PEDAGOGICAL STRATEGIES

for 21st-Century Classrooms

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The publisher, ERRCD Forum, affirms that each chapter in this book underwent a rigorous double-blind peer review process. This process ensures that each chapter was reviewed by two independent experts in the field, with the identities of both the authors and reviewers remaining anonymous to one another throughout the review. Chapters were subjected to this thorough peer-review process only after the editorial team evaluated their quality and relevance to the overall scope of the book.

Justification and Book Synopsis

The book *Pedagogical Strategies for 21st-Century Classrooms* addresses a critical need within contemporary education by providing a comprehensive dual-purpose resource that supports both educators and learners in optimising the teaching-learning process. In all educational contexts, effective teaching and learning are pivotal for individual, institutional, and national growth. The dissemination of quality knowledge necessitates not only the selection of the most appropriate pedagogical strategies but also the adaptation of these strategies to specific classroom contexts. This book effectively bridges a significant gap in current educational literature by focusing on the dynamics of teaching methodologies and learning strategies tailored to diverse classroom environments. By offering a "2-in-1" format, the book serves as a companion for both educators—lecturers, instructors, and teachers—and students, thereby making it a versatile addition to the educational toolkit. In each section, readers are introduced to essential strategies that foster a more structured teaching approach while also promoting a more self-directed learning experience.

Chapters 1 through 10 are specifically designed for instructors across all levels of education, presenting ten essential teaching strategies that address real-world classroom challenges in an organised and practical manner. These chapters encompass a diverse range of methods that educators can employ to foster a more inclusive and dynamic learning environment. Chapter 1 introduces Collaborative Teaching, which encourages group-based interactions and facilitates peer learning among students, whilst Chapter 2 explores Cooperative Teaching, which emphasises the shared responsibility between educators and students in the learning process. In Chapter 3, the text examines Problem-Posing Teaching, a method that aids students in developing critical thinking skills by presenting real-world problems as learning opportunities. Progressing to Chapter 4, Inquiry-Based Instruction promotes a student-centred approach, encouraging learners to engage deeply with topics through questioning and investigation. Visual learning is addressed in Chapter 5, which discusses Visualization as a Teaching Strategy, guiding educators on the effective use of visual aids to enhance comprehension and retention. Chapter 6 focuses on Differentiation, a crucial strategy for adapting instruction to meet diverse student needs, ensuring that all learners are engaged and challenged according to their abilities. In Chapter 7, Technology-Based Teaching is explored, equipping educators with contemporary digital tools to enhance the learning experience and align with 21st-century digital expectations. Chapter 8 discusses Modelling as a Teaching Strategy, which involves demonstrating processes or skills for students to observe and replicate. Chapter 9 centres on Focus-Group Teaching, providing educators with strategies for facilitating productive small-group discussions that cater to various learning styles. Finally, Chapter 10 addresses Behaviour Management in Classrooms, a fundamental component in maintaining a conducive learning environment, offering tools and techniques for educators to manage and support positive student behaviour. Collectively, these ten chapters offer guidance to educators in effectively applying a variety of teaching methodologies, tailored to the unique dynamics and needs of their classrooms.

For students, Chapters 11 through 20 provide a foundational framework for developing self-directed learning skills, which are essential for navigating the complex and evolving landscape of modern education. Each chapter introduces learners to a distinct, research-backed learning strategy, allowing them to select and apply techniques that best support their individual objectives. Chapter 11 commences with Collaborative Learning, facilitating peer interactions that benefit students, while Chapter 12 explores Cooperative Learning, emphasising teamwork and shared goals. Chapter 13 introduces Experiential Learning, suitable for hands-on, practical applications, fostering a profound connection between theory and practice. Chapter 14 elucidates Spaced Practice, a technique proven to enhance long-term retention by distributing learning over time. Chapter 15 addresses Learning, Relearning, and Unlearning (LRU), an adaptive strategy that encourages students to continuously refine their knowledge base. Chapter 16 teaches Exemplification Learning, instructing students to utilise examples to clarify and reinforce concepts, while Chapter 17 focuses on Role Modelling, encouraging learners to emulate successful practices and behaviours. Chapter 18 covers Interleaved Practice, a technique that involves integrating different topics or skills to improve learning outcomes. Chapter 19 discusses Imagery and Visualised Learning, which employs mental visualisation to strengthen memory and comprehension, whereas Chapter 20 concludes with Elaborative Interrogation, a strategy that encourages students to deepen their understanding by engaging with questions of 'why' and 'how'. Collectively, these chapters guide students in selecting and refining learning strategies that enhance their cognitive skills, foster resilience, and promote adaptability. By adopting these techniques, students are empowered to approach their studies with intentionality and critical awareness, thus becoming active participants in their own educational journeys.

Pedagogical Strategies for 21st-Century Classrooms fills a crucial gap in educational literature by being one of the few resources that comprehensively address both dimensions of the educational equation: teaching and learning.

It transcends traditional guides that often focus solely on teaching methods or learning strategies, recognising that a holistic approach to the educational process is essential in contemporary classrooms. The book's structure—divided between educators and students—facilitates a more collaborative approach to knowledge production, rendering it a valuable resource for enhancing the quality of education and supporting lifelong learning skills in both teachers and students alike.

Editorial information

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Emmanuel Olusola Adu is an inaugurated Professor of Teacher Education and Education Research. He is a seasoned educationist and administrator. In addition to being a former dean of the Faculty of Education at BA ISAGO University in Botswana, Faculty of Education Research Coordinator and Deputy Dean of Research and Internationalisation at the University of Fort Hare, Professor Adu served as chairperson of the academic recruitment and appointment committee. He was also a former President of the Global Education Network (GEN), a professional member of the Academic Network on Global Learning and Education (ANGEL), and a Research Emeritus of the International Association of Research Scholars and Administrators (REIARSA). His passion for education has led him to develop curricula that have attracted international recognition and funding from the governments of Botswana and South Africa. He has received numerous grants for overseas trips and is a member of various professional associations in the Republic of South Africa (RSA) and beyond. He was a member of the executive committee of the South African Education Research Association (SAERA). Professor Adu has won the Vice-Chancellor's Senior Researcher Medal Awards for 2015 and 2017 from the Faculty of Education and the University of Fort Hare, respectively. Through public lectures, leading papers, and keynote addresses, he has promoted various universities into the limelight. With over 25 years of experience in administration and lecturing across different African countries, the UK, and the USA, Professor Adu has taught various education-related modules and has held several management positions since 1999. He has an impressive record of more than 200 publications across 18 countries and has supervised students at all levels. He has participated in the planning and implementation of academic curricula and belongs to the editorial boards of reputable journals. Additionally, he serves as a guest editor, editorial consultant, editor-in-chief, and reviewer for numerous journals worldwide. He has written a proposal for UNESCO on ICT in education for equity and equality in Africa and has secured many research grants while supervising numerous postdoctoral fellows.

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Bunmi Isaiah Omodan is an NRF-rated researcher at Walter Sisulu University in South Africa. He holds a PhD in Education Management and Leadership, a master's degree in Educational Management, and a BA Ed in English Language. Additionally, he serves as the Editor-in-Chief of three accredited journals and acts as an editorial member and guest editor for various other renowned journals. Throughout his academic career, Bunmi Omodan has received numerous prestigious research awards. In 2023, he was honoured with the Vice Chancellor's Distinguished Award from Walter Sisulu University. That same year, he was recognised as the most productive researcher at the institutional level and the most productive senior researcher at the Butterworth Campus of Walter Sisulu University. His achievements extend beyond 2023; in 2021, he was acknowledged as a top researcher by the Faculty of Education at the University of the Free State, where he also received a significant monetary research award. Additionally, in 2020, he secured 1st Prize in the Learning and Teaching Research Awards at the University of the Free State. Earlier in his career, in 2019, he won the PhD 1st Prize in an essay competition at the UFS QwaQwa campus, with his essay titled "Decoloniality in the 21st Century Classroom." In addition to his research accomplishments, Bunmi Omodan is an active member of several professional associations, including the South African Education Research Association (SAERA), the British Education Leadership, Management and Administration Society (BELMAS), the Nigeria Association for Educational Administration and Planning (NAEAP), and the Commonwealth Council for Educational Administration and Management (CCEAM). He has also supervised numerous postgraduate students. To date, he has published one book monograph, two edited books, and 100 articles in various local and international journals, book chapters, and conference proceedings. His research interests encompass a range of topics, including qualitative and quantitative research approaches, social and Africanised pedagogy, and conflict management from a decolonial perspective.

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Benjamin Damoah is a distinguished Teaching Scholar of the Association of College and University Educators (ACUE) in the United States. He holds the position of Research Fellow at the University of Fort Hare in South Africa and serves as an instructor in Weather and Climate at the School of Biological, Environmental, and Earth Sciences within the Department of Geography and Geology at the University of Southern Mississippi, United States. He has over 20 years of teaching experience in the educational community. He holds a Doctor of Philosophy and a master's degree in environmental education, along with a Master of Science in Geography. Additionally, he earned a Bachelor of Education in Environmental Education, an Advanced Certificate in Education, and a Teacher's Professional Certificate "A." His professional affiliations include the American Association of University Professors (AAUP), the Association of Geohazard Professionals, the North American Association for Environmental Education (NAAEE), and the American Association of Geographers (AAG). Dr Damoah is an established Environmental Geographer with expertise in Environmental Education, climate change, climate resilience, climate adaptation, climate mitigation, environmental justice, wetlands delineation, Geographic Information Systems (GIS), natural hazards, risks, vulnerabilities, and sustainable planning development. He serves on the editorial boards of respected journals indexed in the Web of Science and acts as a reviewer for high-impact journals. His contributions include co-supervising master's and PhD candidates and producing impactful articles and book chapters with an environmental slant. Notably, he has made significant progress in shaping environmental policies and curricula through his involvement in U.S. federal grant projects and participation in international conferences.

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Chapter 1: Collaborative Teaching in Classrooms

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1.1. Concept Map
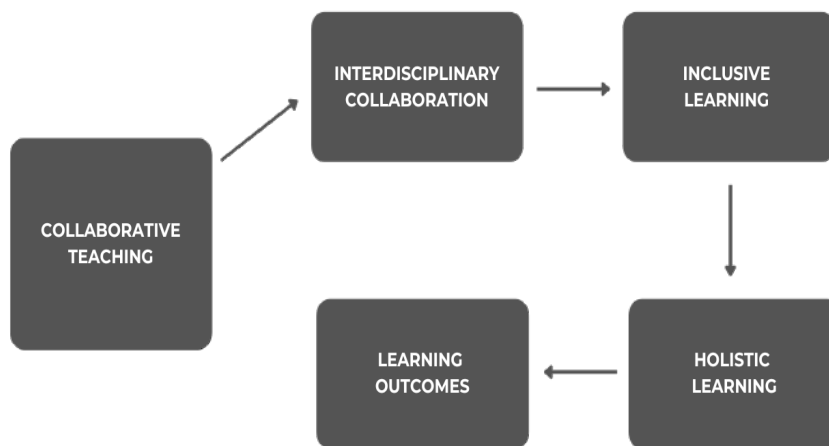
In the context of collaborative teaching, multiple educators coalesce their skills and knowledge to create an enriched learning environment, termed an "Interdisciplinary Collaboration." This environment is "Inclusive," meaning it is tailored to cater to diverse learning needs and backgrounds, ensuring equitable opportunities for all students. Within this inclusive setting, learning is "Holistic," focusing on the intellectual, emotional, creative, and all-encompassing development of each student. This map aims to achieve specific "Learning Outcomes," which are predetermined knowledge, skills, values, and attitudes that students are expected to acquire. This map illustrates a dynamic, comprehensive, and inclusive approach to education, aiming to optimise learning experiences and outcomes for all students involved.

1.2. Learning Outcomes

The learning outcomes of this chapter on Collaborative Teaching in Classrooms are multifaceted and designed to provide readers with a comprehensive understanding of the subject. By the end of this chapter, readers should be able to:

- Gain a solid understanding of what collaborative teaching entails, its foundational principles, and its various implementations in the educational landscape.
- Appreciate the relevance and importance of collaborative teaching in modern, diverse classrooms and its impact on creating inclusive learning environments.
- Critically analyse and understand the advantages and disadvantages of collaborative teaching, allowing for a balanced and informed perspective on its implementation.
- Acquire knowledge of various techniques and best practices in effective collaborative classrooms and apply these techniques to create enriching learning experiences.
- Develop skills to effectively prepare and structure collaborative classrooms, considering the key elements required for successful implementation.
- Analyse and reflect on the provided case studies to gain insights into the practical applications, challenges, and solutions in collaborative teaching scenarios.
- Integrate inclusive teaching strategies and interdisciplinary approaches in designing and delivering lessons to cater to diverse learning needs and preferences.
- Engage in reflective practices to assess the effectiveness, challenges, and areas for improvement in collaborative teaching practices within their teaching context.

1.3. Clarification of key terms

Collaborative Teaching: Collaborative teaching, also known as co-teaching or team teaching, refers to an educational approach where multiple educators work together to plan, instruct, and assess a group of students. This approach aims to leverage diverse teaching styles and methodologies to enrich the learning environment.

Interdisciplinary Collaboration: This term refers to the integration of different subject areas or disciplines in teaching, allowing students to explore connections between various fields of knowledge and apply concepts and skills across different subjects.

- **Inclusive Learning Environment:** An inclusive learning environment is one in which students of all backgrounds, abilities, and needs have equitable opportunities to participate and succeed. It values diversity and seeks to meet the individual needs of each student, ensuring that everyone feels valued and supported.
- **Holistic Learning Environment:** This refers to a learning setting that considers the intellectual, emotional, social, physical, artistic, creative, and spiritual development of students. It focuses on engaging students in the learning process and emphasises the development of the whole person.
- **Learning Outcomes:** Learning outcomes are the specific knowledge, skills, abilities, values, and attitudes that students are expected to gain, develop, or achieve as a result of completing a course or engaging in a learning activity. They are clear, measurable statements that describe the knowledge learners will acquire or the skills they will be able to demonstrate after a learning experience.

1.4. Introduction to Collaborative Teaching

Collaborative Teaching, synonymous with co-teaching or team teaching, epitomises a progressive instructional strategy wherein multiple educators synergise to plan, organise, instruct, and assess a diverse group of students. The fundamental essence of this approach lies in the convergence of the diverse knowledge, skills, and experiences of educators, positing a holistic and rich learning milieu that is adaptive, inclusive, and multifaceted, transcending the limitations of a single-teacher model (Maolida & Sofarini, 2022). It amalgamates varying teaching methodologies, learning modalities, and instructional paradigms to create an enriched learning environment encompassing a broad spectrum of learners. This collaborative pedagogical model fosters a dynamic interactional space, allowing for a multiplicity of perspectives, interactive dialogue, and communal learning, thereby enhancing the cognitive, social, and developmental aspects of learning. The resultant multidimensional learning ecosystem not only caters to diverse learning needs and preferences but also promotes inclusivity, equity, and holistic development, rendering it a pivotal educational strategy in contemporary learning environments.

Collaborative Teaching emerges from Vygotsky's sociocultural theory, which posits that social interaction is fundamental to cognitive development (Vygotsky, 1978). In the context of education, this translates to a learning environment where teachers with varying teaching styles and expertise come together to create a multidimensional and inclusive learning experience. This teaching modality is pivotal in addressing the diverse learning needs of students, thereby contributing to an equitable and inclusive learning environment.

In today's ever-evolving educational landscape, the significance and practicality of collaborative teaching have attained unprecedented prominence, responding adeptly to the escalating diversity in classrooms regarding students' learning preferences, capabilities, and backgrounds (Murawski & Lochner, 2011). The fluidity, inclusiveness, and adaptability inherent in this teaching modality are imperative in addressing the intricate tapestry of individual learning needs, fostering an environment where every student feels valued and included. By seamlessly melding diverse teaching philosophies, methodologies, and viewpoints, collaborative teaching orchestrates a holistic and enriching learning ambience, meticulously attuned to the singular needs and aspirations of each learner, thus manifesting as a beacon of transformative and inclusive education in the contemporary academic sphere.

This chapter embarks on a journey to explore the multifaceted domain of collaborative teaching. It delves deep into the conceptual model, the desired learning outcomes, and crucial terminologies to furnish a thorough understanding of this educational strategy. It explores the advantages and disadvantages of collaborative teaching, shedding light on its practical implications in fostering a collaborative classroom environment. It will also delve into the techniques essential for establishing effective collaborative classrooms and present the dos and don'ts to help educators avoid common pitfalls associated with this teaching approach. Additionally, it presents real-world scenarios through case studies to depict the practical implementation and implications of collaborative classroom teaching. This exploration aims to equip educators, school administrators, and other stakeholders with insights and tools to effectively implement and optimise collaborative teaching strategies in various learning environments. Through this comprehensive examination, readers will gain insights into the theoretical underpinnings, practical applications, and impactful outcomes of collaborative teaching, facilitating a deeper understanding and appreciation of this transformative educational strategy.

1.5. Collaborative Teaching in Classrooms

Collaborative teaching in classrooms unfolds as a dynamic, multifaceted instructional paradigm, allowing educators with divergent expertise and perspectives to converge in a collective endeavour to deliver enriched instruction and bolster student learning. This innovative approach is anchored in the foundational belief that the amalgamation of assorted teaching styles and instructional methodologies augments the educational ambience, creating a milieu that is intuitively responsive and inclusively attuned to the myriad needs of students (Maolida & Sofarini, 2022). The confluence of distinct pedagogical strategies within this model weaves a rich tapestry of learning experiences, embracing diversity and fostering a harmonious balance between individual needs and collective learning objectives. The inherent versatility and adaptability of collaborative teaching are instrumental in cultivating an academic ecosystem that is vibrant, equitable, and learner-centric, facilitating the holistic development of students by nurturing their intellectual curiosity, critical thinking, and collaborative skills, thereby elevating the overall educational experience to new pinnacles of excellence and inclusivity.

In essence, collaborative teaching aims to amalgamate the unique strengths and skills of individual educators to create an enriching and balanced educational experience for students. It employs strategies like co-planning, co-instruction, and co-assessment, enabling seamless integration of diverse teaching methodologies within the classroom (Bacharach et al., 2010). The underlying rationale for implementing collaborative teaching is the acknowledgement that learning is a social construct deeply rooted in Vygotsky's sociocultural theory, which emphasises the role of social interaction and cultural context in cognitive development (Vygotsky, 1978). The interactions and discussions facilitated by multiple educators in a collaborative setting enrich the learning context and promote higher-order thinking, problem-solving, and critical reflection among students.

The indispensability of collaborative teaching in classrooms gains pronounced relevance in today's educational landscape, marked by unprecedented diversity in student demographics, each presenting a unique amalgam of learning needs, preferences, and cultural backgrounds (Murawski & Lochner, 2011). In this intricate mosaic of learner diversity, collaborative teaching emerges as a beacon of inclusivity, offering a meticulously structured yet inherently adaptable framework. This framework is quintessential for educators to encapsulate a wide spectrum of learning styles and proclivities, creating an environment that is not only conducive to individual learning trajectories but also instrumental in fostering a profound sense of community and collective belonging.

This harmonious blend of individualised learning and communal interaction under the aegis of collaborative teaching is pivotal for accentuating academic outcomes and cultivating holistic well-being among students. It acts as a catalyst, facilitating the creation of learning environments that are responsive, inclusive, and supportive, thus enabling educators to transcend conventional teaching paradigms and embrace a more nuanced,

multifaceted approach that resonates with the diverse needs and aspirations of the contemporary student populace.

1.6. Advantages and disadvantages of collaborative teaching

This section discusses the disadvantages of collaborative teaching to provide a better understanding of the practical implications inherent in the concept for educators.

a. Advantages of Collaborative Teaching

- Enhanced Learning Environment: Collaborative teaching fosters a richer and more diverse learning environment. The amalgamation of different teaching styles, methodologies, and perspectives can address various learning preferences and needs, catering to a wider range of students (Friend & Cook, 2003).
- Increased Student Engagement: The varied instructional strategies and active interaction between teachers and students in a co-teaching environment can lead to increased student engagement and participation, both of which are crucial for effective learning (Graziano & Navarrete, 2012).
- Professional Development: Teachers involved in collaborative teaching often experience enhanced
- professional development through the continuous exchange of ideas, teaching strategies, and reflections on their teaching practice, contributing to their professional growth (Murawski & Lochner, 2011).
- Individualised Attention: With multiple educators in the classroom, students receive more individualised attention and support, which can be particularly beneficial for students with special needs or those struggling with the material (Maolida & Sofarini, 2022).
- Diversity and Inclusion: Collaborative teaching promotes diversity and inclusion within the classroom. It supports the integration of students with diverse needs and backgrounds, fostering a sense of community and mutual respect among all learners (Walther-Thomas, 1997).

b. Disadvantages of Collaborative Teaching

- Planning and Coordination Challenges: The necessity for meticulous planning and constant coordination can be daunting and time-consuming. Misalignment in teaching philosophies and styles can lead to inconsistencies and conflicts (Gately & Gately, 2001).
- Resource Constraints: Implementing collaborative teaching effectively often requires additional resources like time, space, and teaching materials, which may not be readily available in all educational settings (Bacharach et al., 2007).
- Unequal Participation: One teacher might dominate the teaching process, leaving the other as a mere spectator. This unequal participation can undermine the essence of collaborative teaching and hinder its effectiveness (Graziano & Navarrete, 2012).
- Assessment Difficulties: The differing instructional strategies and assessment methodologies used by
- collaborating teachers might create confusion and inconsistencies in evaluating students' performance and learning outcomes (Murawski & Lochner, 2011).
- Resistance to Change: Both educators and students accustomed to traditional teaching models may resist the shift to a collaborative approach. This resistance can impede the successful implementation and acceptance of collaborative teaching methods (Maolida & Sofarini, 2022).

1.7. Preparing a collaborative classroom

Preparing a collaborative classroom necessitates meticulous planning, organisation, and the integration of diverse teaching methodologies to create an inclusive and interactive learning environment. Here's a breakdown of how educators can prepare a collaborative classroom. It is important for educators to understand that creating a collaborative classroom involves developing an ecosystem where they collaboratively structure learning experiences that are inclusive, engaging, and responsive to the diverse needs of students, thereby facilitating a synergistic learning environment.

i. **Set Clear Objectives:** Before initiating a science project on ecosystems, teachers collaboratively define clear, attainable objectives like understanding the components of an ecosystem, recognising different types of ecosystems, and creating models of chosen ecosystems. These objectives guide the instructional process and assessment strategies.

ii. **Create a Positive Learning Environment:** Teachers establish ground rules that foster respect, tolerance, and open-mindedness. In a literature class, students are encouraged to express diverse perspectives on a text, ensuring that discussions are constructive and inclusive of varying viewpoints.

iii. **Design Diverse Learning Activities:** In a mathematics class, teachers organise learning stations featuring different activities—problem-solving tasks, interactive games, and practical applications—allowing students with different learning preferences to engage with the content in multiple ways.

iv. **Structure Grouping Strategically:** For a history project on ancient civilisations, teachers assemble heterogeneous groups, mixing students with different abilities, learning preferences, and backgrounds to ensure diverse viewpoints and a range of skills within each group.

v. **Integrate Technology:** Teachers employ digital tools like Google Classroom for sharing resources, Kahoot! for interactive quizzes, and Zoom for breakout sessions, enabling varied and flexible learning experiences.

vi. **Allocate Roles and Responsibilities:** In a collaborative English writing project, one teacher focuses on providing feedback on content and organisation, while the other concentrates on grammar, punctuation, and style, ensuring that all aspects of writing are addressed.

vii. **Implement Differentiated Instruction:** In a mixed-ability class studying geography, one teacher could work with a group needing additional support in understanding topographical concepts while the other teacher challenges advanced learners with extension activities.

viii. **Establish Assessment Criteria:** While planning a collaborative art assignment, teachers jointly develop rubrics outlining the assessment criteria for creativity, technique, presentation, and collaboration, providing clear expectations to students.

ix. **Regularly Review and Reflect:** Example: Post a collaborative science experiment session, teachers meet to discuss the effectiveness of the learning activities, student engagement, and areas for improvement, adapting their strategies based on reflections.

x. **Encourage Student Autonomy:** In a language class, students are empowered to choose topics for group discussions, lead conversation sessions, and provide peer feedback, fostering a sense of responsibility and ownership of learning.

