemporary challenges, it is essential for teachers to integrate critical thinking skills into the repertoire of skills and knowledge taught across various grades and subjects. (Ramma, Samy, & Gopee, 2015).

Several studies have demonstrated the effectiveness of problem-based learning as a teaching strategy in promoting critical thinking among learners (Birgili, 2015; Asyari, Al Muhdhar, Susilo, & Ibrohim, 2016; Seibert, 2020; Saepuloh, Sabur, Lestari, & Mukhlisoh, 2021). Similarly, Abrami et al. (2015) emphasised that student critical thinking skills can be enhanced when they tackle authentic and real-world problems. Hacıoğlu & Gülhan (2021) also suggest that STEM education can serve as another effective approach to foster students' critical thinking skills. Critical thinking, being a crucial cognitive skill, holds significant importance within educational contexts and beyond. It extends beyond the mere acquisition of knowledge and involves the ability to analyse, evaluate and synthesize information to make well-reasoned judgments (Andreucci-Annunziata, et al., 2023). Developing critical thinking skills requires students to engage in reflective and independent thinking, playing a vital role in enhancing intellectual abilities. Furthermore, encouraging students to reflect on their thinking processes, identify biases and evaluate the reliability of information can help them to become more effective critical thinkers.

Recent research on critical thinking does not only emphasise the importance of integrating critical thinking into educational curricula but also sheds light on several strategies to develop this skill in students. A meta-analysis conducted by Williams and Brown (2023), revealed a positive correlation between students' academic performance and explicit instruction in critical thinking. Explicit instruction refers to the intentional and systematic teaching of critical thinking skills, such as argumentation, problem-solving and evidence evaluation.

To foster growth of critical thinking among students, contemporary research emphasises the crucial role of educators in integrating metacognitive strategies into their teaching practices. Metacognition involves individuals' awareness and control over their own thinking processes. In a study conducted by Rivas, Saiz & Ossa (2022), it was demonstrated that metacognitive strategies, such as self-reflection and self-regulated learning, can significantly enhance students' critical thinking abilities. By encouraging students in reflective thinking, identifying biases and assessing the credibility of information, educators can effectively nurture more proficient critical thinkers.

Unfortunately, many education institutions, even universities, still heavily rely on lecture-based formats which are considered detrimental to the development of critical thinking skills in learners (Gaebel, Zhang, Bunescu, & Stoeber, 2018, Ramma, Samy, & Gopee, 2015). To overcome this issue, Dekker (2020) argues that modernising the education system is imperative for fostering the development of critical thinking skills among learners. One effective approach is to provide students with opportunities to engage with multiple disciplines and perspectives, enabling them to confront and navigate contradictions. These opportunities help students recognise that the world can be perceived from different viewpoints. Multidisciplinary curricula, active pedagogies and assessment practices often facilitate such opportunities (Dekker, 2020).

Research on critical thinking continues to evolve and advance. As our understanding deepens, scholars are uncovering new insights and refining existing theories. This ongoing progress in the field of critical thinking enables us to enhance our analytical and reasoning abilities, leading to more effective knowledge, problem-solving and decision-making skills. One significant area of development in critical thinking research involves the identification and assessment of cognitive biases (Battersby & Bailin, 2013). Researchers are constantly exploring the various cognitive pitfalls and biases that can hinder objective and rational thinking. By understanding these biases, we can develop strategies to mitigate their impact and promote more accurate and unbiased reasoning.

This booklet offers a systematic framework for students to develop and refine their critical thinking skills using an innovative approach centred around scenarios. By engaging in these exercises, both educators and students can enhance their ability to think critically, apply these skills across different disciplines and integrate discrete disciplinary thinking into meaningful and interconnected interdisciplinary thinking that resonates with our everyday experiences. Additionally, engaging students in analysing scenarios and subsequently encouraging deep discussions and debates with peers exposes them to diverse perspectives. This exposure challenges their assumptions and encourages them to engage in critical analysis and uncover their cognitive biases.

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**CRITICAL**  
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