1.8. Techniques for effective collaborative classrooms

Effective collaborative classrooms leverage a myriad of techniques to enhance learning experiences and outcomes. Below are five extensively discussed techniques integral to fostering a successful collaborative learning environment. When well implemented, these techniques forge a cohesive and inclusive atmosphere within collaborative classrooms. Differentiated instruction, strategic grouping, integrative technology use, formative assessment, and reflective practice and feedback are instrumental in optimising learning experiences, fostering student engagement, and elevating academic outcomes in a diverse educational setting. By intertwining these techniques with collaborative values, educators can create classrooms that are responsive, dynamic, and conducive to holistic learning and development.

i. **Differentiated Instruction:** Differentiated Instruction is a pivotal technique in collaborative classrooms. It involves adapting content, processes, products, and the learning environment to meet the diverse needs of students. By modifying instruction based on students' readiness levels, interests, and learning profiles, educators can provide varied learning experiences that cater to individual needs. For example, in a class studying ecosystems, differentiated instruction might include using a range of instructional materials such as videos, readings, and interactive activities to explain concepts. Students could be given choices in demonstrating their understanding through projects, presentations, or written assignments, allowing them to engage with the content in ways that align with their learning preferences and abilities.

ii. **Strategic Grouping:** Strategic grouping is essential for promoting student interaction and learning. It involves creating diverse groups that incorporate a mix of abilities, backgrounds, and perspectives to facilitate a rich exchange of ideas and collaborative problem-solving. For example, teachers can form heterogeneous groups for a mathematics project, combining students with varying mathematical proficiencies and learning styles. This approach enables students to learn from each other's strengths, fostering peer learning and enhancing their overall understanding of mathematical concepts.

iii. **Integrative Technology Use:** The adept integration of technology is crucial in modern collaborative classrooms. It can provide diverse learning resources, facilitate interaction, and offer varied avenues for expression and assessment. For example, teachers can utilise platforms like Google Classroom for resource sharing and assignment submissions, as well as apps like Padlet for collaborative brainstorming and idea sharing. Educational games and interactive simulations can also be employed to enhance engagement and learning..

iv. **Formative Assessment:** Formative assessment is central to monitoring student progress and adapting instructional strategies. It provides immediate feedback, allowing educators and students to identify areas for improvement and adjust their approaches accordingly. For example, in a history class, teachers can use quizzes, reflective discussions, and concept mapping activities to gauge students' understanding of historical events and themes. The insights gleaned from these assessments enable teachers to tailor subsequent instruction and provide targeted support.

v. **Reflective Practice and Feedback:** Reflective practice and feedback are cornerstones of continuous improvement in collaborative classrooms. Teachers and students engage in regular reflection on learning experiences and outcomes, using feedback to refine instructional strategies and learning approaches. For example, after a collaborative science experiment, teachers and students can discuss the learning process, the effectiveness of collaboration, and their understanding of scientific concepts. Teachers can provide constructive feedback on group dynamics and individual contributions, while students can reflect on their learning and collaboration skills.

1.9. Dos and don'ts in Collaborative teaching

Navigating collaborative teaching requires educators to be mindful of various dos and don'ts to ensure the effectiveness and productivity of the collaborative environment. Here are some critical dos and don'ts in collaborative teaching. Adhering to these can significantly enhance the efficacy of collaborative teaching, fostering a harmonious and constructive learning environment. By embracing proactive communication, inclusivity, varied teaching strategies, regular feedback, and reflection, while avoiding isolation, neglect of individual needs, and resistance to feedback, educators can optimise the collaborative teaching model for superior learning outcomes.

i. Dos in Collaborative Teaching

- **Do Establish Clear Roles and Responsibilities:** Clearly defining and assigning roles can prevent misunderstandings and ensure smooth collaboration between teachers, enabling each educator to contribute their strengths to the learning process effectively.
- **Do Plan and Communicate Regularly:** Regular planning and open communication are crucial for aligning instructional strategies, assessment methods, and learning goals, ensuring consistency and coherence in teaching.
- **Do Foster an Inclusive Environment:** Cultivate a learning atmosphere where diverse ideas, backgrounds, and learning needs are respected and valued, ensuring that every student feels included and supported.
- **Do Employ Varied Teaching Strategies:** Incorporate a range of teaching methodologies and instructional materials to cater to different learning preferences and needs, enhancing student engagement and understanding.
- **Do Provide Constructive Feedback:** Offering timely, specific, and constructive feedback can aid in the continuous improvement of teaching practices and student learning, fostering a culture of reflective learning and improvement.

ii. Don'ts in Collaborative Teaching

- **Don't Work in Isolation:** Avoid working independently without coordinating with co-teachers. The lack of collaboration can lead to inconsistencies in teaching and learning experiences, hindering the effectiveness of collaborative teaching.
- **Don't Neglect Professional Development:** Refrain from overlooking opportunities for professional growth. Regularly participating in professional development can enhance collaborative skills and keep educators abreast of best practices in collaborative teaching.

- **Don't Ignore Individual Needs:** Avoid focusing solely on group activities and neglecting students' individual learning needs. Balancing group activities with individualised support is crucial for addressing the diverse needs of all students.
- **Don't Resist Feedback and Reflection:** Avoid dismissing feedback and reflective practices, as they are integral for improving teaching practices and learning outcomes. Regularly reflecting on experiences and being receptive to feedback can lead to more effective collaboration.
- **Don't Overlook Assessment Alignment:** Avoid using misaligned assessment strategies. Ensuring that assessment methods align with learning objectives and instructional strategies is crucial for accurately gauging student learning.

1.10. Case Studies in Collaborative Teaching

Four case studies of collaborative teaching are provided below. These diverse scenarios exemplify the versatility, adaptability, and potential of collaborative teaching in addressing different learning needs and objectives. They highlight how collaborations between teachers from different disciplines can lead to richer, more integrated learning experiences, promoting deeper understanding, critical thinking, creativity, and inclusivity among students.

Case Study 1: Elementary School Literacy and Art Integration

Scenario: This scenario involves an elementary school Art teacher and an English teacher. The collaboration involved students illustrating the stories they wrote, integrating literacy with artistic expression to visualise narratives creatively.
Objective: The objective was to intertwine literacy skills with artistic expression, allowing students to connect deeper with their narratives and enhance their storytelling through visual representation.
Outcome: The integration led to richer, more imaginative storytelling, reflecting a deeper comprehension and connection with the narratives. The enthusiasm among the students increased, and both teachers observed more detailed and vibrant narratives, underscoring the enriched learning experience due to the integration of art with literacy.
Reflection: The initiative underscores the significance of blending diverse learning domains. It illustrates how such collaborations can foster creativity, enrich learning experiences, and deepen students' understanding and connection with the subject matter, leading to a more holistic learning environment.

Case Study 2: Middle School Mathematics and Physical Education Collaboration

Scenario: A Middle School collaboration involved a Physical Education teacher and a Mathematics teacher. The collaboration focused on designing activities that combined mathematical concepts with physical performances, enabling students to measure and analyse their performances through mathematical lenses.
Objective: The collaboration aimed to apply mathematical concepts practically to understand and improve physical activity performances, thereby contextualising mathematics within physical education.
Outcome: The students demonstrated a clearer grasp of mathematical concepts and showed keen interest and engagement in physical activities. The practical and engaging approach illustrated the real-world relevance of mathematical concepts and provided students with a more integrated and contextual learning experience, emphasising the correlation between physical activities and mathematical applications.
Reflection: This collaborative endeavour highlighted the effectiveness of integrating different subjects to make learning more contextual, relevant, and engaging. It showcases the potential of collaborative teaching in enhancing students' understanding and appreciation of the practical application of academic knowledge in everyday scenarios.

Case Study 3: Collaborative Teaching in a Multilingual Classroom

Scenario: This case involves an ESL (English as a Second Language) teacher and a Social Studies teacher co-teaching in a classroom with diverse linguistic backgrounds. The teachers integrated language development strategies within social studies content to support English language development, enabling effective engagement with social studies content.

Objective: The objective was to promote English language proficiency and ensure that all students, regardless of their language backgrounds, could access, understand, and engage with social studies content effectively and inclusively.

Outcome: The collaboration resulted in improved language proficiency among English language learners and a better understanding of social studies concepts. It facilitated an inclusive learning environment, allowing equitable participation and learning experiences for all students and highlighting the effectiveness of collaborative strategies in addressing linguistic diversity in classrooms.

Reflection: This case emphasises the essential role of collaborative teaching in creating inclusive learning environments. It demonstrates how integrating diverse teaching strategies can address varied learning needs effectively, ensuring that each student, regardless of their linguistic background, can have equitable and meaningful learning experiences.

1.11. Conclusion

In conclusion, this chapter has traversed the multidimensional landscape of collaborative teaching, illuminating its pivotal role in shaping inclusive, diverse, and integrative learning environments. Through a meticulous exploration of the foundational concepts, practical implementations, and various techniques of collaborative teaching, it is evident that this approach is indispensable in addressing the heterogeneous needs and preferences inherent in contemporary classrooms. The diverse case studies underscore the adaptability and versatility of collaborative teaching in bridging interdisciplinary gaps, enhancing holistic understanding, and fostering a sense of community among students. Furthermore, the reflection on the advantages and disadvantages, coupled with the dos and don'ts, provides a balanced perspective, enabling educators to optimise collaborative endeavours for superior learning outcomes. The effective preparation and structuring of collaborative classrooms are paramount in leveraging the synergies between varied teaching styles and instructional strategies. Ultimately, collaborative teaching emerges as a beacon of transformative education, anchoring learning experiences in mutual respect, shared responsibility, and continuous reflection, propelling education towards a future that values diversity, inclusivity, and collective growth.

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Chapter 2: Cooperative Teaching and Learning in Classrooms

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2.1. Learning Outcomes

By the end of this chapter, you should be able to;

- Define cooperative teaching and learning.
- Identify the advantages and disadvantages of cooperative teaching and learning.
- Describe the dos and don'ts in cooperative teaching and learning.
- Discuss various case studies related to cooperative teaching and learning.

2.2. Introduction to Cooperative Teaching and Learning

In this section, we introduce cooperative teaching and learning. For effective learning to occur, cooperative teaching is essential, as it involves various educational stakeholders working together to achieve the best outcomes in teaching and learning. It acknowledges that an individual cannot effectively engage in learning and teaching alone; rather, stakeholders such as peers, parents, and teachers play significant roles. A pre-service teacher must understand that collaboration with various educational stakeholders is crucial for the academic performance and well-being of any society. In this chapter, we will guide you on how to manage a cooperative teaching and learning environment. We will also discuss the advantages and disadvantages of cooperative teaching and learning. Let us begin by helping you understand what cooperative teaching entails within the classroom.

2.3. Cooperative Teaching and Learning in Classrooms

Cooperative teaching and learning is defined by Birgili, Kiziltepe, and Seggie (2016) as involving collaboration with learners to achieve a particular purpose. It is further noted that cooperative teaching plays a significant role in a child's development, which includes fostering learning motivation. Additionally, it is stated that cooperative teaching aligns well with instructional theory. According to Birgili, Kiziltepe, and Seggie (2016), the Turkish government employs this approach due to the crowded nature of their classrooms. Fallah, Hafezi, Makvandi, and Bavi (2022) applied the cooperative teaching method while exploring creativity in students' learning, specifically in a flipped classroom setting. In this context, arranged resources, internet blogs, films, concepts, and virtual groups were utilised. To implement this cooperative teaching model, teachers involved in the project were provided with information on the most effective ways to apply it. Demonstration and role play were conducted

by the teachers to guide learners in identifying solutions to problems. Throughout this process, learners changed roles to ensure that everyone had a shared experience of cooperative learning

2.4. Advantages of Cooperative Teaching and Learning

- Assists learners with self-esteem by addressing difficult schoolwork as an aspect of learner subjective well-being in the quest for self-fulfilment (Holopainen, Waltzer, Hoang, Lappalainen, Nuutinen, and Pesonen 2023:1).
- It can be used as a framework for developing teacher programmes, improving content knowledge, pedagogical skills, and professional competencies (Fernandez-Rio, Rivera-Perez, & Iglesias, 2022:119).
- Cooperative teaching promotes an interdisciplinary approach that enables learners to effectively and efficiently tackle real-life problems.
- It allows learners to collaborate with educational stakeholders to address challenges in teaching and learning.
- Cooperative learning fosters creativity, flexibility, motivation, and change, resulting in academic growth among learners.
- One added advantage of cooperative learning is that it assists learners with interpersonal relations, as they must be sensitive to the needs of others (Gillies, 2016:178).

Despite the positives associated with cooperative teaching and learning, there are also disadvantages that you need to be aware of.

a. A lack of strict discipline can lead to chaos in the classroom.
b. Conflict between individuals can arise.
c. Uneven distribution of workload can occur.
d. Some learners might loaf around.
e. Everyone might get blamed for a mistake.
f. Different learners learn at different paces.
g. Other learners might try to become leaders.
h. Plenty of time could be wasted (Suyunova, 2023).

2.5. Preparing a Cooperative Classroom

For cooperative teaching and learning to be effective, preparation is essential. As a teacher, you have a responsibility to ensure proper planning that allows learners to benefit from cooperative teaching and learning. Central to this approach is the creation of a caring and safe atmosphere that characterises the learning environment. Learners are more likely to succeed academically when they feel safe within their learning environment; therefore, you should prepare your classroom for cooperative teaching and learning in a way that fosters this sense of safety. A well-prepared cooperative teaching and learning environment will assist in classroom management, promote learner discipline, and create a sense of belonging.

2.7. Techniques in effective Cooperative classrooms

Various techniques can be implemented to enhance cooperative teaching in the classroom. These techniques can include both traditional and technologically enabled practices, depending on the available resources and facilities, especially when embedding technology. Class size and learner demographics, such as age, learning needs, outcomes, and objectives, must also be considered. It is imperative to consistently ascertain that the integration of technology into educational settings yields advantageous outcomes for learning without compromising or impeding the cooperation process.

Table 2.1: Cooperative classroom techniques

Technique	Description	Advantage	Disadvantage	Founder
Jigsaw	Learners form smaller groups, with the goal of each member becoming an "expert" on a particular topic. In the end, one learner from each group of experts explains what they have learned to the class.	• Promotes teamwork. • Enhances communication skills. • Enhances skills in working with diverse teams/members	• Cause Conflict Dependency of other team members	Elliot Aronson (1971).
Carousel	Learners are divided into small groups and rotate through "stations" Each station covers a specific topic or activity.	• Promotes active learning. • Enhances critical thinking. • Encourages engagement.	• Time-consuming • Unequal participation	Unknown (originated in the 1970s).
Round Robin	This technique involves learners equally taking turns in a predefined order to participate on discussions and answering questions.	• Equal participation • Promotes creativity. • Easy to implement	• May cause anxiety. • Not ideal for learners with a fear of public speaking (introverts) • Time-consuming	Kagan, S.
Think-pair-share	Learners first think about an issue or topic on their own (Think), then discuss it with another person (Pair), and then express their thoughts with a group (Share) (Lyman, 2022).	• Provides opportunities for reflection. • Reduces participation anxiety	• Time-consuming • Needs excessive monitoring	Frank T. Lyman (1981).
Team pair-solo	This technique allows learners to be grouped in teams, then as pairs and later individually to work on solving problems of a similar nature.	• Enhances self-motivation. • Boosts active learning. • Enhances problem-solving skills	• Time consuming • Unequal participation, particularly in the group (team) phase	Kagan, S (1989).

2.8. Dos and don'ts in Cooperative teaching and learning

Implementing cooperative teaching, with careful consideration and attention to learners' needs and classroom dynamics, can yield significant effectiveness. Adhering to recommended practices and avoiding discouraged actions can lead to heightened engagement and increased productivity within the learning environment.

Below are the do's and don'ts to consider when implementing cooperative teaching and learning.

Table 2.2: Dos and Don'ts of cooperative teaching and learning (citations)

Do's of cooperative teaching and learning	Don'ts of cooperative teaching and learning
Clarify goals and objectives for the activities. • Learners should have a clear understanding of what's expected of them and how their performance will be assessed.	Total reliance on cooperative teaching • Avoid over-reliance on cooperative teaching. Integrate alternative teaching approaches that are in line with the learning outcomes.
Ensure diversity when assigning groups or teams. • Group learners with various skills, backgrounds, and knowledge together to enhance innovation and creativity (varying ideas)	Provide individual credit. • The success of a group is a result of a combined effort of all members. Giving credit to individual learners may adversely affect the self-esteem of others.
Provide a safe and conducive environment. • The classroom atmosphere should be a safe space and conducive for learners to share ideas freely.	Avoid competitiveness. • Groups should cooperate for the sake of learning rather than competing with one another. This can have an impact on morale and motivation.
Provide opportunities for reflection. • After cooperative teaching has taken place, learners should have the opportunity to engage in and reflect on the activities. This will assist in identifying the strengths, weaknesses, opportunities, and threats of the cooperative techniques implemented.	Refrain from micromanaging the groups. • Teachers should enable groups to work individually without constant supervision and meddling.
Mediate conflict • Conflict may emerge during cooperative learning, and teachers should act as mediators while also providing resolutions.	Limit feedback • Feedback is an important aspect of learning. Create an environment where learners may take input from peers and teachers.

2.9. Case Studies in Cooperative Teaching and Learning

The case studies below reflect the successes of using cooperative teaching and learning techniques in the classroom. They also demonstrate the applicability of these techniques in various settings and contexts.

Case study 2.1: Unleashing the power of cooperation: Science teaching and learning at Makubu Primary School

The low science pass rate at Makubu Primary School served as motivation to seek ways to enhance its science education programme and teaching practices. Two teachers, Mr. Nokwane and Mrs. Williams, aimed to implement cooperative teaching to improve engagement and foster a positive learning environment. The two teachers collaborated with Ms. Martinez to design science lessons that incorporated hands-on activities and group projects. Learners were asked to collect old cans and plastic bags for a group experimental project, allowing each group the opportunity to evaluate another group's project and provide suggestions and recommendations. They employed cooperative learning strategies such as Jigsaw, Carousel, and Round Robin to encourage learners to cooperate and share their knowledge. These cooperative teaching techniques yielded positive results. Learners demonstrated increased enthusiasm for science class, improved critical thinking skills, and better communication with their peers. Additionally, the teachers noticed decreased disruptive behaviour and increased classroom participation.

Now, try to answer the following question based on case study 2.1.
- What specific aspects of Jigsaw and carousel techniques do you think were most effective in enhancing engagement and learning outcomes?
- Implemented techniques in the case study reduced disruptive behaviour in the classroom; what could be causing these behavioural changes?

Case Study 2.2: Breaking barriers: embracing inclusion in high school Mathematics

St Stevens Special School has learners from various backgrounds with differing teaching and learning needs. Individualised attention has been practised to ensure that each learner has an equal opportunity to enhance academic success. However, the teachers observed that this approach created a barrier to peer learning and efficacy, especially in mathematics classes. To create a cooperative environment, two teachers, Mrs. Van Tonder (a mathematics teacher) and Ms. Vilakazi (an experienced special needs teacher), worked together to enhance cooperative teaching, allowing learners to learn from one another. The teachers collaborated in teaching and designing lessons, incorporating their expertise to provide differentiated instruction. They divided the learners into heterogeneous groups, where those with strong mathematics skills could support and guide those who needed extra help. Assistive technologies were also utilised, and practical activities were implemented. The teachers incorporated gamification, escape rooms, and puzzles as additional fun elements to enhance content comprehension and engagement. This approach led to remarkable improvements for the learners. The learners were also involved in the design of gamified activities. Those who struggled with mathematics gained confidence and skills with the support of their peers and teachers. High-achieving learners benefited from reinforcing their knowledge by explaining concepts to others. The overall pass rate increased, and learners reported feeling more supported and valued in the mathematics classroom.

- Which cooperative classroom technique was used in Case Study 2.2, and what disadvantages can you identify, especially given the special needs of the learners?

Case Study 2.3: RoundRobin approach to success: English language acquisition for international exchange learners

With English as their second language, international exchange learners experience difficulties in adequately articulating and communicating. Every year, the University of Walters welcomes 200 Chinese undergraduate medical students who receive instruction in English. To address the issue of language barriers, the university offers an English learning course for international learners who speak English as a foreign language. The course facilitators, Prof. Jones and Dr. Engela, constantly implement new pedagogical strategies to improve English language acquisition. One of their most recent techniques featured a round-robin approach, in which learners in a class were expected to cooperate to create an imaginative story. Each learner would contribute a sentence or paragraph, which would be passed on to the next student in a predefined order. This technique was repeated until the story was completed. This practice enhanced their critical thinking, communication, listening, and creativity skills, helping students step outside their comfort zones. The students also reported decreased anxiety about speaking a foreign language due to the friendly and supportive group environment, which encouraged them to share their ideas openly. Because of the open and accommodating classroom environment, students were less worried about expressing themselves in a foreign language.

- In light of the positive results reported in the case study above, which other cooperative classroom techniques can achieve the same results?

It is worth mentioning that libraries play a crucial role in cooperative education, particularly through information literacy programmes. The lack of these skills calls for pedagogical consideration, advocating for a collaborative teaching approach combined with project-based learning. Inquiry-based learning is defined as a teaching methodology where learning occurs through inquiry as a form of active learning. A typical example of cooperative classroom practice is provided by Chu, Tse, and Chow (2011:132), where General Studies, Chinese, and IT teachers collaborated with the teacher librarian in a Hong Kong primary school to complete two inquiry-based learning tasks. In this cooperative and collaborative project, three classes were involved: Class A consisted of 37 learners, Class B had 35, Class C had 36, and Class D had a total of 35 learners, making the overall total 143. Learners were not separated according to academic performance. To determine the effectiveness of this cooperation, parents and teachers were interviewed. A self-administered questionnaire developed by the teachers was given to the learners to complete. After the project, they were asked to evaluate their information literacy and

IT skills before and after the intervention. A 5-point Likert scale was used, where 1 indicated not familiar and 5 indicated very familiar. The teachers rated the intervention at 4, parents at 3.7, and learners at 3.6 respectively (Chu, Tse & Chow, 2011). The approach in this study is supported by Barlow (2023); however, it is slanted towards distant reading when engaging in difficult schoolwork.

2.10. Conclusion

In this chapter, we introduced cooperative teaching and learning. We defined the concept and discussed its advantages and disadvantages. The dos and don'ts of cooperative teaching and learning were also highlighted. Additionally, we provided various case studies to enhance your understanding of the topic. As you conclude this chapter, please respond to the following questions.
Reflective answers. Add one more question to align with four learning outcomes.
What are the advantages and disadvantages of cooperative teaching and learning?
What are the dos and don'ts of cooperative teaching and learning?
How do you prepare your classroom for cooperative teaching and learning?

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Chapter 3: Problem Posing Teaching in Classroom

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3.1. Concept Map

Fig 3.1 shows the concept map of a problem-posing teaching classroom. It begins with the meaning of problem posing as a teaching strategy, followed by the advantages and disadvantages of problem posing. The map also includes techniques for problem-posing teaching in the classroom, the expected roles of pre-service teachers in problem-posing classrooms, and what pre-service teachers should avoid doing in a problem-posing teaching environment.

3.2. Learning Outcomes

After studying this chapter, you should be able to:
• Explain the meaning of problem-posing teaching in the classroom.

- Set up problem-posing teaching in any subject within a classroom.
- List five advantages of problem-posing teaching in a classroom.
- List three disadvantages of problem-posing teaching in a classroom.
- Use different techniques for effective problem-posing teaching in a classroom.
- Clearly state what is expected of the pre-service teacher in a problem-posing teaching classroom.
- Precisely outline what the pre-service teacher should not do in a problem-posing teaching classroom.

3.3. Clarification of Key Terms

Problem-Posing Teaching: Lee et al. (2020) define problem-posing teaching as an instructional approach that engages students in open-ended, real-world problems to develop critical thinking, problem-solving, and collaboration skills.

Pre-service Teachers: Teachers in training in any higher institution of learning.

3.4. Introduction To Problem-Posing Teaching

Traditional teaching and learning in the classroom are dominated by the teacher's activities, while the learner remains a passive receiver of the teacher's information. Learners are bound and often ignorant. This method of teaching is referred to as the pedagogy of the oppressed, as described by Freire (1972) and cited by Bourn (2022). Hence, the educationist advocates for total freedom and liberation of the learners through a pedagogical shift from oppression to freedom. This method of teaching is known as Problem-Posing Teaching. The pre-service teacher using this approach makes classroom activities democratic and motivating, encouraging creativity, collaboration, and critical thinking among the learners. This chapter, therefore, discusses Problem-Posing Teaching in classrooms.

3.5. Problem-Posing Teaching In Classrooms

Problem-posing teaching in the classroom is a method that emphasises critical thinking for clarification and liberation in the acquisition of knowledge and skills. It is an active teaching approach where the pre-service teacher poses questions, and the whole class collaborates to find solutions. This method involves specific steps that the pre-service teacher must follow in the classroom. Ellerton (2015) stated that problem posing is a pedagogical approach, while Crest (2015) argued that the pedagogy of problem posing empowers students and transforms the classroom into an environment where they are considered co-designers of their educational experiences. The philosophy of problem-posing teaching forms the foundation of modern critical pedagogy, recognising that knowledge is not simply deposited by the pre-service teacher but is developed through dialogue between the pre-service teacher and the learners.
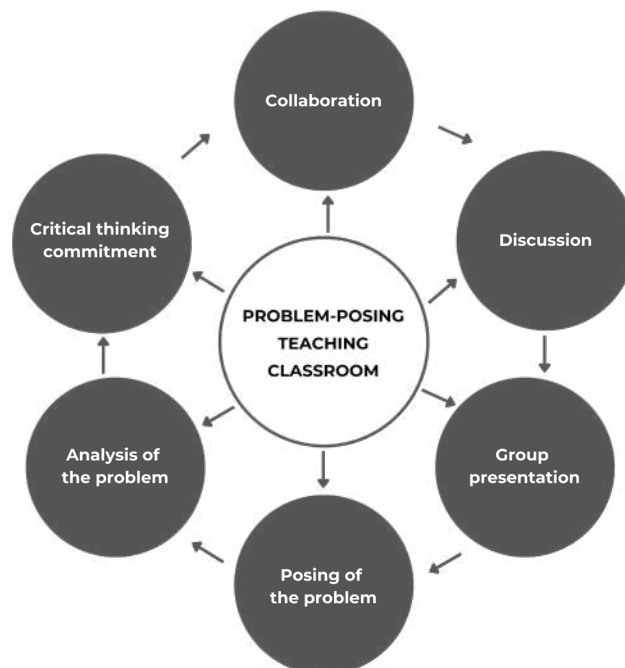
Figure 3.2 above shows the six cyclic steps in Problem-Posing Teaching in the classroom.

The first step involves the pre-service teacher posing the problem. For example, in a physics classroom, both learners and pre-service teachers are focused on learning how to produce simple electric currents from cells. The pre-service teacher assigns the learners to groups of five, comprising both boys and girls. Each group is provided with two cells of 1.5 volts, nine pairs of connecting wires, a bulb, an ammeter, a voltmeter, and a switch. The following problems are then posed to the learners:
1. How would you use the materials provided to get electric light in the bulb?
2. Draw the circuit diagram of how the materials will be set up
3. Use the circuit diagram to set up the apparatus.
4. Close the circuit and record your observation.
5. Measure the potential differences across the terminals of the two cells and record your   answer
6. Measure the amount of the currents in the circuit with the two cells
7. Open the key, and remove one cell
8. Close the key and measure the potential difference across the cell
9. Measure the amount of current in the circuit when the cell is one.
10. Compare your answer in (5) with your answer in (8) what can you say?
11. Compare your answer in (6) with your answer in (8)

Step 2: The pre-service teacher allows learners to analyse the above problems by collecting information about how to solve them.
Step 3: The pre-service teacher stimulates learners and engages them in the process of critical thinking.
Step 4: The pre-service teacher allows learners to collaborate in their various groups and solve the problem.
Step 5: The pre-service teacher guides learners in the joint discussion on their findings.
Step 6: The pre-service teacher guides the learners to present their findings to the whole class group by group while the pre-service teacher gives learners feedback on each of the group presentations.

3.6. Advantages And Disadvantages Of Problem-Posing In Classrooms

Table 3.6.1: Advantages Of Problem-Posing In Classrooms

Advantages	Description
1.It leads to active learning processes	Learners are actively involved in doing one thing or the other in the lesson rather than as passive listeners to pre-service teacher's instruction
2.It enhances the problem-solving	Learners are actively involved in solving problems posed by the pre-service teachers, hence helping in developing the problem-solving skills of the learners.
3. It encourages peer learning	Learners are learning together with their peers, taking ownership of the classroom activities (their learning)
4. It develops critical thinking of the learners	Learners engage in thinking (cognitive activities) on how to solve the problems posed by pre-service teachers. This process leads to the development of their critical thinking skills
5. It also enhances self-learning	Problem-posing in the classroom leads to an improvement in learning on learners' own initiative with minimum supervision from the pre-service teacher.
6. It improves the interactive learning of the learners.	As learners work together in a group, discussing, measuring, and connecting wires to apparatus in the classrooms improves the ability of each learner to interact with peers and the pre-service teacher

Advantages	Description
7. It improves the communication skills of the learners	As learners work in a group, they communicate with each other and with the pre-service teacher. Learners also communicate during group presentations, thereby improving communication skills.
8. Improves learners' engagements	The pre-service teacher engages each learner by collaborating with teams in a group; this improves the engagement skills of each learner and the preservice teacher.
9. Enhances learners' freedom and liberation	Learners are no longer under the bondage of classroom boredom and passiveness but are now liberated, free, and become co-investigators.

Babajide & Olowu fieldwork (2023)

Table 3.6.2: Disadvantages Of Problem-Posing In Classrooms

Disadvantages of Problem-Posing Teaching Classrooms	Description
1. It is time consuming	It consumes a lot of time to plan and execute all the activities in a normal classroom setting.
2. Inadequate resources	Human and material resources for classroom implementations are grossly inadequate to be improved in some schools in Africa.
3. Inconsistency in knowledge acquisition	Knowledge acquisition is not consistent.
4. Lack of faculty training of pre-service teachers on the implementation of problem-posing teaching	Pre-service teachers are not trained on the classroom implementation of problem-posing teaching.
5. Lack of learner motivation	Learners are not motivated to participate in classroom activities in taking ownership of their learning and in generating their knowledge
6. Difficult to execute in a large class size.	Learners' large population is a big challenge in a problem-posing teaching classroom.

Babajide & Olowu field work 2023

3.7. Preparing A Problem–Posing Teaching Classroom

The following are the Pre-Service Teacher's activities that create a Problem-Posing Teaching Classroom environment:
i.   Identify the topic of the lesson, the learning outcomes, and the assessment technique.
ii. Design classroom activities, materials, and both theoretical and practical questions for classroom interactions.
iii. Assign learners to small working groups of boys and girls, and explain what is expected of them.
iv. Pose questions that draw on learners' background knowledge and experiences, presenting these to the class.
v.   Allow learners to discuss, interact, communicate, design experiments, verify findings, and collaborate, facilitating their activities.
vi. Enable learners to make presentations, guide them during their presentations, assess their performance, and provide feedback.
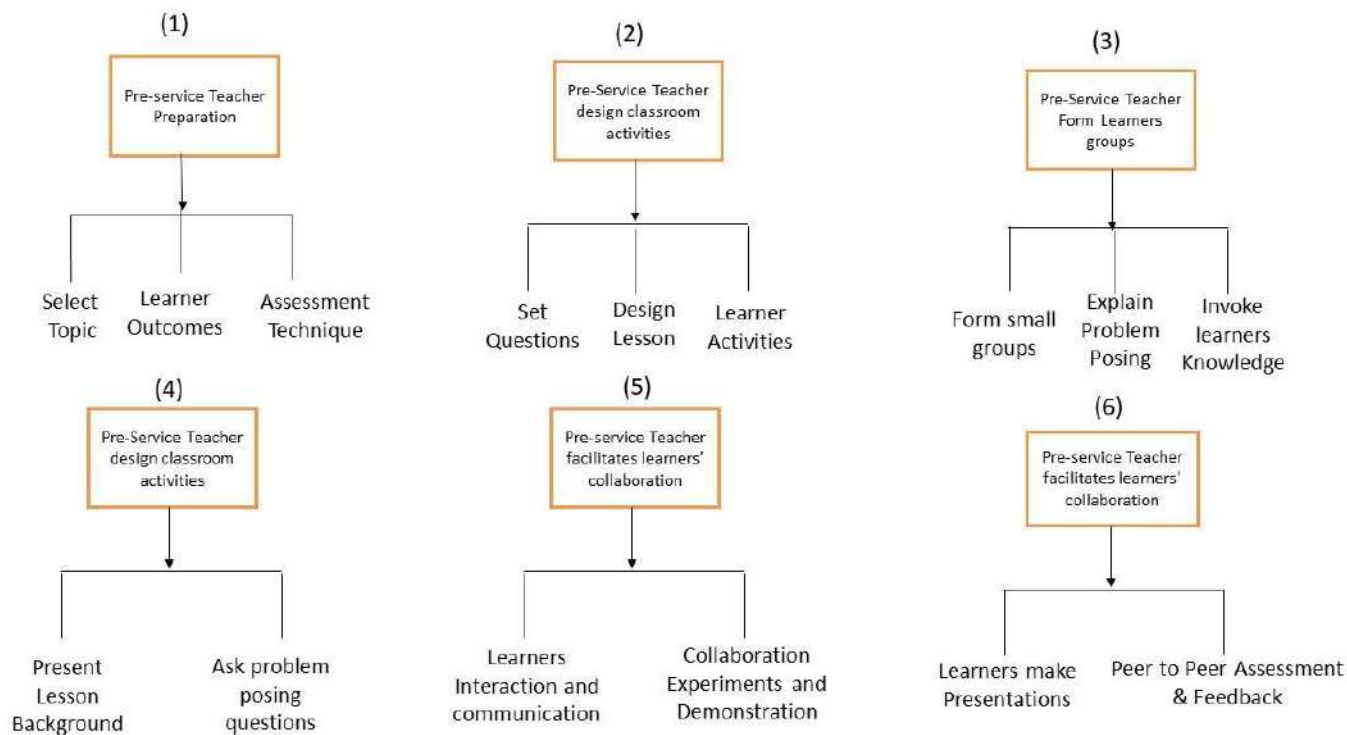
Fig 3.3: Planning, Preparation for a Problem posing Classroom Environments

3.8. Techniques In Effective Problem Posing Classroom

- **Brainstorming:** Pre-service teachers have learners create lists of related content for the topics they are currently studying. This will enrich their understanding when solving problems. Learners discuss with their teams how to solve these problems.
- **Clue me:** This is a form of detective game that encourages problem-solving, critical thinking, and cognitive development. The pre-service teacher allows learners to collect several items, which may take the form of questions they need clarification on that are associated with the lesson topic, and deposit them in a bag. Learners should be informed about the number of items each is allowed to pick and provide answers to until they arrive at the correct response.
- **Problem-solving as a group:** The pre-service teacher instructs learners to create and decorate a medium-sized box with a slot in the top, labelling it as a "problem-solving box." Both learners and pre-service teachers can drop their questions into the box. Each learner then pulls out a question from the box and reads it aloud. The group listens to the answer that each learner provides in response to the question.
- **Survivor Scenario:** The pre-service teacher creates a practical pretend scenario for learners that encourages them to think creatively about each lesson topic. Examples include: (i) Madam Precious is stranded in a location for four days; (ii) there is a power failure in your area for three days; and (iii) Mr. John's car suddenly breaks down while travelling to his village, leaving him stranded in the bush for two days. The pre-service teacher allows learners to propose solutions on how the individuals in each of these scenarios can survive during their periods of stranding.
- **Moral Dilemma:** Pre-service teachers guide learners in creating various moral dilemmas encountered in life. Examples include: (i) a taxi driver mistakenly gives a passenger too much change; (ii) a student in a science class erroneously assigns the wrong value to an object; (iii) a large amount of money suddenly falls from a man's bag, and you happen to pick it up. Allow learners to suggest answers to each of these scenarios. Learners' abilities and interests. Pre-service teachers must ensure that each problem-posing teaching technique aligns with the learners' abilities and interests

3.9. Dos And Don'ts In Problem–Posing Teaching

3.9.1. The Dos in problem-posing teaching

The dos outline the expectations for pre-service teachers (roles) before and during classroom interactions when using problem-based teaching

i.   The pre-service teacher is expected to plan effectively for the class, including materials, questions, and activities to engage the learners.
ii. Provide sufficient information to learners.
iii. Design learner activities clearly.
iv. Facilitate classroom activities effectively by guiding and supporting learners.
v.   Encourage learners to search for solutions to the posed problems.
vi. Be flexible.
vii. Show a level of empathy.
viii. Demonstrate high levels of integrity.
ix. Assist learners in developing critical thinking, collaboration, communication, and presentation skills.

3.9.2. The don'ts in problem–posing teaching

The pre-service teacher is not expected to do any of the following:
1. Must not go to the classroom without adequate preparation.
2. Must not give factual and incomprehensive, inadequate information to the learning activities.
3. The learner's questions must not be posed without preparing activities for the learners to do to find solutions to the problems.
4. Must not dominate classroom activities
5. Must not discourage learners from finding solutions to the problems
6. Must not be rigid
7. Pre-service teachers must not be harsh on the learners.
8. Must not exhibit any act of unfairness in the classroom
9. The learners' development of collaboration, communication, critical thinking, and presentation skills must not be neglected.

3.10. Case Studies In Problem-Posing Teaching

Case Study 1 involved university undergraduate students from the Faculty of Education at the University of Lagos, Nigeria. These students worked under the classroom facilitation of the first author of this chapter, Veronica F.T. Babajide, in a Science Education classroom. The students were organised into cooperative groups of five, comprising a mix of genders (male and female) and academic abilities (high, average, and low), using problem-based teaching as the instructional strategy facilitated by the university teacher (the first author of this chapter).

Case Study 1 comprised six different groups. Each group was assigned different topics (the meaning of science, technology, the benefits of science and technology in society, scientific methods, steps in scientific methods, and characteristics of scientific methods) in the form of problem posing, which needed to be discussed by individuals within the group. They were required to think critically as individuals, then brainstorm collectively, consult artificial intelligence (AI) and other sources, reflect on answers from various sources and individual ideas, and jointly agree on the answers to the questions.

For a period of 30 minutes, the teacher moved around the groups to monitor their activities. The secretary in each group recorded the group's decisions. Each group nominated a presenter to share their findings regarding the problem posed. Each group had five minutes to present their findings. All these classroom activities were recorded on video.

Video Transcript 1 of the presentation from a group.

Science and Technology

Due to science, it helps us to generate solutions for everyday life. What are the problems we are facing in our society? Oh, ok, the problem is that we have so many dirty plates. We have so many dirty clothes. Our women are tired from too much hard work, and then we come up with the invention of technology. Using science, we can get our washing machines, we get our dishwashers, and we get things that make our lives easier. It is science that has done that. Another benefit is that it makes.

Communication networks

It's in communication, and I'm able to speak freely with somebody who is in Scotland, and I don't need to move from where I am. All I need is my phone to get a Skype or even a video call, and I'm able to get across or post whatever information I want. It not only saves energy.
Also, say it's fine. Thank you.

Video Transcript 2 of the presentation from another group

Scientific Networking

They are the rules and the procedures for the pursuit of knowledge involving the finding and stating of a problem. We can now see it as an example according to the definition: an acid is a substance we dissolve in water. Do you say it turns blue litmus paper red, and more so before they can add that to the properties they will have to experiment with? So, this scientific method is used in all sciences, including chemistry, physics, geology, psychology, and the other sciences. In this field, they ask questions and perform different tests. Science fiction also helps scientists today to continue to evolve. They find the scientific method as they employ new techniques and new areas of science.

Scientific Methods

The scientific method is a systematic approach to inquiry. It begins with asking a question, which leads to forming a hypothesis and developing a testable explanation. For example, consider a toasted piece of bread. You plug it into a socket, but upon observation, you notice that the bread is not toasted. This prompts you to ask, "Why is this?" You then check the socket, which is also under observation, and form a hypothesis by unplugging the device and plugging it into another socket. This process is crucial, as it involves asking questions and seeking to understand why things are the way they are. Thus, the scientific method plays a vital role in investigation and critical thinking.

Teacher Assessment: The teacher (facilitator) assesses each group's presentations and provides final comments for students to take home.

3.11. Conclusion

This chapter has discussed Problem-Posing Teaching in the classroom and how a pre-service teacher can implement it effectively. We have examined its advantages and disadvantages, as well as various techniques that a pre-service teacher could adopt for successful problem-posing teaching. Finally, the expectations of a pre-service teacher and what they should avoid were specifically addressed.

3.12. Reflective Questions

1. Briefly explain what you understand by problem-posing teaching.

2. Describe precisely how you would set up a problem-posing teaching method to teach a topic of your choice in your area of specialisation.
3. List and explain five advantages and three disadvantages of problem-posing teaching in your area of study.
4. Choose a problem-posing technique of your choice and explain how you would use it to teach a specific topic in the classroom.
5. Clearly state five roles expected of a pre-service teacher in a problem-posing teaching classroom.
6. Briefly explain three things a pre-service teacher should not do in a problem-posing teaching classroom.

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Learning Outcomes

After studying this chapter, you should be able to:
- conceptualise inquiry-based instruction (IBI) as a teaching strategy
- understand the advantages and disadvantages of IBI
- prepare an IBI classroom
- discuss techniques ineffective IBI classroom
- reflect on the dos and don'ts in IB teaching
- establish case study in IB teaching.

Clarification Of Key Terms

For students/readers to comprehend this chapter clearly, the following points should be clarified: the definition of IBI, understanding the advantages and disadvantages of IBI, preparing an IBI classroom, discussing ineffective techniques in IB classrooms, reflecting on the dos and don'ts of IB teaching, and establishing a case study in IB teaching.

Concept Of IBI: This is also known as inquiry-based learning. Petr (2010) states that "inquiry-based instruction is a type of instruction during which knowledge is created while solving a certain problem through consecutive steps. These steps include setting hypotheses, choosing suitable methods to investigate a certain phenomenon, obtaining results and processing them, drawing conclusions, engaging in discussion, and often cooperating with peers." Papacek (2010) asserts that inquiry-based instruction is one of the effective activating methods of problem-solving education and is based on a constructivist approach to learning. The teacher does not present the subject matter as a whole-class presentation in a pre-determined way; instead, he/she facilitates the creation of knowledge through problem-solving and a system of questions (communication apparatus). It is viewed as a form of self-directed learning where students take charge of their education.

4.1. Chapter Model

The educational literature provides extensive documentation of the range of inquiry phases and cycles (Pedaste et al., 2015). Marshall (2013), for instance, outlines the four Inquiry Phases (IP) as Engage, Explore, Explain, and Extend, specifically incorporating formative assessment (constantly checking in with students) and reflective practice (now where?) into each step. This contrasts with the five IPs listed by Bybee et al. (2006), which are Engagement, Exploration, Explanation, Elaboration, and Evaluation. An inquiry cycle is typically presented in

a manner that implies an organised progression of phases. Nevertheless, researchers clarify that Inquiry-Based Learning (IBL) is not a predetermined, homogeneous linear process (Pedaste et al., 2015).

The constructivist theory of learning, cognitive psychology, and best practices in STEM instruction form the foundations of the 5E inquiry-based instructional methodology (Bybee and Landes, 1990). The five steps of the 5E learning cycle are Engage, Explore, Explain, Elaborate, and Evaluate. The 5E instructional model connects educational activities, provides consistency across various teaching philosophies, and aids science teachers in determining how to interact with students (Biological Sciences Curriculum Study, 2019). The 5E learning cycles yield greater gains in students' capacity for scientific inquiry than traditional teaching models (Bybee, 2009).

Engage: Students can be mentally engaged through questions or activities, pictures, videos, demonstrations, kinesthetic exercises, and free writing. Explore: Students engage in practical exercises to understand concepts. They pose testable questions, collect data, conduct research, formulate hypotheses, test these hypotheses, draw conclusions, and present their findings. Explain: The teacher clarifies terminology and presents interactive materials, textbooks, levelled readers, and articles (both print and online) that were introduced in the Explore phase. Elaborate: Students participate in extracurricular activities to apply what they have learned to new contexts, including discussions, project-based learning, lab experiments, careers, and contemporary science. Evaluate: The educational process involves reviewing and reflecting on their learning, conducting self-evaluations, performance-based evaluations, compiling portfolios of student work, and employing claim-evidence reasoning (including scenario and prompt final presentations).

4.2. Introduction To Inquiry-Based Instruction As A Teaching Strategy

There has been an obvious need for instructional techniques that embed questioning, critical thinking, reflection, collaboration, communication, and research to ensure that our students have the necessary tools to meet the demands and expectations of their future. For this contribution, Inquiry-Based Instruction (IBI) is synonymous with Inquiry-Based Learning (IBL) and will be used interchangeably. Inquiry-based instruction is a student-centred instructional strategy that facilitates learning through meaningful tasks such as cases, projects, and research (Avsec & Kocijancic, 2016). Students are required to work cooperatively to identify solutions to problems, develop their research abilities, and enhance their capacity for making trade-offs (Avsec, Rihtarisic & Kocijancic, 2014). With IBL, students actively participate in their education and strive to make sense of their surroundings (Alfieri et al., 2011). At this stage, the concept of IBI must be viewed.

4.3. Inquiry-Based Instruction As A Teaching In Classroom

The inquiry approach placed a strong emphasis on four key components, such as student-centred learning.ntred, non-passive learning; process-oriented material; and a focus on concepts rather than facts. This method highlights the importance of reflective exploration and engaging outcomes in the teaching and learning process. It encourages students to assist one another in acquiring knowledge rather than simply accepting what the teacher presents. Rather than being content-focused, the philosophy of the inquiry technique is process-oriented, prioritising conceptual understanding over factual recall. It is centred on the pupil, not the teacher, and promotes active participation rather than passive behaviour (Beyer, 1971).

4.4. Advantages Of Inquiry-Based Instruction

Several studies have illustrated and concluded on the merits of the application in the stated class setting. Learning goes hand-in-hand with Science, Technology, Engineering, and Mathematics (STEM) instruction and inquiry. Research suggests that Inquiry-Based Science teaching improves students' comprehension of concepts in the field of science. It also exposes learners to develop and experience critical thinking skills, thereby furnishing them with a sense of accomplishment in the long run.

In a video titled "Seven Skills Students Need for the Future," Wagner (2009) identifies a variety of skills needed for students to succeed globally. Namely, these are the seven skills:
1. Critical thinking,
2. Problem solving,
3. Collaboration and leading with influence, agility and adaptability,
4. Initiative and entrepreneurialism,

5. Effective oral and written communication,
6. Accessing and analyzing information and
7. Curiosity and imagination.

Marks (2013) explains that this is supported by the fact that in an IBL context, students learn, practice, and reflect on these seven abilities in a way that is authentic and representative of procedures used in the real world. According to Guido (2017), there are seven merits to IBL:
i. Consolidates curriculum material
ii. Prepares the mind for learning
iii. Enhances a deeper comprehension of the topic.
iv. Makes studying enjoyable
v. Encourages initiative and self-reliance
vi. Works in nearly every classroom, and
vii. Offers differentiated instruction.

According to Jonassen (2000), students take ownership of their learning as they examine and explore, as they are expected to make decisions and draw conclusions. Goldston et al. (2010) contend that while inquiry-based learning (IBL) emphasises critical thinking, problem-solving, and communication skills, it also considers the knowledge-related aspect of learning. Similarly, Sockalingam et al. (2011) noted that when students have the opportunity to work on a topic, they acquire new knowledge and further extend and deepen their existing understanding. Students' critical thinking abilities increase when they learn through exploration and investigation in real-world situations (Hwang & Chang, 2011). In a similar vein, Marks (2013) concludes that learners who actively engage in inquiry master both content and cognitive habits. According to Harlen (2013), students gain understanding through their thinking and reasoning in various ways, including the enjoyment and satisfaction that comes from learning something for themselves, firsthand experience of what works as opposed to simply being told, satisfaction and stimulation of their natural curiosity about the world around them, and the development of increasingly strong ideas about it. Students who participate in inquiry-based practices demonstrate higher levels of academic self-efficacy, resolve conflicts more frequently, are less hesitant to take risks, and are more inclined to persist in trying new strategies for success after experiencing failure, according to a study by Gu et al. (2015). Inquiry-based learning has numerous merits, including improved self-confidence, retention of what was discovered, and enhanced communication skills. Students understand that failure is part of learning and, therefore, are not afraid of failing, which provides them with more opportunities to succeed in life. Other benefits include sharpening critical thinking skills, leading to greater intelligence, and fostering better interpersonal relationships with others.

4.5. Disadvantages Of Inquiry-Based Instruction

Ecolf (2020) asserts that although this procedure has a few drawbacks, they should not be overlooked, even if they are not very noticeable. These drawbacks can be addressed with good management. The following are some drawbacks and how to fix them: Many timid and reserved pupils may experience issues due to their lack of confidence. This can be avoided if the teacher provides each pupil with individualised attention and additional support. Its impact may be compromised if the teacher holds a concealed attitude toward this idea. Therefore, the teacher must commit to practising it fully. Its effectiveness can also be hindered by an inappropriate location. Every student should have the opportunity to voice their thoughts under a fair system that is established. A poorly handled scenario may not yield positive results. The lack of a strong foundation could render the entire operation ineffective. As a result, teachers need to be knowledgeable and help pupils choose the right path. There may occasionally be some confusion among the students.

According to Crockett (2021), the main disadvantages include testing performance, reluctance to participate, which could be detrimental to the teacher's mindset and preparedness, student readiness, assessment, questioning, portfolios, and checklists and ratings.

Inquiry-based learning is not a perfect teaching and learning strategy in the classroom setting, like any other strategy, it has its hiccups. Here are some of the challenges: time-consuming assessment, a tendency not to favour shy students who may struggle to think quickly or who have low confidence, and the challenge of categorising all students as one, as some are weak, average, or intelligent.

4.6. Preparing An Inquiry-Based Classroom

This section explains how to organise a classroom for effective teaching delivery.
- The teacher must understand the student(s).
- Exercise patience and logical distance.
- Set practical restrictions.
- Adhere to the schedule you have already established.
- Recognise the factors that influence behaviour.
- Schedule a consultation
- Engage with students
- The teacher should be in charge of the class
- Delegate some duties to those trustworthy to deliver
- Students should be encouraged to be active participants

4.7. Techniques In Effective Inquiry-Based Classroom

There are several techniques that teachers can utilise in the classroom to achieve effective teaching and learning outcomes. Here are some of them, according to Schwartz (2015):
- Rather than teaching the topic standards, assist students in locating the knowledge they need on their own.
- Instead of telling students what they need to know, set up the environment so they can discover it for themselves.
- Use class time to connect disparate parts of knowledge.
- Since many students have trouble reading, engage them with spoken words.
- Avoid assigning the most tedious version of the work to struggling students, forcing them to complete it repeatedly.
- Astonish students by displaying a primary source document on the screen without any background information.
- Since the conventional method of delivering knowledge isn't particularly effective, don't be afraid to experiment with inquiry -based learning.
- Acknowledge "bends" in the results and be willing to abandon the prescribed course of action.
- Allow students to ask engaging questions, even if they don't align with pacing recommendations.
- Utilise the meta-practice of inquiry to approach the practice of teaching and to make improvements.
- The following suggestions are also provided:
- The class must commence with a question.
    - Students should be allowed to explore after the question is asked.
    - Students should discuss the topic with one another to ensure adequate comprehension.
- Teachers should provide resources for students to utilise.
- The teacher concludes the topic.
- Evaluation is crucial to observe what needs to be amended subsequently, using "carrot and stick methods."
- The teacher must summarise what was taught by highlighting the major/key points.

4.8. Dos And Don'ts In Instructional-Based Teaching

Every class has a teacher in charge, and that position of authority comes with a certain power. As a result, there are dos and don'ts of teaching that educators must follow to be successful. There are many things that teachers at all levels of education should and shouldn't do regularly. These classroom management strategies should serve as your guide, whether you are teaching a small or large class. Here are 20 teaching guidelines for effective classroom management:
1. Always act professionally, even when feeling irritated by a manager, parent, or child. Maintaining control is never easy, as we all have emotions and a tendency to lash out when triggered. However, keeping your composure demonstrates sophistication, maturity, and professionalism.
2. Be impartial; refrain from making investigative comments in the notes you send to the principal or the parents. Despite pressure from administrators or a desire to sugarcoat the truth, it is important to write frank progress reports that do not falsify information or ignore issues. Teachers who embellish the truth to defend themselves when they make mistakes are disdained by their students.
3. Prepare fallback strategies in case an activity does not go as planned. Teachers are expected to be tactically flexible, allowing them to learn a new method if they find that their current strategy is ineffective in the middle of a lesson.

4. Make plans for various instructional methods, including verbal, auditory, visual, and kinesthetic. Remember that pupils learn best through diverse approaches, so every lesson should contain a variety of situations that help reinforce the concept.
5. Teachers must always keep in mind that every child is unique. Each student has their own individuality. Never personalise a student.
6. Prepare for varying levels of learning capacity. Research shows that students learn best from their peers, so wherever possible, classes should integrate unified learning.
7. Allow students to choose their tasks. Give them options from which to select. It may require more effort to provide choices, but focus more on the process than on the result.
8. Encourage youngsters to take risks and let them make mistakes. Motivate them to try again afterwards. We must learn from our errors and implement the appropriate strategies and procedures.
9. Strengthen the integration of subjects and values by using teachable moments.
10. Include these three phases in your lesson planning: before, during, and after reading.
11. Consistently evaluate your teaching strategies and students' growth in the classroom. Always ask yourself: Did I utilise the best approach in teaching this concept? Could I have done anything better to reach every child? Did I sufficiently plan for the students, and were the exercises meaningful?
12. Create opportunities for students to employ psychological techniques to assess, evaluate, synthesise, and apply knowledge to real-world circumstances.
13. Create a literate environment that features words printed everywhere. To encourage children to engage in reading and writing activities and to recognise their reading and writing skills, provide opportunities and resources.
14. Use an equitable curriculum to prepare children for success in school and in life.
15. Include Kagan's PIES model in your instructional strategies so that students can take full responsibility for their education.
16. Instead of being passive observers, aim to develop engaged participants in every lecture. The days of teacher-centred instruction are over; teachers must now devise inventive ways to teach technology-related subjects and classes by using engaging activities, as students are easily distracted.
17. Regularly monitor and evaluate each student's reading development and proficiency. This continuous evaluation guides and informs instruction.
18. Encourage students to be willing to learn throughout their lives.
19. Enhance the classroom's sense of belonging and acceptance. This regard fosters a supportive and cooperative environment.
20. To be approachable, particularly with children and others, teachers must be enthusiastic, caring, and readily available (Godwin, 2022).

4.9. Don'ts In Instructional-Based Teaching

1. Don't make fraudulent accusations against a student or teacher
2. Never underestimate any student's learning ability
3. Avoid using physical force or aggressive behaviour toward any pupil.
4. Avoid becoming overly friendly with any pupil; doing so could send the wrong message.
5. Do not throw items or objects at any student in anger
6. Don't insult any student referring to her parent's failure or poverty status
7. Always remember to care about the well-being of your students, especially when they are in a challenging situation.
8. Avoid the use of sarcasm and contempt as a reaction to student discipline
9. Keep away from notifying parents of the negative attitudes of their students
10. Avoid working with individual effort, recall you can't do it alone. Work as a team with the students if you expect more and better rewards.
11. Only make effective criticisms and adjustments that would enhance the progression of plans.

4.10. Case Study In Inquiry-Based Teaching

The term "assigned scenarios" refers to circumstances in which students are asked to observe, evaluate, record, apply, conclude, summarise, or recommend as part of an instructional approach (not a theory). To facilitate analysis and discussion, case studies are developed.

Students are encouraged to use their subject-specific knowledge, critical thinking abilities, and problem-solving techniques in secure, practical settings.

Active learning techniques, including case, scenario, problem, and inquiry-based learning, are appropriate for face-to-face, online, or hybrid settings. These methods require students to employ their subject-specific knowledge, critical thinking skills, and problem-solving techniques in a secure, real-world context.

In case-based learning (CBL), students are presented with a case or dilemma to resolve in an actual setting. Background information and supporting details are provided to the students, who have the option of working alone or in groups. Rather than providing answers, the course organiser acts as a facilitator to aid in learning. A case study is typically based on real events (names and details are often modified to maintain confidentiality). Many case studies provide supplementary information and evidence, prompting students to formulate a response to an open-ended inquiry or to develop solutions that will guide their learning.

The best examples:
- are created by clearly stated learning objectives,
- have a goal of education,
- are genuine and pertinent,
- use prevalent or typical examples,
- Think about conundrums to encourage decision-making,
- add supplementary information where required, and
- have likeable characters, and some even use their voices (like those of patients) to add drama and authenticity.

To promote case-based learning:
- Allow them enough time to study the case and reflect on it. The case can be presented before the class.
- Briefly describe the case and offer some suggestions for addressing it.
- Form groups (preferably 3-6 pupils) and supervise them to ensure everyone is participating.
- Request that groups share their ideas and rationale.
- To clarify and advance the conversation, ask questions.
- Summarise the issues raised. At the conclusion, be sure to tie the various threads of the conversation back together. After asking each group to summarise their results, compare the group responses. Assist the entire class in interpreting and understanding the implications of their responses.

Brief Problem-Based Assignment

During class, students compete in problem-based tasks relevant to their discipline. The goal is to produce a written response (1500 words) to the issue or to work in groups to create and present a 10–15-minute presentation outlining a solution.

Conclusion

The method is an essential and better alternative to traditional classroom methodologies used previously. The above discussions depict that this instruction is primarily student-centred; learners are expected to examine questions and provide solutions scientifically. It is also excellent for real-life application, with teachers being less active during the process. Therefore, to fully comprehend the concept, students are encouraged to engage in one-on-one experiences to gain a deeper understanding of its hallmarks and benefits.

Reflective Questions

1. Conceptualise the term inquiry-based instruction (IBI) as teaching in the classroom.
2. Outline the advantages and disadvantages of IBI.
3. What are the procedures for preparing an IBI classroom?
4. What have you learned concerning the techniques in an effective IB classroom?
5. Reflect on the dos and don'ts of IB teaching.
6. How could you establish a case study in IB teaching?

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Chapter 5: Visualisation as a Teaching Strategy

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5.1. Concept Map

The concept map above illustrates the flow of the chapter's discussion on visualisation as a teaching technique. It begins with the definition and features of visualisation, followed by the advantages and disadvantages of the approach. The map then outlines how to prepare a visualised classroom, the techniques to be utilised in visualisation, and finally the 'dos' and 'don'ts' of visualisation.

5.2 Learning Outcomes

At the end of this chapter, the reader will be able to:
• explain visualisation as a teaching strategy

- identify the features of visualisation as a teaching strategy
- state the advantages and disadvantages of visualisation as a teaching strategy
- prepare a visualised classroom
- discuss different techniques to be utilised in visualisation
- note what to do and what not to do in the use of visualisation

5.3 Clarification of key terms

Visualisation: The creation of mental images as the learners are involved in the learning process
Teaching strategy: A technique that aids the learning and knowledge acquisition process
Learning: The process of gaining knowledge, abilities, attitudes, or competencies through instruction, study, or experience.
Critical thinking: This is the ability to analyse and evaluate information objectively and systematically, in order to form reasoned judgments and make decisions.

5.4 Unpacking visualisation and its features

Our biological and socio-cultural existence depends on vision. As a result, the following is a good description of the biological element (Adams & Victor, 1993, p. 207): "The faculty of vision is the most important source of information about the world. The largest part of the cerebrum is involved in vision and in the visual control of movement, the perception and elaboration of words, and the form and colour of objects. The optic nerve contains over 1 million fibres, compared to 50,000 in the auditory nerve. The study of the visual system has greatly advanced our knowledge of the nervous system. Indeed, more is known about vision than about any other sensory system.

Visualising is a teaching technique that helps students create mental images of what they are reading or learning (Pettersson, 2020). This can be done by asking students to close their eyes and imagine the scene, or by providing them with visual prompts, such as pictures, diagrams, or videos. Albert Einstein is known for saying, "If I can't picture it, I can't understand it." This saying underscores the importance of creating mental pictures in learning.

The reading technique known as visualisation helps students to picture what they are reading in their minds. It almost seems as though the learners are creating mental movies or videos based on their prior knowledge, creativity, and the content of the text. When students read a text, they can form different interpretations and mental images based on their previous experiences and imagination. Interacting with the text can create a vivid mental image that helps students understand the meaning better. This personal visual context is unique to each reader and can enrich their reading experience. Presmeg (1992), cited in Shatri and Buza (2017, p. 23), claims that because visualisation is a tool for understanding, it is possible to talk about picturing a concept or an issue. To visualise a problem is to comprehend it as a visual (mental) image; as a result, the visualisation process entails visual imagery, with or without a diagram, as a crucial component of the method of solution (Presmeg, 1992, cited in Shatri and Buza, 2017, p. 23).

5.5 Visualisation as a Teaching strategy

Visualisation is a significant teaching strategy that can improve learning and comprehension across a variety of subject areas in the classroom. Learners can better understand complicated concepts, remember information more efficiently, and enhance higher-order thinking skills by conjuring mental images and using visual aids. Abdelhamid, Yahaya, and Shaharuddin (2023) reveal that visualisation techniques can be especially helpful for learners who struggle with conventional teaching methods, such as those with learning difficulties or non-native speakers of the language of instruction. Kelly and Kortegast (2023) mention that learners can become more engaged, complicated ideas can be understood more easily, and information retention can be improved with the use of visual aids and mental images. Thus, employing visualisation as a teaching strategy can enhance learners' educational opportunities and foster a deeper comprehension of the material.

Visualisation as a teaching strategy is an approach that utilises visual aids and mental imagery to enhance the learning process. Schwalbe and Finzel (2023) point out that visualisation techniques can help make abstract concepts more concrete and comprehensible, and can be particularly beneficial for learners who may struggle with traditional teaching methods. Visualisation can be integrated into classroom teaching by encouraging mental

imagery, using visual aids, incorporating art and design, and employing simulations and role-playing.

Encouraging mental imagery: Making mental images of ideas or events being addressed in class is known as mental imagery. Encouraging learners to conjure up mental images can help them better understand and retain the material being covered. This process allows abstract ideas to become more concrete and memorable through mental imagery. For instance, if students are studying a historical event, they would be encouraged to mentally picture the scene, envisioning the participants, the environment, and the events occurring. Similarly, teachers may help students to visualise how a complicated system works and how its various components interact when learning about its inner workings. By generating mental images, learners can more easily comprehend the material.

Using visual aids: Any visual depiction that can help explain difficult ideas or procedures is referred to as a visual aid. Visual aids include, among other things, illustrations, tables, graphs, and videos. When striving to make abstract concepts more understandable and accessible to learners, visual aids can be especially beneficial (Zulu & Mudaly, 2023). For instance, a diagram can be used to explain the various components of a complex system, enabling students to more easily comprehend how they interact. When data is presented in an understandable manner, such as through a chart or graph, students can more readily identify patterns or relationships among variables. A video can illustrate a historical or scientific experiment, allowing students to better grasp the procedure and process.

Integrating art and design as a visualisation strategy: Art and design can be incorporated into teaching as a means of creating visual representations of concepts or ideas. This approach can be especially beneficial for learners who are more visually oriented or who may struggle with traditional teaching methods. By using art and design, educators can provide students with a creative outlet to express their understanding of the subject matter and create visual aids that reinforce key concepts and ideas (Eberhard, 2023). For example, students might be asked to create a poster or infographic that summarises a topic or concept. This task can help them synthesise the information and present it in a visually appealing and easy-to-understand manner. Students may also be encouraged to create a model or sculpture representing a scientific process or historical event, which helps to bring the subject matter to life and make it more tangible. By integrating art and design into teaching, educators can make the subject matter more engaging and memorable for students, providing them with a creative outlet to express their understanding of the material. Additionally, this approach can help develop students' creativity and critical thinking skills as they work to create visual representations of complex ideas and concepts.

Establishing simulations and role-playing: In establishing a scenario or environment, learners can engage with complicated processes or events in a more concrete way through simulations and role-playing exercises. By experiencing the material personally, students may gain a greater comprehension of it through participating in these activities (Qiu & Fang, 2022). For example, learners can imitate a scientific experiment to better understand the scientific principles at work. Alternatively, students could role-play a historical event, assuming historical personas and acting out crucial decisions or moments. This approach may provide learners with a deeper understanding of the event's significance and context, as well as a more nuanced view of the individuals and factors that influenced it. Thus, visualisation as a teaching strategy can help to engage learners, make complex concepts more accessible, improve retention of information, and promote a deeper understanding of the subject matter. By incorporating visualisation techniques into their teaching practice, educators can create a more dynamic and effective learning environment for their students.

5.6 Advantages and disadvantages of visualisation Teaching

Visualisation teaching has several benefits for learners. When students create vivid mental images while reading, they are more likely to remember the content better. This is because the act of visualisation helps to form stronger connections in the brain and facilitates better recall. Additionally, students who engage in visualisation often ask more questions, leading to a deeper understanding and engagement with the text. When learners visualise, they can better comprehend the text or concept they are studying, as they connect the information to their own experiences and prior knowledge. Visualisation teaching can enhance learning by making it more engaging, interactive, and memorable. It can help learners understand complex concepts by providing visual aids that make the information more tangible and easier to comprehend. Furthermore, visualisation teaching enhances memory and helps learners remember information more effectively, as the images they create are stored in their long-term memory.

Another advantage of visualisation teaching is that it stimulates creativity, as learners use their imagination to generate new ideas based on the visual aids presented.

This approach can enhance retention by making the information more memorable; learners are more likely to remember visual aids than textual information, which can help them retain knowledge for longer periods. Communication is also improved through visualisation teaching, as it provides a common visual language that learners and teachers can use to convey ideas. This method can help learners understand the language of the subject matter being taught, leading to better communication and comprehension.

However, visualisation teaching also has disadvantages. There are costs involved in the process, as creating visual aids can be expensive, and not all educational institutions can afford to invest in these resources. Another disadvantage is accessibility; not all learners have access to the same equipment or technology, which can limit their ability to benefit from visualisation teaching. Additionally, there may be an over-reliance on visuals, leading learners to become too dependent on visual aids, which can hinder their ability to think critically and independently. Visualisation teaching can also become a distraction if the visuals are not designed effectively. If the visuals are too complex or distracting, learners may find it difficult to focus on the lesson and absorb the information being taught.

5.7 Preparing a visualised classroom

Preparing a visualised classroom involves creating an environment that is visually stimulating and conducive to learning. This can be achieved by incorporating various types of visual aids such as posters, charts, diagrams, and maps. It is essential to start by defining the learning objectives to determine which visual aids will be most effective in conveying the information. For example, if the objective is to teach geography, maps and globes would be suitable visual aids. The next step is to identify the target audience. Visual aids should be appropriate for the age, education level, and cultural background of the learners. For instance, young learners may benefit from colourful and engaging visual aids, while older learners may prefer more sophisticated options. Once the learning objectives and target audience have been established, the appropriate visual aids can be selected. These can include posters, charts, diagrams, maps, videos, and slideshows, among others. It is important to choose visual aids that are relevant to the learning objectives and that will engage the learners.

After selecting the appropriate visual aids, they should be organised in a way that is visually appealing and easy to understand. For example, posters and charts should be placed in areas where they can be easily seen and read. Visual aids can also be organised in a sequence that follows the flow of the lesson. Technology can be a powerful tool for creating visualised classrooms. Interactive whiteboards, projectors, and tablets can display visual aids and engage learners in interactive activities. Additionally, technology can be used to create digital visual aids such as videos, animations, and infographics. It is important that visual aids are updated and refreshed regularly to maintain a visually stimulating and engaging classroom environment. Outdated or irrelevant visual aids should be removed, and new ones should be added to keep the classroom dynamic and exciting.

Therefore, preparing a visualised classroom requires careful consideration of the learning objectives and target audience, selection of appropriate visual aids, organisation of visual aids, incorporation of technology, and regular updates and refreshment of visual aids. A well-prepared visualised classroom can enhance learning and make the classroom environment engaging and memorable.

5.8 Techniques in effective visualised classrooms

Techniques for creating an effective visualised classroom are essential for engaging learners and enhancing the learning experience. The techniques for effective visualised classrooms include:

- **Engage all five senses:** Encourage students to engage all their senses when visualising a scene. They can use a group mind map to ensure they cover each sense and ask themselves what they see, hear, smell, taste, and feel.
- **Practice visualisation:** Ask students to close their eyes and imagine a scene that you describe, either made up or from a book. Then, have the students add further details to the picture they have created.
- **Play a "soundscape":** Play a soundscape and ask students to create a mental picture of where they are and what they see, hear, smell, taste, and feel.

- **Identify descriptive words:** With a text in front of them, students should identify the words that helped them to visualise while reading. They can compare their choices with their peers to determine if some words were more helpful than others and why.
- **Use descriptive words in writing:** Encourage students to visualise a setting using all their senses when writing. Urge them to include descriptive words that will help their readers visualise and create a vivid picture of the scene.

5.9 The Dos in visualisation teaching

Best practices and typical errors to avoid when instructing students in visualisation techniques are referred to as "dos and don'ts." Dos are the advised procedures that instructors should follow when teaching visualisation. By adhering to these dos and avoiding the don'ts, teachers can create an efficient and engaging learning environment for their students, allowing them to develop the skills needed to create impactful visualisations.

When teaching visualisation techniques, it is important to start with the basics. This includes the use of colours, shapes, and charts, and how they can be used to convey information effectively. For example, colours can highlight important information or distinguish between different categories, while shapes can represent various types of data. Similarly, charts can present data in a visually appealing and easy-to-understand manner. By providing a strong foundation in these fundamental concepts, students can build on their knowledge and skills to create more complex and sophisticated visualisations in the future.

Visualisation teaching also involves using real-world examples to show students how visualisation can be applied in various industries and contexts. This helps students understand the practical applications of visualisation and how it can be used to solve real-world problems. For instance, visualisation can be used in finance to track stock market trends, in healthcare to monitor patient health data, and in sports to assess athlete performance. By providing examples from different fields, students can see the versatility of visualisation and appreciate its relevance in diverse contexts. This can also motivate them to learn more about visualisation and how it can positively impact their chosen field.

Furthermore, visualisation teaching encourages exploration as students experiment with different visualisation tools and techniques. This could involve using various chart types, trying different colour schemes, or exploring different software programs. By fostering exploration, learners can develop their creativity and problem-solving skills, gaining a deeper understanding of the strengths and limitations of various visualisation techniques. This process can also help students cultivate their own unique visualisation style and approach, which can be invaluable in their future careers.

Offering constructive criticism on students' visualisations as feedback helps learners improve their skills and understand what makes a good visualisation. Feedback can include suggestions for improvement, highlighting areas where the visualisation is particularly effective, and pointing out aspects that could be enhanced. Learners gain a better understanding of what constitutes a successful visualisation and how they can refine their own work through this feedback. Furthermore, encouraging learners to collaborate on visualisation projects assists them in learning from each other and developing teamwork skills. Collaborating on visualisation projects can involve sharing ideas, brainstorming, and providing mutual feedback. Working together fosters a deeper understanding of the strengths and limitations of different visualisation approaches and techniques, while also enhancing their communication and interpersonal skills, which are valuable in any setting.

Teaching students how to use visualisation to tell a story involves understanding the audience and identifying the key message that needs to be conveyed through the visualisation. For example, a visualisation designed to persuade investors may need to focus on financial metrics, while one aimed at informing the public about a health crisis may prioritise public health data. Through storytelling, learners can create visualisations that are not only informative but also compelling and engaging. This process helps students develop their communication and presentation skills, preparing them for future careers where they may need to convey complex data clearly and engagingly. Furthermore, incorporating hands-on activities and exercises keeps learners engaged in the learning process, aiding their understanding and retention of the information being taught while making the experience more enjoyable. Interactive activities can take many forms, such as creating visualisations on a whiteboard, working with real data sets, or using online visualisation tools. By engaging in these activities, students can acquire practical experience with the concepts being taught and develop their skills in a more applied setting. These activities encourage students to collaborate, exchange ideas, and share insights.

This collaborative approach often leads to a deeper comprehension of the subject matter and a more engaging learning experience. By working together, students can learn from one another's perspectives and contribute to each other's ideas, resulting in a more comprehensive understanding of the material.

5.9.1 The don'ts in visualisation teaching

When it comes to teaching visualisation, there are certain "don'ts" that educators should avoid to ensure their visual aids are effective and enhance learning. Do not overload visual aids with too much information, as this can overwhelm learners and make it difficult for them to focus on key points. Visual aids should be concise and focus on the most important information. While visual aids are an essential part of teaching visualisation, they should not be the only mode of instruction. Teachers should also incorporate other instructional strategies, such as discussions, activities, and assessments, to ensure that learners are engaged and actively learning. Low-quality visual aids, such as blurry images or unreadable text, can be distracting and ineffective. Teachers must ensure that the quality of visual aids is high and that learners can easily read and understand the information.

It is crucial to avoid using inappropriate visuals. Visual aids should be suitable for the topic being taught, as well as for the age and cultural background of the learners, as inappropriate visuals can be confusing and may even offend some students. Accessibility should not be overlooked; instead, teachers should ensure that learners with disabilities or other special needs have access to visual aids. This may involve using larger fonts, providing audio descriptions, or incorporating tactile aids. While repetition is an important aspect of learning, teachers should be careful not to overdo it, as excessive repetition can be boring and unengaging, causing learners to lose interest in the lesson. Visual aids should be used to engage learners and encourage active participation in the learning process. Teachers should remember to engage learners through questions and answers, encourage discussions, and provide opportunities for learners to apply what they have learned.

Thus, teaching visualisation can be a powerful instructional strategy, but educators should be mindful of the "don'ts" of visualisation teaching. By avoiding these mistakes, teachers can create effective visual aids that engage learners and enhance the learning experience.

5.10.1 Case Study A - visualisation in teaching

Background: Plastic pollution is a major environmental issue affecting marine ecosystems worldwide. Plastic waste can harm marine life by entangling animals, blocking digestive tracts, and releasing toxic chemicals into the water. In this case study, students will use visualisation techniques to understand the impact of plastic pollution on marine life.

Scenario: Students are given a real-world dataset that shows the amount of plastic waste in the ocean over time and the corresponding impact on marine life. The dataset includes information on the types of marine animals affected, their population trends, and the severity of their injuries.

Task: Working in groups, students are asked to create a visualisation that illustrates the impact of plastic pollution on marine life. The visualisation should include:
- A clear and concise title that describes the topic
- An introductory section that explains the problem of plastic pollution and its impact on marine life
- A data visualisation section that shows the trends in plastic waste and the impact on different types of marine animals
- A call-to-action section that encourages viewers to take action to reduce plastic waste and protect marine ecosystems.

Students are encouraged to use various types of visualisation tools, such as line charts, bar charts, or heat maps, to effectively represent the data. They may also incorporate images or videos of marine animals to make the visualisation more engaging and relatable.

Outcome: At the end of the project, students present their visualisations to the class, explaining the key insights and design choices they made. The visualisations are evaluated based on their clarity, accuracy, and ability to communicate the impact of plastic pollution on marine life. Through this case study, students enhance their visualisation skills and gain a deeper understanding of plastic pollution and its effects on the environment.

5.10.2 Case Study B - visualisation in reading comprehension

Lesson Objective: Learners will learn how to use visualisation to improve their reading comprehension.

Materials:
- A picture book with rich imagery and specific language
- Paper and pencils
- Markers or crayons

Procedure:
1. The educator introduces the concept of visualisation and explains that visualisation is when one creates a mental image of something you are reading about. This can help learners to understand the text better and to remember what they would have read.
2. The educator reads aloud the picture book to the learners and should stop at several points throughout the story to ask learners to visualise what they are reading about. For example, the educator may ask the learners to close their eyes and imagine what the setting looks like, or to picture the characters' facial expressions.
3. After reading the book, the educator may ask the learners to draw a picture of what they visualised. This will help them to solidify their understanding of the story.
4. The educator should discuss the learners' drawings. Ask them to share what they visualised and how it helped them to understand the story.

Learning Assessment:
- Observe learners' ability to visualise as they read.
- Review learners' drawings to see how well they were able to depict what they visualised.
- Ask learners questions about the story to assess their understanding.

Catering for differences:
- For learners who are struggling to visualise, the educator should provide them with more support. For example, the educator might give them a list of descriptive words to help them create their mental images.
- For learners who are advanced, the educator should challenge them to visualise more complex scenes or characters. The educator may also have them write a paragraph describing what they visualised.

Extended work:
- The educator should have learners create a visualisation journal. In their journal, they can write about what they visualise as they read different texts.
- The educator should have learners create a visualisation game. This could involve drawing pictures or creating storyboards to depict what they visualise.

5.11. Conclusion

Visualisation is a valuable teaching strategy applicable in any discipline. This technique promotes active learning by enabling learners to create a mental picture of concepts they have learned. Visual images are used to form powerful mental representations that enhance the attainment of higher-order learning outcomes. Educators should incorporate the visualisation teaching strategy to improve teaching and learning processes.

5.12 Reflective Questions

1. How can I utilise visualisation in my classroom to increase students' interest and comprehension?
2. What kinds of visual aids would be most useful for my course material? How can I make sure that all students can access these visual aids?
3. How can I most effectively include visuals in my courses to support other teaching methods including discussions, exercises, and assessments?
4. How can I utilise visualisation to inspire students to think critically, challenge presumptions, and take into account opposing viewpoints?
5. How can I evaluate the success of visualisation as a method of instruction in my classroom? What measures should I employ to assess how well visuals enhance student learning?
6. How can I ensure that my use of visualisation respects cultural norms?

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6.1. Concept Map

6.2. Learning outcomes

After studying this chapter, you should be able to
- Understand why the contemporary societal context requires differentiated teaching and why a "one size fits all" teaching style no longer suffices
- Know the main dimensions of differentiated teaching, i.e. along which dimensions should the teacher differentiate
- Understand the principles which should determine the teacher's differentiated teaching
- Be able to plan a lesson in your subject in which you employ the principles of differentiated teaching.

6.3. Key concepts

Differentiation: the action of distinguishing between different people. In a classroom situation, that means distinguishing between various learners.
Diversity in classroom variety among learners in the classroom; a large number of learners of varying socio-economic descent, gender and sexual orientation, cultural background, ability, and interest and aptitude.

6.4. Reflective questions

1. Imagine a classroom in a typical South African school. Think about how diverse the learners of that classroom can possibly be, i.e., along which dimensions of diversity will a teacher have to design his/her teaching strategy?
2. Then think about the subject or the phase you are teaching. How would you devise your teaching strategy for your subject or the phase you are teaching in order to accommodate each of these dimensions of diversity of learners?

6.5. Introduction

In the context of 21st-century classrooms, teachers increasingly encounter diversity among their students. Moreover, contemporary society values diversity, and teachers are expected to accommodate it positively. This is achieved through differentiation strategies. This chapter focuses on differentiation as a key pedagogical strategy of the 21st century. It begins by outlining two significant trends in the historical evolution of education: the shift from elite to mass education and the transition from schools as instruments of hegemony to schools as spaces where diversity is valued. These two trends have created an imperative for differentiation.

6.6. Differentiation Teaching in classrooms

In this new world of mass education and a society that values diversity, teachers face a student body that is diverse across a number of dimensions. The first dimension is cultural diversity. The cultural diversity among students that teachers encounter in many countries has been accentuated by the desegregation school movement, which has, over the past seventy years, been a central tenet of education reform in many countries, including the United States of America, Malaysia, Kenya, Zimbabwe, Namibia, and South Africa.

A second dimension is socio-economic background. In student composition, this dimension has been emphasised in recent decades by the comprehensive school movement in Western Europe, which has ended the historically hierarchical school systems in that part of the world. Gender diversity is another dimension that has also been highlighted in recent years by a co-education movement in many school systems that have historically been gender-segregated. Furthermore, society has recently begun to recognise diversity in sexual orientation. There is also diversity in terms of ability, which includes students who are physically, psychologically, and cognitively challenged — underscored in recent decades by the movement towards mainstreaming in education. Finally, there is diversity in terms of aptitude, interests, and the choices that should be allowed.

The pedagogic response to the diversity teachers encounter in their classrooms is differentiation. Differentiation can be defined as the action of distinguishing between different individuals. In a classroom context, it means that, in terms of teaching style, curriculum, examples, and assessment, the teacher should distinguish between different students. This is done to ensure that the learning material is comprehensible and meaningful for everyone. Issues such as Bourdieu's concept of cultural capital come to mind here (see Claussen & Osborne, 2013). Reflecting on an extensive literature survey on differentiation in education, Eikeland and Ohna (2022) draw attention to the fact that differentiation can occur between groups of students as well as between individuals. This distinction is significant, and each has its place in the classroom. However, particularly when using the former, teachers should be mindful not to promote discrimination and stereotyping, and should also be vigilant so as not to appear condescending, denigrating, or patronising, or, above all, to constitute a form of (re)segregation or internal segregation within a school. Differentiation should not reinforce inequalities or marginalisation in education or in society, nor should it stigmatise certain students; rather, ideally, differentiation should contribute towards greater equality, enriched learning for all, and the promotion of the aims of intercultural education.

6.7. Advantages and disadvantages of Differentiation Teaching

The advantages of differentiating teaching include fostering inclusive education, promoting equality, and creating maximum opportunities for each learner, in line with the principles of Capabilities Theory (see Wolhuter, Espinoza & McGinn, 2024). However, the disadvantages include its higher cost and increased demands compared to a uniform approach to teaching. Nevertheless, given the benefits, it is imperative for teachers to make a concerted effort to differentiate their teaching practices as much as possible.

6.8. Preparing a differentiation classroom

When preparing a differentiated classroom, you need to know your learners well. Without violating anyone's right to privacy, collect information on the diversity among your learners regarding socio-economic background, gender and sexual orientation, cultural background, ability, and interests and aptitude. This knowledge should inform your specification of learning objectives, the physical arrangement of the classroom, the teaching methods used, the learning methods employed, the aids to be used, and the assessment.

6.9. Techniques in effective differentiation classrooms

The four classic techniques for an effective differentiation classroom are content, process, product, and environment. Content refers to "what" you are going to teach, while process refers to "how" you are going to teach it. Product pertains to what students will be asked to do to demonstrate their learning, often in an assessment. Environment involves creating conditions that enable learners to learn. These may vary from seating arrangements and time management to learning aids.

6.10. Dos and don'ts in differentiation teaching

Dos
- give every learner maximum opportunities to realise potential and live out wishes and choices, using the Capabilities Theory as a yardstick (see Unterhalter, 2020).

When differentiating, don't:
- make any child feel inferior or being discriminated against
- be condescending
- be patronising

6.11. A case study in differentiated teaching

I am a teacher at the beginning of the year, teaching Geography to a Grade 11 class in a high school in the greater Cape Town metro area. I have the following aspects of diversity among the students, which I need to take into account in my lessons:

Culture: As an indication of the cultural diversity I face, I have learners who speak six different home languages among themselves: Afrikaans, English, isiXhosa, isiZulu, Greek, Swahili, and Shona. A second aspect of cultural diversity is religious conviction. Among the thirty learners in my class, twenty identify as Christian, representing a number of denominations, including Roman Catholic, Dutch Reformed, Greek Orthodox, Methodist, Anglican, and the Zionist Christian Church. Additionally, there are two Muslims, three learners who adhere to traditional or indigenous African religions, one Jewish student, one learner who identifies as agnostic, one who identifies as an atheist, one who is spiritual but not religious, and one who is uncertain about their belief in God. Ability: My class includes one deaf learner, one visually impaired learner, and two learners with epilepsy.

Socio-economic background: The student body in my class covers the entire socio-economic spectrum, from children from informal settlements to those with unemployed parents, working-class children, lower-middle-class children, children from comfortable middle-class families, and learners from upper-middle-class families.

6.12. Conclusion

As explained in this chapter, the increased diversity of students that teachers encounter in classrooms requires differentiation as an appropriate pedagogical response. This differentiation should occur along multiple dimensions, including students' socio-economic backgrounds, cultural backgrounds, abilities, gender and sexual orientation or identity, as well as individual aptitudes and interests. Differentiation is no easy task for teachers, demanding all their creativity, innovation, professional knowledge, and leadership qualities. However, when implemented effectively, differentiation can make a critical difference in the outcomes and quality of education systems, including those in the Global South.

6.13. Reflective answers

1. Imagine a classroom in a typical South African school. Consider the various dimensions of diversity that the learners in that classroom may represent. In which ways will a teacher need to design his or her teaching strategy to accommodate this diversity?
    - There will be diversity in terms of culture (including, but not limited to, language and religion), socio-economic background, gender identity and sexual orientation, as well as interests and aptitude.
    - Preparing a classroom for differentiated teaching
    - Techniques for differentiated teaching
    - beware the do's and do not's of differentiated teaching
    - capitalise on the advantages of differentiated teaching and attempt to avoid the disadvantages of differentiated teaching

2. Then think about the subject or the phase you are teaching. How would you devise your teaching strategy for your subject or the phase you are teaching in order to accommodate each of these dimensions of learner diversity?

This answer will depend on your subject. In teaching History, for example, you should strive to find role models and interpretations that inspire each of the categories of learners you have. Then,
    - Preparing a classroom for differentiated teaching
    - Techniques for differentiated teaching
    - beware the do's and do not's of differentiated teaching
    - capitalise on the advantages of differentiated teaching and attempt to avoid the disadvantages of differentiated teaching

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Chapter 7: Technology-based teaching

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7.1. Concept Map
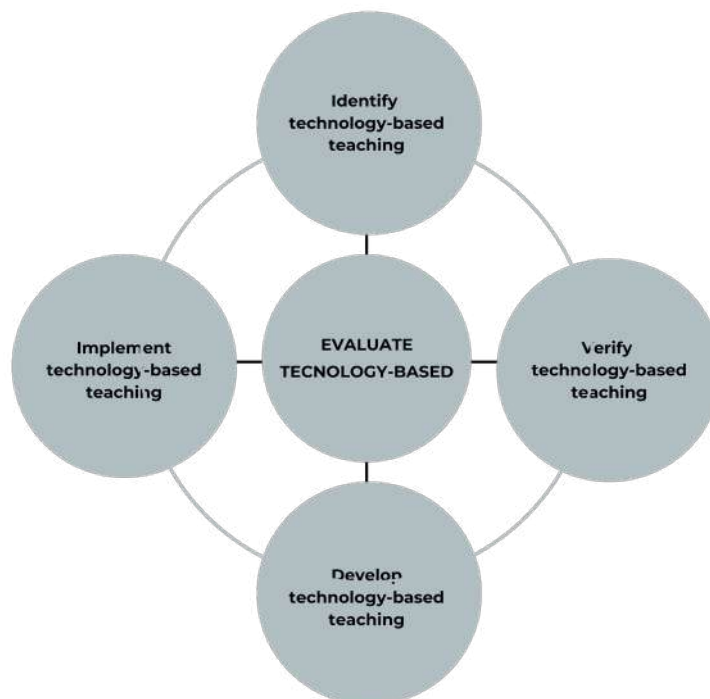
The model outlines the stages of planning technology-based teaching during instruction. The first stage involves identifying the types of electronic devices suitable for a particular concept. The teacher then verifies these devices by designing the concept to achieve the instructional objectives and testing the strategies. The next stage is the development of the designed concept, in which the teacher creates guidance for both themselves and the students, and conducts a pilot test. The fourth stage is the implementation phase, where the teacher prepares the learning environment and engages the students. In the final stage, technology-based teaching is evaluated based on the devices used and the students' engagement, with areas for improvement identified.

7.2. Learning Outcomes

It is assumed that the readers of this chapter will be able to achieve the following learning outcomes:
• Define technology-based teaching
• Explain technology-based teaching classrooms
• State the advantages of technology-based teaching
• State the disadvantages of technology-based teaching
• Mention the steps in preparing a technology-based classroom
• State techniques ineffective technology-based classrooms
• Identify dos and don'ts in technology-based teaching

7.3. Concept notes

The shift from conventional to modern teaching and learning methods represents the most effective and optimal use of technology and the vast information at our disposal. Teachers enhance the learning experience by utilising various technologies provided by educational technology companies to increase student engagement. This innovative approach to teaching and learning is more personalised and engaging. When such technology is employed in the classroom, students find learning enjoyable and, most importantly, engaging.

This chapter presents the methods and strategies for navigating teaching and learning in the classroom while employing technology-based pedagogy. It includes definitions and discussions of technology-based teaching, along with its benefits and drawbacks, as well as insights into the teaching environment and technological tools. The chapter also outlines dos and don'ts for technology-based classrooms and effective practices in technology integration. Additionally, it highlights several case studies of classrooms that successfully utilise technology.

7.4. Reflective Questions

Are teachers capable of implementing technology-based teaching pedagogy in their classes?
Can teachers modify their teaching methods to incorporate technology-based pedagogy?

7.5. Introduction to Technology-based Teaching

Technology can be defined as the act of integrating scientific knowledge into the development of machinery and equipment to find solutions for human problems. The effective integration of technological equipment or devices into teaching to impart knowledge to learners is called technology-based teaching. The emergence of technology in the education system has modernised traditional methods of teaching and learning in the classroom, especially in the 21st century. Technology serves as a teacher's tool for effective instruction in this era. Consequently, the pedagogy of technological teaching has advanced significantly in developed countries and globally, including in the United States of America, Finland, Japan, Germany, Canada, the United Kingdom, and Singapore.

Technology-based teaching in the 21st century involves electronic teaching that incorporates computers, the internet, audio and video resources, satellite broadcasts, software applications, video conferencing, chat rooms, smartphones, websites, computer-based instruction, and CD-ROMs during instruction. It utilises computers, the internet, emails, radios, televisions, and projectors in the teaching process. Technology-based teaching adopts a more practical approach. E-learning is also a form of technology-based teaching that enables teachers to connect with learners, near and far, via networks and provide instructions from a distance. Technology-based teaching supports student-centred and authentic learning (Abulon, 2014). Technology has made it possible for individuals interested in education to participate in the learning process, regardless of distance (Sharma, Malhotra, and Chauhan, 2021). Additionally, technology-based learning encompasses platforms such as Zoom, Google Meet, WhatsApp, Google Classroom, MS Teams, webinars, and other technological devices and software for imparting knowledge to learners.

7.6. Technology-based Teaching classrooms

Classrooms are environments where interactions between teachers and students take place. Teachers have the authority to organise their classrooms in a manner that is conducive to effective learning support, healthy cooperation, independent judgement, and choice, allowing learners to adapt, relax, and learn freely. Teachers design

their instruction in such a way that the use of the internet is incorporated. Webinars, Google Classroom, video conferencing, smartphones, Google Meet, animations, online video lectures, Microsoft Teams, Zoom, and digital examinations, among others, are ways of using technology in teaching. All these apps and software facilitate collaboration among students in the classroom and enable teachers to evaluate students' performance with ease (Sharma, Malhotra, and Chauhan, 2021).

Technology-based teaching classrooms provide interactive teaching opportunities for both teachers and students, fostering active participation and healthy cooperation. Convenient technology-based teaching environments will transform the teaching landscape, including teaching styles, content delivery, evaluation methods, and even management approaches. Wherever there is technology, remarkable change is inevitable. Some of these technological tools used in teaching can be discussed below:

Interactive electronic whiteboard (IWB): This whiteboard is an invention that replaces the chalkboard. The advantage of the IWB is that it provides clarity and allows every student, regardless of their position in the classroom, to see what the teacher is presenting. This IWB consists of a computer, projector, and whiteboard.

Social media: This is a platform where teachers and students can disseminate information quickly and efficiently. It has proven useful globally by enabling the sharing of information through WhatsApp, Facebook, Instagram, LinkedIn, Twitter, instant messages, and chat, among others. Teachers use these tools to deliver instructions in the classroom or remotely, receiving instant feedback from students.

PowerPoint Slides: These tools have been used in the education system for decades in institutions of learning. A PowerPoint slide consists of text and audiovisual clips, making it effective for delivering abstract concepts. It is designed colourfully to attract students' attention and is easy to modify.

Animation: Animation is an interactive, technology-based teaching tool that engages students' attention during instruction. It enables students to comprehend concepts easily and removes barriers that hinder their understanding of abstract ideas. It can be played as many times as needed to improve retention. A well-designed animation video can be downloaded to students' smartphones, ensuring continuity of instruction both in schools and at home.

Microsoft Teams: This is an innovative platform that facilitates online chat and video conferencing in educational institutions. Many teachers conduct classes, exams, and homework assignments online. Presentations on the platform are recorded, allowing students to view them at their convenience and catch up on any lessons they may have missed.

Zoom: Teachers use the Zoom app in the classroom to connect with students both near and far. It offers features such as full-screen viewing, simultaneous screen sharing, group chat, whiteboarding, and interaction between the teacher and students. It accommodates as many users as possible.

Google Meet: Google Meet is a free application that does not cost much, except for data. The only way to install it is for the user to have a Google account and a functional email address. It produces a link that enables the teacher to invite students to the class. The teacher can use the link as many times as necessary and with different groups of people.

Google Classroom: This is common in the educational environment. It enables teachers to share information and class materials with students. They can use it on any device, such as computers, phones, tablets, and others. Teachers can interact with students and communicate at any time through this medium.

7.7. Advantages and disadvantages of technology-based teaching

7.7.1. Advantages of technology-based teaching

There are many advantages of technology -bases teaching which include the following:
- Access high-quality, current information: Having the most recent information available in a classroom setting where technology is used to teach students helps create the best educational experience. To ensure accuracy, teachers might also utilise or direct students towards reliable sources. Both the teacher and students can use hyperlinks, tabs, and accordions to access information about a topic, rather than reading through text sequentially.
- Gather student performance metrics easily: The use of technology in the classroom enhances teacher performance. Technology-based strategies may be adopted primarily due to the data advantages they offer when specific learning goals can be achieved more effectively through technological approaches.
- Students learn technology skills: The chances for students to acquire technological skills automatically improve when technology is used in the classroom. Teachers can provide exercises that allow students to test and develop their skills.
- Improved student participation and engagement: The introduction of technology is a strategy to increase

student engagement, as most students adore it. The teacher uses technology to introduce students to web resources, show short films, utilise interactive software, create digital presentations, and encourage students to produce their own digital content.

- Automate repetitive tasks: Teaching may involve laborious activities such as tracking attendance, monitoring quiz results, and noting completed assignments. Existing technology can assist teachers in preparing courses, evaluating students, grading homework, providing feedback, and managing administrative tasks.

Other advantages are as follows:
- Technology tools can assist teachers with time-consuming administration.
- Assessment data can guide teachers on what topics to focus on or which students need additional assistance.
- Studies show an increase in student engagement with the use of technology.
- Tools such as Google Docs can be used for student collaboration.
- Resources such as video, animations and simulations can enhance learning (Future teachers, 2022).

7.7.2. Disadvantages of technology-based teaching

The disadvantages of technology–based teaching include the following:
- Faster but less memorable learning: Devices and learning apps operate at a pace faster than the human mind's rate of learning. When studying, students may skim over certain concepts or omit details that add texture and depth. Educational technology specialists recommend that teachers adjust media use to slow down the learning process, allowing for more rumination and reflection.
- Technology can be distracting: Students will inevitably become distracted when using devices like computers and tablets in the classroom. Some misbehaving pupils will attempt to utilise technology for amusement rather than its intended utility.
- Less direct social interactionAnother point of concern is how social interaction appears to be diminishing due to technology. When using technology, students interact and communicate verbally with their teachers and one another less frequently. Face-to-face communication is entirely absent from online education.
- Integrating technology is often time consuming: The role of a teacher may become significantly simpler in the future thanks to technology, but that time has not yet arrived. Planning effective lessons using digital technology instead of conventional approaches can be difficult and time-consuming.

Other disadvantages are:
- Some technology can be used by students to cheat on exams.
- New technology is expensive, and budgets at most schools are constrained.
- Students can turn off their cameras in a virtual lesson and disconnect from the class.
- The internet is distracting to some students.
- Training is required for both teachers and students.
  (Future teachers, 2022).

7.8. Preparing a technology-based classroom

Computers, specialised software, network-based communication systems, and other hardware and infrastructure are examples of technology resources. Some classrooms have been utilising technology for decades (McNulty, 2021). Consider the discrete calculators commonly found in science or mathematics classes, or the overhead projectors that some teachers mastered. Modern educators have a wide range of options at their disposal. Most classrooms are now equipped with data projectors or smartboards as standard, and teachers also have laptops for lesson planning and creating presentations. If permitted by school policy, teachers may use smartphones or clickers to gauge the class's mood (Kouser & Majid, 2021). They can quickly assess whether their students have grasped a concept by conducting a test or poll. To facilitate online research and utilise tools like Google Classroom, several schools have established Wi-Fi networks and purchased Chromebooks (Zinger, Tate & Warschauer, 2017). At the more complex end of the spectrum, teachers can conduct scientific experiments or interactive simulations to demonstrate how an engine functions. Additionally, to assist with class administration, some educators have adopted learning management systems and online assessment platforms. For those comfortable with the recording process, lessons can be transformed into podcasts or videos that students can use as a reference for revision.

Technology – based classrooms can be prepared in various ways, some of the examples are:
- Gamification of learning
- Online field trips
- Student feedback.

- Producing digital material
- PowerPoint or Google Slides
- Online grading programs or assessments
- Online classroom calendar
- Classroom Tablets
- Communication
- Online platforms or resources
- Social media
- Models and simulations
- Online mind maps
- Listserv
- Collaboration
- Free educational resources or Open Educational Resources (OERs),
- Learning management systems (LMS)
- Digital portfolios (McNulty, 2021).

7.9. Techniques in effective technology-based classrooms

Approaching a digital pedagogy that is not technocentric - A fundamental principle of effective teaching in technology-based classrooms is recognising the role of the teacher in the teaching and learning process. For example, a PowerPoint presentation serves as a tool that supports the teacher in implementing the lesson plan effectively, while the use of video or film stems from a more learner-centred approach, incorporating activities such as peer discussions or informal assessments. Therefore, the film resource should be actively integrated into the teaching and learning approach (Kouser & Majid, 2021; Schoemann, 2013).

A Digital Pedagogy in Context

School Context - School and class infrastructure will rarely allow for a fully digital classroom (Mukuni, 2019). Therefore, an integrative approach to technology in the classroom is vital. This integration balances recent digital technological advances, technology from the 1990s and early 2000s, and older educational technology that is still prevalent in many schools. When considering the use of technology in the classroom, it is essential to assess the degree to which the technology is backwards compatible or whether adapters are readily available. For example, computers and projectors that are compatible with both HDMI and VGA are preferred when developing classroom infrastructure.

Learner Context - Teachers in effective classrooms should be informed by a context-based approach towards technology that considers the teacher, learner, and curriculum when incorporating technology-infused pedagogy. This affords the teacher the opportunity to consider whether they or the learners fall with respect to digital native, digital immigrant, or digital refugee.

Classroom Context - Ensuring equal access to technology within the classroom allows for effective learning (NETP17, 2017). All learners should engage with the same level of educational technology. The wider community and home context should also be considered when setting assessments or evaluating eBooks, particularly regarding the availability of technology in those contexts. Assessments should align with the minimum levels of technology available at home to avoid disadvantaging or advantaging learners based on their technological access.

Designing Assessment for the 21st century Learner - Assessment aimed at engaging the 21st-century learner is best designed using ICT technology. Digital tools play a role in creating informal assessments that are most suitable for learners classified as digital natives. Learners can be demotivated by assessments that do not appear professional and modern in design, as well as by traditional textbooks. The integrative approach aims to provide learners with access to both e-books and hard copies of textbooks available in the classroom.

Class Administration for the Digital Pedagogue - Computerising all administrative tasks will save essential time and allow for a greater focus on teaching and learning. Paperless communication of reports to parents can be further automated using newer school systems, such as ADAM. The Google Education Suite is useful for storing reports, moderating assessments, and keeping attendance records. Google Drive offers the advantage of backing up documents on a server, preventing unexpected losses of files.

7.10. Dos and don'ts in technology-based teaching

Pre-lesson preparations - Technology-integrated pedagogy must involve testing the technology used in the classroom immediately prior to the lesson to ensure its functionality during the session.

Ensuring equal access to technology for learning – Teachers should render the technology for teaching and learning in the classroom homogenous. Some flexibility should be allowed in the home environment but not to the extent of advantaging any group of learners. As such, a teacher should be highly aware of the infrastructure needs for their classroom and lessons and what is available.

Notes for using digital resources - Videos and films should have subtitles whenever possible. This supports the spoken word with the written word and helps learners follow the video material. Films should serve as an interactive aspect of a lesson, rather than simply being played during it.

Notes on using PowerPoint Presentation software - PowerPoints should be employed judiciously. First and foremost, a teacher should own a PowerPoint remote to teach more authentically. The remote allows the teacher to bring aspects of the presentation to the learners' immediate attention. PowerPoints should only contain a skeleton and summary of points.

7.11. Case Studies in technology-based teaching

At Silverstream (South) Primary School, teacher Andrea Robertson employed hydroponics as a context for developing students' understanding of technical systems. The students created their own hydroponics systems, investigated common items as technological systems, and enjoyed a field trip to a hydroponics farm. Through their work in the hydroponics unit, the students learned that a technological system converts an input into an output. They were able to identify the elements of a hydroponic system as well as its advantages.

Given that Andrea knew the owners of Saddle View Nurseries, a nearby hydroponic farm, it was clear that using hydroponics as a framework would enhance students' understanding of technological systems. It was evident that the students needed to interact with various technological systems to gain a thorough understanding. Andrea created a draft unit plan, contacted the hydroponics farm to inquire about the possibility of a field trip, and collected and created teaching resources.

A technical system comprises multiple connected components that operate together to achieve a specific goal without the need for additional human designers. Technological systems transform, store, convey, or control resources, energy, and/or information for a particular purpose. To construct their own systems, students must understand the following concepts: input, output, transformation, and control; "black box"; redundancy and dependability; and operating parameters.

The terms input, output, and transformation were introduced to the children alongside several simple systems. The children then selected one of these systems, sketched it in their books, and gave it a name. The popcorn maker was frequently chosen, likely because it was the easiest to comprehend. Andrea then presented the concept of hydroponics as a technological system.

She stated, "When I showed them photographs of hydroponics units, I found that not one child was at all aware that plants could grow without soil." "My own class's response was interesting." Andrea began building on her students' developing understandings by utilising a range of teaching strategies. Some of the children were starting to grasp the idea that there are many different kinds of systems.

7.12. Reflective answers

Are teachers capable of implementing technology-based teaching pedagogy in their classes?
Teachers can utilise technology-based teaching pedagogies in their classes to a certain extent. However, they encounter a number of obstacles that limit their potential. To fully realise this potential, teachers require better support through technology-based professional development. Additionally, promoting positive attitudes towards using technology in the classroom should be an essential goal of this training.

Effective implementation of technology-based pedagogy also necessitates funding that ensures an even playing field for both instructors and students. Therefore, teachers can successfully apply technology-based pedagogy in their classes when they receive proper encouragement and training.

Can teachers modify their teaching methods to incorporate technology-based pedagogy?
Under the correct conditions, teachers can adapt their teaching strategies to include technology-based pedagogy. For a teacher, switching entirely from their traditional pedagogy to one based on technology in a short period of time would be very difficult. Teachers must gradually integrate technology into their lesson plans. This would assist in bridging the gap between the known and the unknown. The teacher can add more components of a technology-based pedagogy as more technology is successfully deployed. It is essential that teachers receive direction and assistance throughout this process.

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Chapter 8: Modelling in Classrooms

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8.1. Concept Map
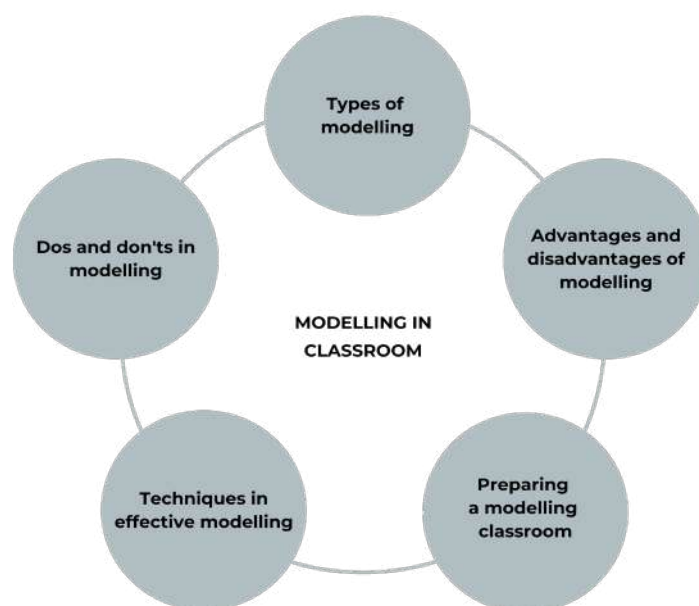
Figure 8.1. Modelling in classroom

8.2. Learning Outcomes

By the end of this chapter readers should be able to:
- Define modelling.
- Explain types of modelling in the classroom
- Discuss the advantages and disadvantages of modelling in classrooms
- Prepare a modelling classroom
- Apply effective modelling strategies in teaching-learning situations.

8.3. Clarification of key terms

Modelling: This refers to a pedagogical method or teaching strategy that involves delivering lessons by using real objects or materials as instructional media relevant to the subject matter in a sequence of activities (Ramadan & Surya, 2017). This definition aligns with that provided by Chingombe (2013), who states that modelling involves the teacher performing a task while learners observe, and later, they will be asked to imitate the skill or behaviour.

Teaching strategy: This is a well-designed plan for delivering a lesson, which includes topics, instructional objectives, and an outline of teacher and learner activities implemented in class, ensuring that learners acquire worthwhile knowledge and skills for lifelong learning.

Procedure: This term is used synonymously with "technique," signifying a series of steps or phases that a teacher employs when modelling or delivering content knowledge to learners in the classroom or during outdoor learning activities.

8.4. Reflective questions

1. What is modelling in the classroom?
2. Compare and contrast step-by-step and whole process modelling in the classroom.
3. Assess the advantages and disadvantages of modelling in the classroom.
4. Explain the steps and precautions you would take when preparing a modelling classroom.
5. Identify effective modelling techniques and explain how you would apply them in teaching-learning situations.

8.5. Introduction to modelling as a teaching strategy

Modelling in the classroom encompasses a set of strategies and techniques that teachers employ to create a conducive learning environment that supports learners' academic, social, and emotional growth. This can involve using real objects, demonstrating how something works, or engaging in role play to act out social situations. Modelling is also referred to as the demonstration method, where the teaching-learning process is systematically carried out, initially by the teacher and subsequently by the learners, whether in a classroom or during outdoor activities. In this learning situation, learners observe the instructor performing a teaching-learning task and then imitate and replicate the technique. This chapter discusses three main types of modelling by execution: step-by-step modelling, whole process modelling, and on-the-spot modelling. It also provides an overview of the advantages and disadvantages of modelling in the classroom, along with acceptable and unacceptable practices. A case study is included for readers to reflect on and evaluate against the effective modelling techniques recommended in this chapter.

8.6. Modelling in classrooms

The main purpose of modelling in the classroom is to simplify the understanding of concepts and to help learners develop systematic procedural proficiencies or competencies. A teacher models by systematically performing a specific learning activity or illustrating a concept that he or she wants learners to understand and replicate. Effective modelling in classrooms requires the teacher to understand the audience, their background knowledge, and the modelling environment. Teachers should know why, when, how, and what teaching materials to use when modelling in the classroom.

A teacher should engage in modelling under the following circumstances: when introducing a new topic to learners; when learners face difficulties in connecting theories to practical applications; when the teacher wants to explain and illustrate the connection between difficult or abstract concepts and the lived realities of the learners; and when revising a test that learners performed poorly on. The main purpose of modelling in classrooms is to demonstrate the occurrence of an event or the stages in processes that take place within a phenomenon, thereby facilitating an easier understanding of the subject matter for learners. In other words, the teacher models factual and conceptual knowledge as well as procedural problem-solving skills. Figure 8.2 below shows the key steps in classroom modelling.

Steps in modelling in the classroom
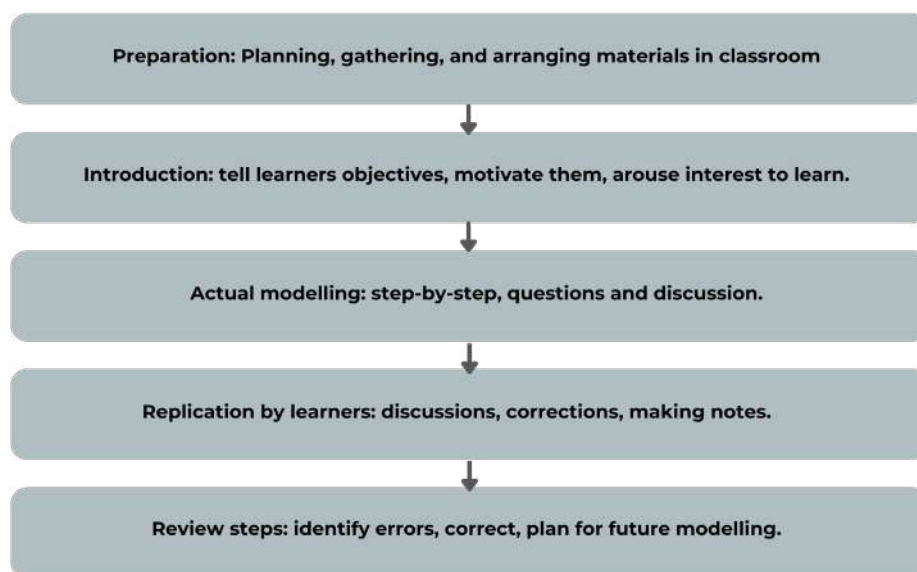
Figure 8.2. Steps in modelling in class.

Chingombe (2013) classifies types of modelling based on their execution methods: step-by-step, continuous modelling, and spot modelling. Similarly, Basheer et al. (2017) identify three types of modelling used in classrooms: visual, analogical, and experimental modelling. This chapter merges these classifications according to their execution in the classroom to minimise confusion for practitioners. The following section discusses types of modelling by execution.

8.6.1. Step-by-step modelling in the classroom

Step-by-step modelling involves the teacher executing the modelling process before the class and explaining each phase to ensure that learners master the key skills, knowledge, and precautions (especially when dangerous tools and substances are used) before moving on to the next phase. The teacher displays objects, substances, and visual aids to help learners visualise functions and processes at each stage. Teachers can utilise films, projectors, computers, experiments, and other information and communication tools to illustrate concepts or demonstrate functional inter-relationships in space. At the end of each phase, the teacher asks comprehension questions, facilitates brainstorming, entertains questions from learners, and may ask learners to replicate each step to identify and eradicate mistakes before proceeding to the next phase. This type of modelling allows learners to observe detailed procedures, hear the accompanying explanations of activities from the teacher, and participate through replication. The advantage of step-by-step modelling is that it caters to all learners with diverse learning needs and abilities. Chingombe (2013) noted that the use of visual teaching aids is particularly suitable for learners with hearing impairments. Visual modelling is crucial in reducing verbose lectures and saves time in covering a given topic of study. According to Basheer et al. (2017), visual modelling benefits learners with high visual and spatial intelligence but limited cognitive abilities.

8.6.2. Whole process modelling in the classroom

Whole process modelling is the second type of modelling, representing a real experiment in a science laboratory. Experiments are common forms of modelling in science classrooms and other practical subjects, where a teacher demonstrates practical skills covering all pertinent stages that he or she wants the learners to master in the processes.

In this type of modelling, the teacher demonstrates the entire process from beginning to end without interruptions from the learners. The purpose is to enable the learners to see the whole process and then allow them to replicate the modelling while the ideas are still fresh. This continuous modelling process is particularly appropriate when substances, chemicals, and catalysts with timed reactions are used, as any interruption may distort the experimental results.

8.6.3. On spot modelling in the classroom

Execution of spot modelling in the classroom usually occurs when the teacher follows up on learners' attempts to replicate modelling done through step-by-step or whole-process modelling. At this point, the teacher takes corrective steps in response to the learners' replication of prior modelling. Spot modelling is carried out when the teacher identifies a problem or mistake in the learners' modelling performance. In this case, the teacher halts the learners' activities to prevent the issue from worsening. The teacher then redemonstrates or repeats the important modelling activity that the learners failed to execute adequately. The teacher explains complications, errors, and the significance of precision at each step. This phase involves particular attention to each learner's conceptual understanding and skills proficiency development. The teacher engages the learners by asking questions about concepts, procedures, precautions, and the importance of each step towards content mastery. Analogical modelling is implemented when a teacher chooses a phenomenon exhibiting relevant similarities to the concept or aspect of a process the learners need to understand. This method can be applied in any of the three types of modelling discussed above.

Teachers should recognise that modelling in the classroom is influenced by the nature of the learners, class sizes, lesson time distribution, and the availability and allocation of learning resources. Teachers must first identify the learning needs and interests of their learners before selecting and employing modelling methods. In this regard, education systems should consider incorporating rigorous training in modelling and appropriate language use as examinable components in teacher training programmes.

When modelling in classrooms, teachers should utilise instructional media related to the subject content intended for mastery by the learners. The use of indigenous knowledge, tools, concepts, and practices should be prioritised during modelling, ensuring that knowledge is built from the known to the unknown, and from simple to complex, while bearing in mind the principles of assimilation and accommodation of new knowledge. Step-by-step modelling facilitates the creation of cognitive links between new and previously learned knowledge.

While modelling in classrooms is often perceived as more suitable for science, mathematics, agriculture, technical subjects, and information and communication technology studies, proficient teachers in the social sciences can effectively model historical events, rules, stories, and religious and cultural practices, thereby connecting abstract concepts to the lived realities of learners. In science subjects, modelling serves as a pedagogical strategy aimed at illustrating a specific scientific concept (Basheer et al., 2017).

Teachers should be aware that learning becomes more motivating, interesting, and impactful when learners are directly and actively engaged with the subject matter through effective discipline and quality modelling. Learners should be tasked to replicate the modelling after the teacher assesses their procedural and conceptual knowledge development. Modelling can be complemented by employing Socratic dialectics (the question-and-answer method) to evaluate the advancement of critical problem-solving thinking skills in learners. Improvement in efficiency and academic achievement largely results from well-planned and diligently executed modelling in class.

8.7. Advantages and disadvantages of modelling in teaching

There are advantages and disadvantages of modelling that a professional education practitioner should understand.

8.7.1. Advantages of modelling in teaching

The modelling method is an excellent way to actively engage learners in classroom participation, involving the use of concrete objects and various senses for lifelong learning. Consequently, learners will develop a deeper perceptual and conceptual understanding and internalisation of the content knowledge gained through the modelling method, which becomes permanently remembered.

Modelling arouses and increases learners' interest, curiosity, motivation, and satisfaction. The quality of the teacher's modelling processes, along with allowing learners to demonstrate their mastery of skills, inspires them with the spirit of discovering new knowledge. Thus, modelling becomes the key ingredient in boosting learners' reasoning capacities, problem-solving success, and academic achievement.

Modelling is a practical pedagogy that enhances the understanding of complex or difficult topics, enabling teachers to explain concepts easily using a variety of learning materials. More importantly, modelling accelerates learners' cognitive development and improves their reasoning capacities and problem-solving abilities. Consequently, there is a significant improvement in their overall performance compared to the conventional lecture method. Basheer et al. (2017) found that learners exposed to modelling exhibited increased interaction and became more active in academic discussions than the control group that was not exposed to it. Modelling in the classroom dramatically improves learners' behaviour.

Modelling motivates learners to undertake serious original individual inquiry and to gain the necessary psychomotor skills and empowerment objectives. Additionally, modelling saves time because learners can visualise the modelling process live, which helps them understand the practical application of the theoretical knowledge acquired. Modelling enhances the translation of theory into practical application, the development of creativity and innovation skills, and the understanding of scientific concepts by learners. This method can also trigger and encourage post-modelling group discussions and cooperative learning, providing learners with opportunities to reflect on what they have learned during the modelling session. Modelling is the most suitable learner-centred pedagogical method for teaching students of all age groups, from kindergarten learners in the psychomotor stage, through primary school learners in their pre-operational and concrete operational stages, to higher levels of education. Figure 8.2 below summarises the advantages of modelling in the classroom.

Advantages of Modelling (summary)
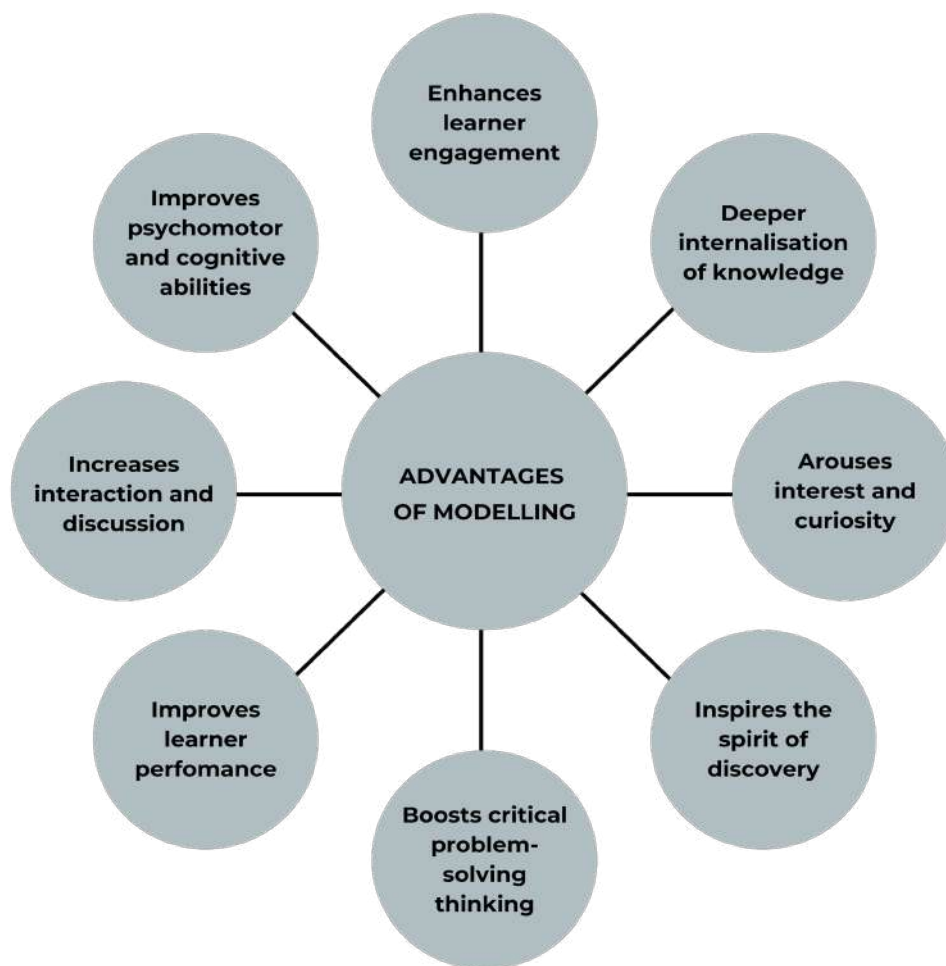
Figure 8.3. Advantages of modelling

Figure 8.2 illustrates the advantages of modelling in the classroom. The diagram can be interpreted in any direction.

8.7.2. Disadvantages of modelling in teaching

Modelling requires financial and material investment to equip teachers with communication skills and modelling proficiencies. Learners do not benefit equally due to individual differences and experiences. Modelling is costly, time-consuming, and may not be inclusive when implemented in large classes with mixed-ability learners. Not all teachers have experience in modelling, and it can be confusing if executed with limited resources and poorly prepared media. Important modelling tools can be damaged when inexperienced learners attempt to replicate the teacher's modelling, and this can result in injury if the modelling involves dangerous tools or chemicals. The teacher serves as the primary source of knowledge and controller of every activity.

8.8. Preparing a modelling classroom

The modelling environment should be neat, clean, and conducive to all learners. In preparing a modelling classroom, a teacher should revisit Bandura's theory of social learning, which posits that learners learn through imitation and emulation. The teacher must be aware that their modelling will be imitated, whether it reflects positive or negative behaviours. During the planning stage, the teacher should be diligent and thorough in designing logically sequential steps in the modelling process to prevent errors. They should also be proactive, ensuring that all essential procedures are included in the planning phase.

The teacher should consider the seating arrangement in the modelling classroom, positioning all learners so they have a clear view of the modelling processes. Additionally, teachers must prepare for the safe collection, management, and use of any necessary equipment by the learners. If the modelling involves the use of energy sources such as electricity, gas, or other fuels, the teacher should take precautions to mitigate risks to life and prevent shortages during the modelling session. Moreover, teachers should identify potential risks that may arise during the preparation and execution of the modelling, such as the use of sharp objects, harmful substances, and irritants.

8.9. Techniques in effective modelling in the classroom
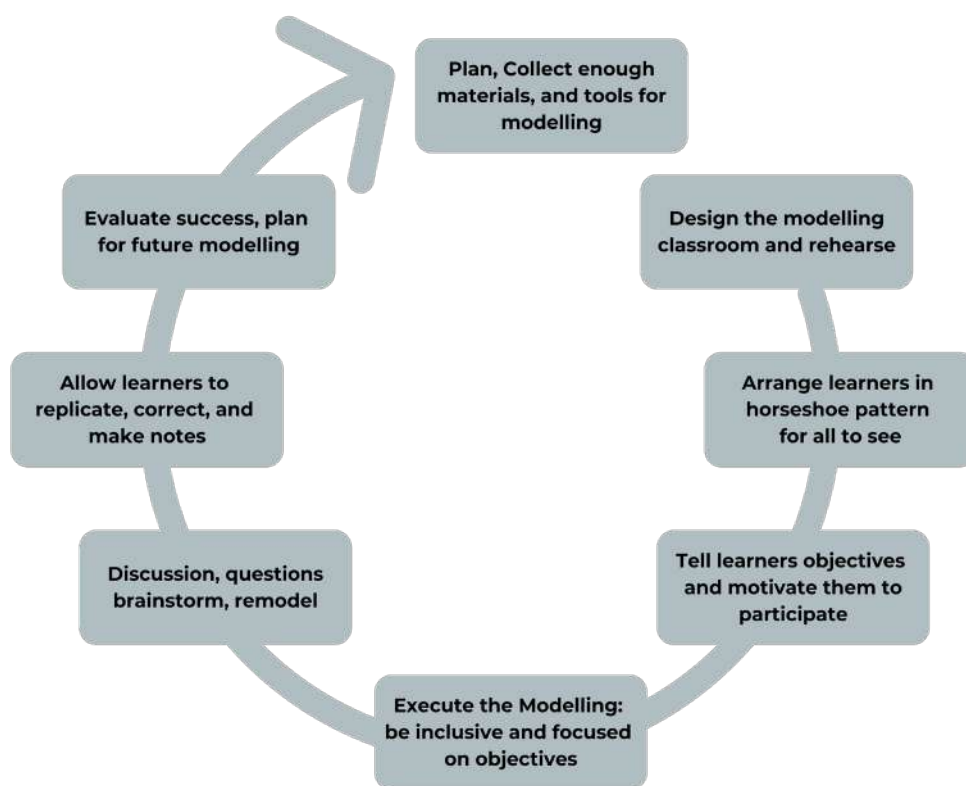
Figure 8. 4. Techniques in effective modelling in the classroom.

Figure 8.3 illustrates techniques for effective modelling in the classroom. The following section discusses these techniques in detail.

The teacher should introduce the lesson by explaining the purpose or objectives of modelling. He or she can proceed with a simple and interesting experiment, a fascinating story, or a problem that relates to the environmental experiences of the learners, as well as their differences and backgrounds. It is important to arrange learners in a horseshoe formation or create a stage or podium so that every learner is actively involved and can fully view the modelling tools and processes without difficulty. A good teacher should always begin by capturing the learners' attention, motivating and preparing them for psychological and academic readiness for the modelling session. The teacher should strive to develop pedagogical interventions that enhance learners' interests and positive attitudes towards excellent modelling performance.

During modelling, the teacher should display objects and materials that are large enough and visible to all learners. The teacher should use well-prepared teaching aids such as models, photographic media, linear or cyclical diagrams on whiteboards, graphs, and information and communication technology tools during the modelling. Field trips may be conducted if direct interaction with nature and specific concrete objects becomes necessary for the modelling, especially in science studies, agriculture, and geography. Teachers should be versatile and dynamic when modelling. This method can be complemented by discussion, brainstorming, and lecture methods when clarifying key analytic concepts. Post-modelling discussion and brainstorming are beneficial for the active, inclusive involvement of all learners. It is the teacher's responsibility to recognise the individuality of learners and ensure that everyone is benefiting from the modelling proceedings. The instructor can video record the modelling session, which can be replayed during reviews without wasting materials.

The teacher should keep in mind the principle of reflective thinking in learners, building new knowledge upon their previous knowledge. The teacher should elevate learners' attention and involvement. This can be achieved by allowing learners to define key concepts, discuss them, jot down major points, list lessons and principles learned, and explain the interrelationships discovered during the modelling session. Teachers should create a democratic and inclusive environment for learners to generate questions and provide answers during the modelling process to boost their critical thinking skills. Teachers should conduct formative and summative evaluations of the entire modelling session by reviewing the performance of learners, taking note of areas that need improvement, to make future modelling in the classroom more effective and efficient.

8.10. Dos and don'ts in modelling teaching

The teacher should be aware of what is acceptable (the dos) and what is not acceptable (the don'ts) when modelling in the classroom. The dos and don'ts of modelling are discussed below.

8.10.1. The dos in modelling teaching

To ensure that the demonstration method is a success, the following advice should be followed. Teachers should set clear, specific, measurable, achievable, realistic, and time-framed goals and objectives for the modelling. The teacher conducting the modelling should design a well-planned strategy that is simple and easy to implement. The modeller should prepare a thorough and detailed lesson plan that is well-structured and focused on the subject matter to be modelled. During the planning stage, the teacher should consider the safety of the learners and creatively gather quality materials and a complete collection of tools needed for the modelling (Damiani et al., 2018). It is essential to allow time for rehearsal before the actual modelling in class to ensure its success. When using the modelling method, teachers should use clear and simple language that promotes a better understanding of concepts and processes.

The teacher should be inclusive by paying full attention to all the learners in the class, motivating them, and providing equal opportunities to learn from the modelling. The teacher should create a democratic environment where learners are encouraged to ask questions to clarify ambiguities. Teachers should allow the answers to come from the learners themselves, giving them time to gather their thoughts and think through their responses. The teacher can provide clues or leading questions to stimulate critical thinking among learners.

8.10.2. The don'ts in modelling teaching

Do not rush when planning to model; take your time to consider the content to be modelled, the modelling tools, the sequencing of activities, the timing, and the involvement of learners. Do not omit important steps and necessary modelling procedures. Do not begin modelling until all learners understand the purpose of the modelling or the problem it is intended to solve, and until they are fully motivated. Ensure that no learner is left behind; every learner must benefit from a supportive modelling environment. Avoid careless use of objects and substances that are necessary but pose dangers to life.

8.11. Case studies in modelling teaching

A School of Agriculture advertised a vacancy to teach an elementary agriculture class. Shortlisted candidates would be required to teach, for 60 minutes, an agricultural topic of their choice using the modelling method. Thompson Sixpence applied for the post and stated in his application letter that he was skilled at modelling. He became one of the fortunate candidates to be shortlisted and was invited for an interview.

Thompson decided to model plant propagation using stem cuttings. In his lesson plan, he listed the following resource requirements: a sharp knife or scissors, a plant pot or any plant container, growing media, a pencil, a clear plastic bag, a rubber band, and a stem cutting. He collected these items in preparation for the interview. He was the first to model on the interview day. All learners were seated in their usual places, and the interview panel sat at the back of the classroom. Everyone in the modelling classroom was a stranger to one another.

Thompson placed his modelling items on the table in front of the class. He started by naming and explaining the uses of each item or medium he was going to use. He saturated the growing media with clean water. Using a knife, he cut the stock plant 5mm below the leaf joint and removed the leaves. He explained the precautions that must be taken when using sharp objects and noted that the rooting hormone can be an irritant to the skin or eyes. As a precaution, he advised the learners to use gloves and masks, although he did not have them available. Thompson used a pencil to create a hole in the growing media and placed the plant stem to prevent the displacement of the rooting hormone during planting. He inserted the cut end into the rooting hormone powder. He gently covered the cutting with the medium and placed it in a plant pot. He then covered the plant pot with a clear plastic bag and secured it with a rubber band. He explained that the plastic bag was to provide warmth and moisture for the rootless cutting.

Thompson also explained how to care for the propagated plant: it should be kept under moderate temperatures, checked weekly for moisture levels and root growth, and the plant pot size should be changed when the plant's root density increases. His modelling session took 45 minutes and concluded there.

Case study revision tasks
Imagine that you are a member of the interview panel. Write a report to the school head, explaining with reasons whether Thompson Sixpence should be offered the job or not.
Write a feedback report advising Thompson Sixpence on the strengths and weaknesses of his modelling.
Suppose you were Thompson Sixpence. Review your modelling session and suggest strategies for improvement in the future.

8.12. Conclusion

Modelling is a teaching strategy that involves executing lessons through the sequential exhibition of real objects or instructional media relevant to the subject matter. There are three types of modelling in the classroom: step-by-step, whole process, and spot modelling. The purpose of modelling is to simplify the understanding of concepts and to develop systematic procedural problem-solving skills in learners. The advantages of modelling include arousing interest and curiosity in learners, increasing reasoning, memory, and academic performance, and motivating learners to engage in individual inquiry and apply theory in practice. Teachers should engage in rigorous planning on how to actively involve learners. The modelling teacher practices inclusivity during the process. Teachers should exercise caution when using potentially harmful objects and substances in modelling. It is recommended that teachers regularly review their modelling techniques for continuous improvement.

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9.1. Concept Map

Figure 9.1: Concept Map

9.2. Learning Outcomes

- Readers or teachers should be able to perform the following tasks after carefully reading this chapter:
- Understand and define focus-group teaching in the classroom.
- Articulate the advantages and limitations of the focus-group teaching strategy.
- Identify learning content areas where focus-group teaching strategies can be effectively utilised.
- Identify various techniques for implementing focus-group teaching in the classroom.
- Prepare lessons that incorporate focus-group teaching strategies
- Adequately prepare for focus-group teaching sessions in the classroom to meet the learning needs of students.
- Effectively manage focus-group teaching sessions in the classroom.
- Contextually evaluate what worked and what did not work during focus-group teaching in the classroom.

9.3. Concept Notes

This chapter presents focus-group teaching as a creative and innovative approach to facilitating learner-centred teaching in the classroom. It describes the concepts, elements, and practical applications of focus groups in teaching, along with their advantages, disadvantages, stages of implementation, challenges, and anticipated learning outcomes. The goal is to equip teachers with the knowledge and skills to transform learners from passive recipients into active participants in their learning journey. The chapter also highlights the benefits and relevance of focus-group teaching, supplemented by case studies demonstrating its effective implementation.

Historically, the focus-group strategy has been successfully used in qualitative research, with Robert Merton recognised as the pioneer of this technique (Morgan, 2022). Ernest Dichter coined the term "focus group" in 1991 (Ames, 1998). Initially employed in market research, focus groups have become valuable tools across various fields, including public health, education, social sciences, and communication studies (Morgan, 1996).

In 21st-century schools, classroom activities should stimulate active learner participation in their learning processes. Focus-group teaching, a learner-centred, participatory, and collaborative method, enhances communication and engagement on specific topics (Anderson, 1995). Its democratic nature ensures equal opportunities for all learners to contribute to classroom discussions. There is a demand for a more innovative, effective, and efficient teaching strategy in schools due to the known drawbacks of traditional teaching methods, such as restricting students to specific content and fostering teacher dependence. Traditional methods hinder learners from developing self-learning skills and impede the development of higher cognitive skills. Additionally, traditional teaching methods may discourage problem-solving and inquiry-based learning and do not support learners in developing context-adaptability abilities such as communication, interpersonal relations, motivation, and facilitation skills. These disadvantages of the traditional teaching approach underscore the need for every learner in a classroom to be active during the learning process so that no learner is left behind during lessons (Patel-Junankar, 2021). Teachers have expressed the need for schools to change traditional teaching methods that treat learners as passive recipients of knowledge (BizCommunity, 2019). The same report argues that teachers act as information transmitters instead of creating active learning spaces for learners.

There are many learner-centred approaches that can be used to achieve learning outcomes in the classroom. One such method for efficiently facilitating the learning process is focus-group teaching. The quest to improve tuition and pedagogical processes in the classroom demands the use of new approaches and the application of well-tested strategies to advance teaching and learning.

Why do we need focus-group teaching?

Focus-group teaching offers teachers valuable insights into their strategies by allowing learners to share their perspectives on what helps or hinders their learning. This approach helps identify effective teaching methods and areas that need improvement, making it a useful diagnostic tool. Learners actively participate in their learning by reflecting on classroom experiences, teaching resources, and learning environments, which can enhance teachers' pedagogical effectiveness. Teachers can apply this method when taking on a new class or teaching a subject for the first time, using learners' feedback to refine their approach and improve inclusivity in the classroom.

9.4 Introduction To Focus-group Teaching

Focus-group teaching is a powerful approach that allows teachers and learners to listen to and learn from each other on a particular topic of interest. Liamputtong (2011) argues that this method is suitable for collaborative and mutual learning among a group of people. The teacher's responsibility is not to direct the discussion but to facilitate it. All learners' perceived meanings and interpretations of a topic or phenomenon of interest are treated as important and relevant. This teaching strategy is useful for exploring and examining what learners think about the topic, the teaching style, or the learning process in the classroom. Its peculiarity lies in providing each learner with the power to engage meaningfully from their perspectives. The attention of the learners as a group is focused on learning content, pedagogical processes, learning approaches, or any issue where they share common experiences through discussion, debate, or reflection on the issue at stake. This approach allows teachers who opt for it to gain an in-depth understanding of the topic from the learners' perspectives. Creating a friendly, non-threatening, comfortable, non-judgmental, and permissive classroom atmosphere is crucial for the successful implementation of focus-group teaching.

While consensus may not necessarily be attained, this teaching approach can elicit rich, detailed, and useful thoughts, opinions, feelings, knowledge, perspectives, and impressions from learners, articulated in their own words on the topics of interest.

9.5 Focus-group Teaching In Classrooms

In classrooms, focus group teaching techniques foster interaction among learners who are allowed to discuss planned topics of interest in detail. This method is suitable for relatively small classes, but larger classrooms can be divided into groups. Various studies recommend that the size of each focus group should be between six and twelve learners (Graham, 2022; Trinity College Dublin, 2019). During the focus group teaching session, healthy interactions between the learners and the teacher, as facilitator, can help clarify and explore their viewpoints on the topics being discussed. The success of focus group teaching depends significantly on the teacher's skills in planning and facilitating the lessons. Furthermore, when introducing a topic, the teacher needs to guide the process in a way that encourages learners' participation without making any learner feel targeted or excluded. Time management and classroom control skills are essential for productive and beneficial focus group teaching. It is critical that both learners and teachers view the focus group teaching technique as an opportunity for new learning experiences. As a result, the classroom is transformed into a learning space in which learners and teachers mutually learn from one another about the topics under discussion. After each focus group classroom session, learners' feedback and concerns should be taken seriously and addressed to improve subsequent focus group learning and teaching sessions.

9.7. Advantages And Disadvantages Of Focus-group Teaching

Focus-group teaching strategies offer appealing pedagogical options for teachers to enhance the learning process in the classroom. We will discuss the advantages and drawbacks of this teaching approach.

Advantages

Adopting the focus-group teaching technique is mutually beneficial for both teachers and learners. Due to its learner-centred nature, focus-group teaching provides a unique opportunity for learners and teachers to actively share knowledge on the same topic in the classroom, with most contributions coming from the learners. Other advantages include:
- It enhances learners' communication abilities and self-independence, enabling them to hone their public speaking skills and expand their understanding of the topic.
- It fosters problem-solving skills, allowing learners to think quickly and present their perspectives or solutions.
- It promotes collaborative learning and teamwork among learners.
- It trains learners to listen to one another, learn from each other, and respect their peers' opinions.
- It provides an exciting and motivating learning environment, as each learner can take ownership of their learning process without leaving anyone behind.
- It may increase learners' interest in the topic and potentially in the subject as a whole.
- t may help learners prepare for lessons by providing pre-lesson exercises. An individual who wishes to contribute during the session may be motivated to prepare by completing these exercises.
- It provides teachers with meaningful and valuable feedback on the discussed topic, which can guide them in planning and conducting appropriate interventions.
- It allows teachers to uncover new problem-solving approaches and ideas through learners' input.
- Overall, it could enhance teachers' reflective abilities and introduce them to new skills, such as data analysis.

Disadvantages

Despite the discussed benefits of focus-group teaching, it is important to know its disadvantages. It requires the facilitating teacher to be skilled and have good classroom management abilities. This is necessary because a focus-group lesson could be disruptive if planning and implementation are not well managed. Several learners may want to contribute to the discussion simultaneously, leading to chaotic engagement and loss of concentration, and teachers may have trouble controlling the learners. Other drawbacks of focus-group teaching include:
- Teachers may not easily identify learners who are struggling or who may not understand the topic being discussed.

- Time constraints mean that the allocated time for the lesson may not be sufficient for all the learners to make an in-depth contribution to the topic of interest.
- It may not be suitable for all concepts and topics, so the teachers will have to predetermine which topic they would like to use focus-group teaching for (Smithson, 2008).
- Learners with aggressive or domineering personalities may considerably influence the direction of the topic being discussed if the teacher does not manage them properly.
- Possible unintended consequences include learners' emotional discomfort, withdrawal, and trauma.
- Some learners may go along with the general opinions rather than express their own views.
- It requires teachers to be skilled in facilitation and possibly qualitative data analysis.

Consequently, teachers need relevant training to acquire the skills to reflect on and analyse the information provided by the learners. Their feedback could deepen the learners' understanding of the discussed topic. Despite its apparent disadvantages, the benefits of well-implemented focus-group teaching in a classroom are tremendous and worthwhile.

9.8 Preparing A Focus-group Classroom

Every teacher requires an adequate lesson plan to efficiently facilitate the learning process in the classroom (Iqbal et al., 2021). Pre-lesson preparation is critical to the success of focus-group teaching. During lesson preparation, the teacher must formulate the goals of the planned lesson, the learning objectives, and the topic to be discussed. The aim could be diagnostic or evaluative, to obtain feedback on the learning process, receive learners' perspectives on an issue, or serve any other purpose. If applicable, a guide to pre-lesson activities, such as reading and watching video clips on the planned topic, should be made available to learners.

Furthermore, the planning should specify how the teacher will run the session. The teacher may opt for a larger venue, such as the school hall, if the classroom is smaller and unsuitable for focus-group teaching, ensuring that the group size remains manageable for effective participation. A larger venue should be selected to provide comfortable seating and allow for free expression among participants rather than solely to accommodate a larger group. The planning should detail how many learners will be in each group. The preparation should include information on venue set-up, seating arrangements, equipment, the definition and assignment of roles, how the session will be recorded, and post-lesson reflections, analysis, and feedback. Furthermore, a facilitator guide containing open-ended questions about the topic of interest should be developed. The lesson plan should be flexible and responsive to accommodate possible unforeseen circumstances. For instance, changes can be made to the group arrangement if there is unexpected absenteeism or a need to move learners around to ensure that some learners are comfortable or to prevent potential disruptive behaviour if some learners are placed together in the same groups.

9.9 Effective Techniques In Focus-group Classrooms

Once a workable lesson preparation has been established and a suitable venue selected, the teacher should communicate the lesson's purpose, importance, expectations, and ground rules to the learners. The teacher must clearly explain the lesson objectives, highlighting what information is needed from the learners, how they should share it, and how the collected information will be used. Following this, learners should have the opportunity to ask clarifying questions regarding the topic, class procedures, the lesson itself, and any concerns they may have. At the start of the lesson, learners should be informed of the time allocated for their responses and participation in the discussion. For instance, a guideline such as the "2x4 protocol" can be implemented, depending on the number of learners and the time available, whereby each contributing learner speaks for two minutes and then waits for another four participants to contribute before making additional comments. This approach will help prevent any individual from dominating the group discussion.

Some of the ground rules for focus-group teaching in a classroom could include, but are not limited to:
- Learners' contribution is voluntary.
- There is no answer that is wrong or right.
- Respect others' opinions, even if you disagree with them.
- Each learner's contributions should be made within the allocated time.
- Stay focused on the topic of discussion.
- Non-disclosure of personal details - respect and protect one another's privacy.

Furthermore, learners should aim to understand other learners' contributions rather than imposing their own perspectives during discussions. A consensus may not be reached, and it is normal to agree to disagree. Learners should bring their writing materials with them, as this will allow them to formulate their ideas and thoughts before contributing to the topic being discussed. Each learner can start by briefly mentioning their name before making their contributions. The facilitator must use probes and prompts to elicit information from the contributing learners while encouraging other learners to participate without putting them under undue pressure. During focus-group teaching, the teacher has an important responsibility to continuously gauge, monitor, and note the dynamics of the focus group and the non-verbal cues of the learners, as this will help the teacher analyse and interpret the information collected from the learners and provide meaningful feedback to them. The analysis of the information obtained from the learners should be done as quickly as feasible; we propose completing it within 24 hours of holding a focus-group lesson and then sharing the information obtained during the process with the learners.

9.10 Dos And Don'ts in Focus-group Teaching

The teacher implementing focus-group teaching should be aware of the best practices for facilitation to optimise its benefits for both learners and teachers. These best practices will be divided into two categories: "dos" and "don'ts."

"Dos" In Focus-group Teaching
- Create a relaxed, non-threatening, and fun classroom atmosphere to make all the learners comfortable.
- The lesson should be learner-centred, where the discussion is promoted amongst learners and the teacher listens.
- Keep all the discussions on track with the goals of the focus teaching group.
- Know the focus-group guide questions by heart.
- Record learners' contributions verbatim, including all non-verbal cues from both the speaking and listening learners.
- Use open-ended questions.
- Clarify with learners that their thoughts and perspectives are accurately captured.
- Respect learners' diversity

"Don'ts" In Focus-group Teaching
- Do not be dominating, defensive, threatening, or judgmental to ensure proper implementation.
- Do not question the learners' ideas.
- Avoid reading questions from the books as it could affect learners' active learning.
- Avoid sharing personal opinions, biases, beliefs, and views verbally or through body language when facilitating.
- Do not exhibit favouritism or deviate from the objectives and established ground rules.
- Do not allow a few learners to dominate or influence class focus group discussions, nor permit distracting side conversations. Do not presuppose, assume, or predict learners' replies, and do not actively endorse any party in the event of disagreement.
- Avoid using a large vocabulary that might interfere with the learners' understanding of the topic being discussed in the focus group class.

9.11 Case Studies In Focus-group Teaching

Rigorous and thoughtful preparation is a key requirement, regardless of the teacher's intended purpose. A well-defined learning objective must be clearly stated and communicated to the learners. In addition, pre-lesson activities such as reading, watching relevant video clips, and engaging with other materials related to the planned topic should be provided. Below are case studies of focus-group teaching methods used in the classroom. All sessions were audio recorded after obtaining written consent from the learners.

Case Study One

Aim: To assess learners' knowledge of HIV prevention during a Grade 11 Life Orientation lesson.
With all the necessary preparation for a focus-group class in place, I asked learners a central question: "In what ways can HIV transmission be prevented?"

This was followed by prompting and probing questions such as "Could you please tell me more?" "Any other way?"

The collected information was processed, and feedback from the lesson was given to the learners.

Case Study Two

Aim: To elicit innovative ideas from learners in Grade 9 on building hydraulic system projects during Technology class.

Learners were given pre-lesson activities to prepare for a focus-group lesson. These activities included reading about hydraulic systems, watching a YouTube video, and asking knowledgeable relatives and friends for relevant information. Other preparatory and introductory protocols were also observed. A central question was posed: "How would you design and build a hydraulic system?"

This was followed by prompting and probing questions such as, "Why did you prefer this method?" and "Are there other methods?"

After this focus-group lesson, learners found it easier to complete their project tasks, as it helped them identify whom to consult among themselves. Additionally, it fostered strong friendships among the learners.

Case Study Three

Aim: To obtain feedback from learners about mathematics Euclidean geometry lessons in a school. Background: I conducted a focus group session for my Grade 11 mathematics class to gather feedback on the series of lessons on Euclidean geometry before moving on to a new topic. This will aid in planning an effective and tailored revision for the learners on the subject. The learners were divided into three groups of ten in a conducive venue. They were welcomed, and the purpose, ground rules, and procedures were communicated. I posed a central question: "Describe your experience regarding the Euclidean geometry lessons we have had over the past two weeks."

This was followed by prompting and probing questions such as, "Why did you find it easy or difficult?" "Can you mention the aspects you find easy or difficult and explain why?" "How can you be helped to improve your understanding of this topic?"

9.12 Conclusion

This chapter explores focus-group teaching, highlighting its qualitative properties that enhance collaborative learning. We discuss how this learner-centred approach can be applied for diagnostics, evaluation, feedback, needs assessment, idea generation, problem identification, and problem-solving across various subjects. We outline key "dos" and "don'ts", as well as advantages and drawbacks, supported by case studies to guide classroom implementation. We argue that the benefits of focus-group teaching outweigh its challenges. Therefore, teachers, with the support of school managers, should anticipate and address potential lesson-planning challenges to maximise the effectiveness of this strategy.

9.13 Reflective Questions

1. Why do you, as a teacher, need to understand focus-group teaching techniques?
2. What are the key skills and resources needed to implement focus-group teaching in your classroom?
3. What are the possible challenges you face as a teacher that may prevent you from implementing focus-group teaching in your school?
4. How do you think these challenges can be addressed?
5. What subject areas or topics in your field would you consider for focus-group teaching?
6. Describe how focus-group teaching will improve your teaching skills as a teacher.

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This chapter discusses behaviour management in classrooms. It begins by outlining the advantages and disadvantages of behaviour management. Additionally, it highlights key considerations and techniques for effective behaviour management. Finally, the chapter presents selected case studies of behaviour management among students.

10.1 Learning Outcomes

By the end of this chapter, students are expected to:
- Discuss behaviour management in classrooms.
- Establish advantages and disadvantages of behaviour management classrooms.
- Discuss key considerations for preparing for effective behaviour management.
- Examine techniques for effective behaviour management in classrooms.
- Analyse case studies of behaviour management among students.

10.2. Introduction to behaviour management as a teaching strategy

Behaviour management remains a critical teaching strategy employed by teachers in the classroom. This is due to the fact that student behaviour problems pose the greatest challenge to teachers and the management of educational institutions worldwide. Although common misbehaviours, such as talking out of turn, low levels of attention, idleness, and hindering others, may seem minor, their repetitive nature can interrupt the flow of teaching and learning, adding to teacher stress. Furthermore, research indicates that teachers globally spend significant time managing student behaviour and regard it as their main challenge in the profession (Kwok, 2020). Additionally, behaviour problems in the classroom elevate stress levels for both teachers and pupils, disrupt lesson flow, and create conflict with learning objectives and the processes of learning.

10.3. Behaviour management in higher classrooms

Students in higher education institutions sometimes engage in high-level control behaviour that inhibits their own learning and the learning of their peers. Therefore, instructors have to find a formula to control misbehaviour. However, most instructors lack knowledge and have a low level of competency in classroom control, inconsistency with certain behavioural problems, late arrival to the classroom, irrelevant teaching materials, and a lack of with-it-ness (Duygu & Armagan, 2022). Therefore, effectively managing student behaviour involves the use of a set of educational practices and strategies, on the one hand, to prevent and effectively manage

inappropriate behaviour and, on the other hand, to create and maintain an environment that promotes both teaching and learning. Effective behaviour management entails two types of interventions, namely proactive interventions and corrective interventions.

10.3.1. Proactive interventions

Proactive interventions aim to create an environment conducive to teaching, learning, and the prevention of inappropriate behaviour. In this chapter, proactive interventions refer to the actions teachers take to foster an environment that supports and facilitates both academic and social-emotional learning. This involves establishing integrated systems within classrooms that promote students' social, emotional, and cognitive development. The proactive interventions are discussed in this section as follows:

Setting goals: Instructors should develop goals that drive their teaching, clearly stating the desired results and framing the subsequent decisions they make. Setting these goals creates an environment in which instructors can provide maximum teaching during classroom time, thereby limiting disruptive behaviour among students.

Planning of classroom space: This involves the layout of furniture and the design of access points and pathways. The arrangement of a classroom facilitates the interactions expected among students. Thus, instructors arrange chairs in a circle, which communicates that all students are encouraged to participate. The learning goals should encompass both the core concepts of a subject and the skills and abilities required to achieve them.

Preparing social space: The social space of a classroom comprises the exchanges between the instructor and students and among students. The instructor can plan the basic structure of this space by considering the norms that should be established and what expectations are endorsed. The social space within a lecture fosters dependability when an instructor puts into practice the norms and expectations planned for the social space of the lecture.

10.3.2. Corrective Interventions

Corrective interventions are to be used when students engage in inappropriate behaviours. Instructors adopt these interventions to address misbehaviour among students. Some of the corrective interventions are discussed below:

Refocus notes: This is a non-verbal option to deal with distracting behaviours. Instead of interrupting the teaching, the instructor writes what they want the student to stop doing on a note or post-it and quietly puts it in front of the student who is distracting (Kyle & Rogien 2004).

Target–stop–do: The target is the student exhibiting distracting behaviours, while the stop refers to the distracting behaviour that needs to be addressed. The do is the responsible behaviour that should replace the misbehaviour (Kyle & Rogien, 2004).

Distract the distractor: This is an attention-focusing option where an instructor diverts the student by asking a question without embarrassing them, or by asking the student to perform a task. This technique is used to reduce a particular behaviour but not to eliminate it (Kyle & Rogien, 2004).

Chat Time with Students: This is one of the options for working on long-term solutions with angry/violent students. This strategy involves getting together with the student and having a conversation about the problem to actively involve the student in the discipline process (Kyle & Rogien, 2004).

Restitution: Restitution is used when students choose angry/violent behaviours and focus on repairing the damage that was done. Thus, if a student messes something up, the student cleans up the mess, or if they break something, then they fix and replace the broken item.

Chill-Out Time: This is a corrective strategy for dealing with the initial situation with a volatile student. Dealing with their angry feelings is their main need, so chill-out time helps the students recognise anger and calm down when it is starting to build up.

10.4. Advantages and disadvantages of behaviour management Classrooms

10.4.1. Advantages

- Effective behaviour management classrooms have numerous advantages, and few of them are;
- Effective behaviour management strategies help establish the environmental context for effective instruction and maximise time for instruction (Pas et al., 2015).
- Effective classroom management is directly responsible for substantial student learning. Teachers with strong management skills can maintain control and keep students engaged during instructional time instead of constantly focusing on off-task behaviours.

- Effective classroom behaviour management helps create a positive educational environment, where teachers manage their students effectively by being organised and consistent.

10.4.2. Disadvantages

Here are some disadvantages of behaviour management strategies;
- Behaviour management strategies often use rewards to incentivise desired behaviour; this approach can be limiting as it can result in students' dependency or expectation of incentives before they elicit the right behaviour.
- Some behaviour management strategies may be ineffective if students' current abilities do not match up with teachers' tasks or expectations.
- Behaviour management strategies could be effective in addressing symptoms of underlying behavioural issues but not necessarily addressing their causes.
- If care is not taken, some strategies can induce shame; for example, public display of charts can lead to judgement from peers and negative feelings towards oneself.
- Over time, if strategies are not adequately and carefully used, it can lead to a loss of motivation in learners.

10.5. Preparing For Effective Behaviour Management In 21st Century Classroom

Throughout teaching and learning, educators have employed various methods to manage student behaviour in the classroom. However, many of these practices are ineffective or even discriminatory towards certain groups of students (Ngubane & Makua, 2021). Beyond imparting knowledge, teachers are responsible for shaping the behaviours and character of their students, which can only be achieved in a suitable environment (Jagers et al., 2021). Creating a positive classroom environment is crucial for fostering a conducive and effective learning atmosphere that promotes positive behaviour among students, encourages engagement, and enhances overall academic and social development. By understanding the underlying principles of behaviour management and implementing evidence-based strategies, educators can cultivate a classroom environment that supports positive behaviour, nurtures a positive learning culture, and facilitates student success. In the following sections, we will explore the intricacies of establishing a positive classroom climate and equip educators with the knowledge and tools needed to create an environment that promotes positive behaviour and facilitates student success.

10.5.1. Key Considerations For Preparing For Effective Behaviour Management

Educators need to understand the 21st-century classroom's context to effectively manage student behaviour. This involves recognising the impact of technology integration, addressing the needs of diverse student populations with cultural competency and inclusivity, and being aware of evolving societal norms.

Technology Integration: The incorporation of technology into instruction has become increasingly prevalent in modern classrooms. Extensive research, including studies by Seufert et al. (2022), has provided evidence supporting the benefits of integrating technology in education. According to Praetorius and Charalambous (2018), technology can be a valuable tool in helping students develop problem-solving skills, manage classroom disruptions, establish time management practices, and set ground rules. However, managing digital distractions can present a challenge for teachers, as students may be tempted to engage in online activities unrelated to the class, thereby disrupting classroom behaviour management.

Diverse Student Populations: The increase in diversity has created a demand for teachers to become culturally competent, equipping them with the skills to integrate principles of diversity, equity, and inclusivity into their classroom behaviour management practices. These practices foster an enabling environment that is safe and supportive for all learners. Consequently, students develop a sense of belonging, along with feelings of respect, regard, and value. This can lead to improved engagement, motivation, academic achievement, and positive relationships and interactions among students (Hester et al., 2022).

Evolving Societal Norms: Societal norms and values are constantly evolving, which impacts behaviour management in the classroom. Moreover, social media can affect students' self-esteem, social dynamics, and even behaviour. Teachers need to be aware of these influences and adapt their behaviour management strategies accordingly.

10.6. Techniques For Effective Behaviour Management In Classrooms

Implementing effective classroom management strategies, customised to meet the diverse needs, characteristics, and contexts of modern learners, can significantly assist teachers in effectively managing complex classroom behaviours. Here are some strategies that can be effective in managing classrooms in the 21st century:

Technology integration: In line with this idea, Yang et al. (2016), discovered in their study that implementing technology-rich classrooms facilitated the shift from teacher-centered to student-centered learning environments. Adopting a digital behaviour management system that enables teachers to monitor and incentivise positive behaviours can offer immediate feedback to students and foster a culture of positive behaviour.

Positive behaviour reinforcement: The behavioural approach to classroom management has continued to be the dominant worldview in teacher preparatory education programs. Moreover, Rafi et al. (2020) found positive behaviour reinforcement techniques, such as praise, rewards, and incentives, as effective in managing and preventing disruptive behaviour in the classroom. Recognising and reinforcing positive behaviours can motivate students to continue exhibiting those behaviours and create a positive classroom culture.

Restorative practices: The Restorative approach to discipline has been gaining popularity in the US as an alternative to the punitive practice of suspending racially marginalised students. Restorative practices can include strategies such as community-building circles, peer mediation, and restorative conferences, which can promote positive relationships and reduce incidents of disruptive behaviour.

Differentiated instruction: Differentiated instruction (DI) is an inclusive instructional method where teachers offer a variety of learning options tailored to students' diverse backgrounds, readiness levels, interests, and profiles (Estaiteyeh & DeCoito, 2023). Differentiated instruction can help engage students in the learning process and reduce disruptive behaviours that may arise due to boredom or frustration (Birnie, 2017).

Social-emotional learning (SEL): SEL involves teaching students skills for self-awareness, self-regulation, social awareness, relationship-building, and responsible decision-making (Sabornie & Espelage, 2022). Incorporating SEL into behaviour management can help students develop the emotional intelligence and social skills necessary for positive behaviour in the classroom. Teachers can use strategies such as mindfulness exercises, emotional check-ins, and conflict resolution skills to promote SEL and manage behaviour effectively.

Collaborative problem-solving: In the 21st-century classroom, teachers can encourage collaborative problem-solving to empower students to take ownership of their behavior and find solutions to challenges (Jagers et al., 2021). This can involve students setting classroom rules and expectations, having problem-solving sessions to address challenging behaviours, and promoting student-led initiatives to create a positive classroom culture. Clear communication and expectations: Establishing clear communication and expectations is crucial for effective classroom management. When teachers communicate their behaviour expectations clearly and consistently, using age-appropriate language and visual supports, conformity becomes easier for learners. This can include setting clear rules and consequences, providing regular feedback, and maintaining open communication with students, parents, and other school staff.

Individualised Behavior Plan: An individualised behaviour plan is a targeted approach to address specific behavioural challenges faced by a student. It involves creating a personalised plan that outlines clear goals, interventions, and rewards tailored to the student's needs. The key components of an individualised behaviour plan include goal setting, targeted interventions, rewards and incentives, and monitoring and progress tracking.

Behaviour Reflection and Support: Behaviour reflection and support involve guiding students to reflect on their actions, understand the consequences of their behaviour, and provide them with the necessary support to make positive changes (Bosman et al., 2021). The key elements of behaviour reflection and support include reflection opportunities, identifying triggers, self-regulation strategies, a supportive environment, and collaboration and guidance.

Incorporating these strategies into classroom management can create a positive, inclusive, and supportive learning environment that promotes positive behaviour and academic success in the 21st-century classroom. It is important for teachers to continuously reflect on their practice, adapt their strategies to the unique needs of their students, and seek professional development opportunities to enhance their classroom management skills.

Don'ts in Behavior Management Teaching

Rely solely on punitive measures: This includes time-outs, public shaming, and naming. Avoid relying solely on punitive measures and discipline without considering the underlying causes of behavioural issues. Focus on teaching and reinforcing positive behaviours instead.

Ignore individual differences: Avoid treating all students the same. Recognise and address the unique needs and strengths of each student.

Neglect the importance of relationships: Don't underestimate the impact of positive relationships in behaviour management. Invest time in building connections with students to create a supportive and inclusive classroom environment.

Overlook the role of technology: Don't overlook the potential of technology in supporting behaviour management and engagement. Embrace technology as a tool to enhance learning experiences and communication with students.

Dismiss social-emotional development: Recognise the significance of social-emotional development in student success. Don't overlook the importance of teaching and fostering these skills in the classroom.
Use one-size-fits-all approaches: Avoid using rigid approaches that do not consider individual student needs and strengths. Adapt your strategies to meet the diverse needs of your students.

10.7. Case Studies

10.7.1. Case Study 1: Building A Positive Classroom Culture

Context: Mr. Johnson teaches a 9th-grade English class in a diverse urban school. The class has a mix of students with varying behavioural challenges, including frequent disruptions and a lack of motivation.

Approach: Mr. Johnson decided to focus on building a positive classroom culture to address the behaviour issues. He implements the following strategies:
1. **Clear Expectations:** Mr Johnson establishes clear behaviour expectations and discusses them with students at the beginning of the year. He emphasises respect, active participation, and collaboration.
2. **Positive Reinforcement:** He implements a reward system where students earn points for positive behaviours, such as active participation, helping others, and following classroom rules. Students can redeem their points for small rewards or privileges.
3. **Community-Building Activities:** Mr. Johnson incorporates team-building activities and cooperative learning projects to foster a sense of belonging and collaboration among students. These activities help strengthen relationships and create a positive classroom atmosphere.

Outcome: Over time, students in Mr. Johnson's class start to exhibit more positive behaviours and actively engage in learning. The disruptions decrease, and students show improved motivation and participation. A positive classroom culture enhances the overall learning experience for students.

10.7.2. Case Study 2: Addressing Individual Student Needs

Context: Ms. Rodriguez teaches a 6th-grade science class in a suburban school. She has a student, John, who consistently displays disruptive behaviour, struggles with completing assignments, and frequently interrupts the class.

Approach: Ms Rodriguez takes a personalised approach to address John's behaviour and support his academic success:
1. Individualized Behavior Plan: Ms Rodriguez collaborates with John's parents and the school counsellor to create an individualised behaviour plan. The plan outlines specific goals, targeted interventions, and rewards for meeting behavioural expectations.
2. Behavior Reflection and Support: When John displays disruptive behaviour, Ms. Rodriguez provides him with an opportunity for reflection and discussion. She helps him identify triggers, develop self-regulation strategies, and provide additional support when needed.

3. Positive Feedback and Supportive Environment: Ms. Rodriguez regularly acknowledges John's positive efforts and improvements. She creates a supportive classroom environment where John feels safe, respected, and encouraged to participate in class activities actively.

Outcome: With the implementation of the personalised behaviour plan and targeted support, John's disruptive behaviour decreases over time. He becomes more engaged in the classroom, completes assignments with greater consistency, and demonstrates improved self-regulation skills. The individualised approach helps John thrive academically and socially.

10.8. Conclusion

To sum up, managing behaviour in modern classrooms is a complex and ever-changing process that requires teachers to utilise a range of methods to establish a supportive and welcoming learning atmosphere. Teachers can develop personalised behaviour plans, encourage reflection and assistance, promote group bonding activities, facilitate circle discussions, and establish clear expectations to cultivate a classroom culture that emphasises positive behaviour, active participation, and academic achievement. In addition, recognising the unique obstacles and prospects provided by today's educational environment, such as technological integration and cultural diversity, can help teachers modify their behaviour management strategies to meet the needs of diverse student populations. By prioritising effective behaviour management, teachers can create an environment that fosters growth, cultivates important social-emotional skills, and enables students to reach their full potential.

10.9 Reflective Questions

1. How is behaviour management in higher classrooms?
2. What are the advantages and disadvantages of behaviour management classrooms?
3. What are the key considerations for preparing for effective behaviour management?
4. Which techniques could be adopted for effective behaviour management in classrooms?
5. which case studies are available for behaviour management among students

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11.1. Concept Map
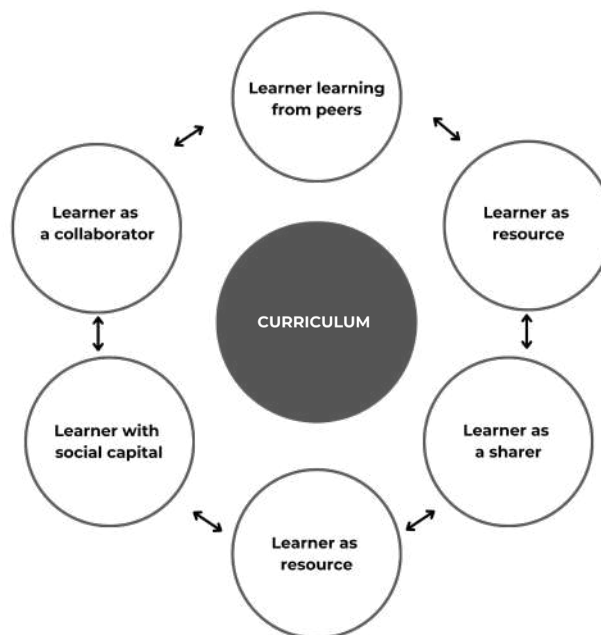
11.2. Learning Outcomes

- After studying this chapter, you should be able to:
- Define the Collaborative Learning method of teaching and learning.
- Prepare a productive collaborative learning environment.
- Explain the benefits of collaborative learning.
- Employ effective techniques when applying the collaborative approach in the teaching and learning process.

11.3. Clarification of Key Term

Collaborative learning: In this instructional strategy, students in a team collaborate to resolve a dilemma, finish a project, or produce a final product (Paul & Kundu, 2021).

Communality in teaching and learning: An attitude created in teaching and learning that promotes joint affiliation, cooperation, mutual dependence, and reliance on each other to attain common goals (Fisher & Fanyo, 2022)

Ubuntu Philosophy: The philosophy of togetherness that equips teachers with skills and attitudes that could empower them to deal with classroom challenges and produce citizens who would be able to solve societal problems (Sotuku & Duku, 2014).

Social capital: Value derived from positive relationships, social networks, shared purpose, culture, and attitudes (Daghar et al., 2021).

11.4. Introduction to Collaborative Learning

As a teaching strategy, collaborative learning involves groups of two or more learners working together to resolve issues, complete tasks, or comprehend new ideas. Rather than relying on rote memorisation of facts and statistics, this approach actively engages learners in the processing and synthesis of concepts. It is based on Vygotsky's (1920) philosophical idea of the Zone of Proximal Development, wherein learners collaborate to perform activities that they would otherwise be unable to do independently (Schneuwly & Leopoldoff Martin, 2022). The drive in education towards greater enthusiasm and engaged learners is reflected in the emergence of active learning classrooms. Active learning, or collaborative learning, results from a teacher's deliberate and focused effort to promote learner participation in a lesson. Collaborative learning is considered the most beneficial active learning strategy. Teachers often use collaborative learning to accelerate learners' understanding and enhance their performance. It improves learners' capacity for critical thought. Student participation and interaction in a group setting, relationship management, and content development are all aspects of collaborative learning (Qureshi et al., 2023). A rich cooperative environment has been suggested to enhance learners' metacognition, social relationships, and cognitive performance. In an interactive learning environment, learners function as resources for one another by talking to each other, observing the work of others, sharing ideas, and making collective decisions (Ibid).

This chapter covers the use of collaborative learning as a teaching and learning approach in the classroom. It argues for the relevance and applicability of collaborative learning as a teaching strategy. Collaborative learning is an approach that enhances collaboration, communality, and togetherness. It is therefore based on the founding principles of Ubuntu, which promote interdependence among learners (Sotuku & Duku, 2014). It is one of the most frequently recognised teaching approaches, as it fosters learner-centredness in the classroom. In this approach, a teacher serves as a facilitator of learners' learning, allowing learners the opportunity to lead their own learning (Keiler, 2018). The days when teachers were seen as imposers of knowledge on learners are gone; contemporary teaching and learning require that learners work collaboratively to discover knowledge independently. This chapter therefore discusses the collaborative learning approach, with specific emphasis on preparing a productive collaborative learning environment, techniques teachers should use for effective collaborative learning, and the advantages and disadvantages of collaborative learning. It will also elaborate on the dos and don'ts of collaborative learning, equipping student-teachers and in-service teachers with the necessary knowledge and skills to apply collaborative learning in their classrooms. Two case studies are used to illuminate the relevance and importance of collaborative learning.

11.5 Case studies in Collaborative learning

The case studies below demonstrate the dynamics in the collaborative classroom and how collaborative learning can be beneficial to teachers and students.

Case Study 1 on Collaborative Learning

In one of the provinces of Uganda, Bhungane High School is located in the affluent town of Loxton. Its students, who come from working-class and middle-class families, are relatively diverse. The diversity of the student population in terms of ethnicity, race, and culture adds to this richness. Therefore, on days designated as Cultural Days, the school is a vibrant display of colours. Learners proudly showcase their cultural heritage by dressing appropriately and bringing traditional dishes to class on these special days.

One of the more seasoned teachers, Mr. Brand, originally from the United Kingdom and in his mid-fifties, has been teaching Life Orientation for the past five years. On this particular day, he assigned the Grade 9 learners a group

project that required them to learn about the eradication and management of reptiles, particularly snakes, in the community. He thoroughly explained the goals of the exercise, the roles of individual learners within the groups, and the expectations for their presentations. More importantly, he emphasised the learners' crucial role in collecting and understanding the information and sharing it with other teams.

On the day of the presentations, the teams provided their findings along with explanations of their approaches, which appeared to be underpinned by research. The learners debated and identified four different tactics. While each group focused on one strategy, it became evident during their presentations that more than one strategy was discussed, with the groups having to agree on just one to present in class. It was also clear that significant development and learning occurred within those small research groups. One group spoke of using fire to capture the snake, which would then be killed by its deadly bite. Another group mentioned that they had interacted with Snake Catchers and visited the local snake park. They even claimed to know the phone numbers of the Snake Catchers, believing that every time they encountered a snake, they could call for assistance in removing it. The third group noted that some snakes held spiritual significance and were connected to their totems. Depending on the type of snake, individuals might feel pleased to find a totem and celebrate it if it aligned with their spiritual beliefs. The final group discussed the biblical parable of the snake and its antagonistic relationship with humans, concluding that they would kill the snake as it is perceived to be dangerous to people.

After the presentations, learners reflected on the new knowledge they had gained that day. Mr. Brand also acknowledged that he had learned new ideas and strategies from the groups. In conclusion, Mr. Brand encouraged learners to utilise their social capital, continue learning from one another, and respect each other's social backgrounds and cultures.

Activity:

i. From the case study, what is your understanding of collaborative learning?
ii. What are the benefits of collaborative learning?
iii. Would you say Ubuntu principles are at play in the above case study? If so, how so?
iv. How would you describe Mr Brant's role?

Case study 2

At Ndabezitha Senior Secondary School, Mr Lukho teaches history to Grade 11 learners. He appears to enjoy engaging with students and is very passionate about his work. His school is frequently praised for its success in History. In the same school district, I also teach history at Zeli Secondary School. We had a conversation when I met him one day in the district office. When I asked him which teaching method he preferred, he identified involving learners in collaborative learning. We continued our discussion until we reached a shared understanding of collaboration, which included visiting one another during history classes.

The following week, I paid him a two-day visit during his history lessons at his school. He engaged learners in group discussions, with five students in each group. First, he ensured that everyone comprehended the lesson. Different assignments were provided to each group, and they had two days to submit them. Each group member was given a specific task to focus on, which they were responsible for delivering to the other group members before presenting to the entire class. Each group member was required to have one question ready for each presenter. This compelled all group members to read and prepare thoroughly.

During the plenary sessions, all group members participated by presenting their assignments to the whole class. This led to a class discussion in which all the learners contributed. The groups took turns making presentations, and during each presentation, all group members had specific roles. After the presentations, the entire class engaged in the discussion.

Activity:

i. Would you recommend the teaching approach Mr Lukho used in his history lesson? Why?
ii. What do you think are the benefits of this teaching approach?
iii. What values do you think this approach inculcates to the learners?
iv. Would you try collaborative teaching as suggested in this case study?

11.6 Theories Guiding Collaborative Learning

A multitude of theories inform collaborative learning. Yet, when it comes to implementing collaborative learning in the classroom, four theories, Ubuntu theory, achievement goal theory, cognitive theory and sociocultural theory, occupy the forefront.

11.6.1 Ubuntu theory and collaborative learning

There are three categories into which Ubuntu theory falls. These are acknowledging others, being open and connected, and being human. Because of their interconnectedness, humans are free to share and should demonstrate a willingness to do so. Second, Ubuntu's notion is based on the strong pillars of generosity, hospitality, care, and compassion, all of which can increase human connectivity (Waghid, 2020). According to the third classification, a person who practises Ubuntu needs to be open, acknowledge others, and interact with them. When used in a collaborative learning environment, Ubuntu can create learners who recognise the advantages of cooperating to accomplish a common objective.

11.6.2 Applying Achievement Goal Theory in Collaborative Learning

Achievement Goal Theory is a guide for interpreting, understanding and responding to events (Hmelo-Silver & Chinn, 2015). When Achievement Goal Theory is considered in a collaborative classroom, learners are encouraged to work together and engage in achievement behaviour. This theory is relevant to applying collaborative learning as it provides a framework that helps learners develop a shared sense of task mastery and achievement. Achievement Goal Theory fosters learners who are goal-oriented and focused on a common objective.

11.6.3 Cognitive theory its relevance to collaborative learning

Cognitive theory is relevant for cooperative learning in that individuals' cognitive processes change when they engage in behaviours that appear to come naturally in cooperative learning environments, such as explaining concepts or posing questions (Stahl, 2013; Fischer et al., 2023). Collaborative learning, therefore, enables individuals to progressively internalise cooperative behaviours as cognitive strategies and collaboration skills that can be applied in various contexts. However, to participate in advanced collaborative processes, learners must be mentored in collaborative learning.

11.6.4 Using Sociocultural theory in collaborative learning

Applying collaborative learning through the framework of sociocultural theory assists learners in developing their psychological strength. The goal of sociocultural theory is to elucidate the relationship between cultural, institutional, and historical contexts and individual mental functioning. Accordingly, the sociocultural perspective focuses on how involvement in social interactions and culturally structured activities impacts psychological development.

11.7 Collaborative Learning in Classrooms

The focus in a collaborative classroom is on sharing information. Teachers continue to possess the appropriate subject matter expertise to convey it effectively to students (Darling-Hammond et al., 2020). However, there is tested evidence that equally important is a focus on fostering students' knowledge, experiences, and backgrounds, which are associated with learner achievement (Gamage et al., 2021). This perspective is linked to the democratic learning process known as Collaborative Learning (CL). Yang (2023) unpacks collaborative learning as an umbrella term for various instructional approaches to small group learning, including, but not limited to, cooperative learning, team-based learning, peer tutoring, study groups, project-based learning, problem-based learning, and learning communities. Learners are offered the opportunity to set their goals within the confines of what they are being taught using collaborative learning. Consequently, learners are empowered to utilise shared power for their learning and decision-making. This enables them to propose tasks or activities that reflect their interests and objectives while assessing their learning (Keiler, 2018). There is also a strong emphasis on appreciating and patiently listening to other people's viewpoints and claims rather than upholding a system of unequivocal reality and injustice.

The emphasis of collaborative learning lies in the processes through which learners negotiate knowledge and developwithin a community of peers (Yang, 2023). Piaget believed that children construct knowledge as they develop and repeatedly interact with their physical, social, and intellectual surroundings (Stump et al., 2011). As learners develop and learn together, the process allows for and appreciates contributions from all, with every contribution working towards the achievement of the end goal (Ibid). It's crucial to understand that traditional "ability" segregation is deliberately opposed to collaborative learning, as every pupil deserves the chance to contribute and value the efforts of others. Accordingly, the very nature of collaboration means that everyone, regardless of presumed academic accomplishment, has much to learn from one another. Collaborative Learning, therefore, encourages learners of different abilities, social backgrounds, experiences, and knowledge to share their learning (Roldan et al., 2021). While learners in collaborative learning own and make decisions about their learning journey, the teacher's role remains key, increasingly functioning as a mediator rather than a dictator (Keiler, 2018). The mediator of learning includes the teacher's role as a promoter of activities that encourage participation and foster effective quality in interactions and social relationships (Liu & Gillies, 2021). In its capacity as a mediator, this role helps and encourages learners to relate new material to their personal experiences, offers assistance when a group encounters difficulties, and provides direction regarding how to acquire knowledge (Ibid).

11.8 Preparing a productive collaborative learning

This part covers the steps involved in creating a collaborative learning environment. A learner's ability to succeed or struggle may depend on the establishment of a secure and cooperative learning atmosphere in the classroom (Qureshi et al., 2023). Collaborative learning is a methodical strategy for promoting critical thinking and knowledge exchange among students. This approach is not only highly intriguing but also much easier to implement, thanks to the availability of reliable, portable technology for learning. Collaborative learning in the classroom marks a significant departure from the rote learning and narrowly prescribed solo activities typical of Victorian teaching. Instead, interacting with peers encourages learners to mentor one another and think critically about ideas (Yang, 2023). However, just because a teacher has assigned a group task does not guarantee a motivating outcome. It requires careful development and implementation. There are two critical steps involved in preparing a productive collaborative learning environment. These steps include designing an effective collaborative learning classroom and creating a safe and supportive learning atmosphere.

Flexibility is essential for effective teamwork. Working with others can necessitate a variety of resources, including access to information, privacy, and specialised equipment. However, static or formulaic classroom designs can hinder easy collaboration (Palmgren-Neuvonen et al., 2021). Such collaborative learning can be especially facilitated by the use of Information and Communication Technology (ICT) devices, which offer a wide range of flexible instructional applications. With the aid of technology, teachers can move among their students, projecting their displays while evaluating each student's performance. Every learner can access the necessary data on their own device from any location in the classroom. Feedback and conversation can occur naturally, as digital documents can be accessed, created, and annotated collectively (Nasir et al., 2021).

The process cannot occur in a single lesson or overnight, but a secure and collaborative classroom can be constantly cultivated and developed over time. Some learners feel immediately at ease participating in discussions and communicating with their peers, while others may require more time. The effort taken to overcome nervousness is well worth it once they feel comfortable engaging in class (Ibid). It is essential to ensure that learners understand the purpose and learning objectives of each project so that they feel safe and comfortable working together. To meet the diverse learning needs of students, it may be necessary to present these elements in various formats. This could involve distributing assignment guidelines verbally, in written form, and on a rubric during class time. When learners comprehend and consider the goals and purposes of activities, they may engage in their own unique ways (Curtis & Lawson, 2019).

Whether online or in-person, trust is one of the most crucial components in creating a positive environment. Learners are more eager to share knowledge and solutions when they have mutual trust. Collaborative teamwork will also enhance their level of engagement. Both the teacher and the learners must work together to build this trust. This involves eliminating assessment bias, valuing all comments, questions, and viewpoints, allowing learners to express their distinctive perspectives, and providing meaningful feedback that demonstrates concern for their academic success and personal well-being (Curtis & Lawson, 2019).

In a digital world, glitches are unavoidable. Few things are more annoying than having your Wi-Fi cut out in the middle of a lesson or group project. Hence, it is critical to approach the digital classroom with an understanding

of these challenges to prevent learners from experiencing additional stress due to circumstances beyond their control (Campo, 1993).

It is also important to acknowledge that learners have varying access to technology and workspaces. Early on, it is essential to address this in a supportive manner so that students understand that, rather than the brand of monitor or computer they are using, what matters most is the quality of their work and their participation in class (Dytham, 2017). For instance, some learners may struggle with intermittent connectivity, data availability, and appropriate ICT devices. Whatever the situation, these unique experiences offer a wonderful opportunity to incorporate a range of viewpoints into the course material.

Through digital learning, learners may often feel less connected to their peers and the course material, but there are solutions to address this. Early on, teachers should clearly communicate the level of participation and involvement they anticipate from their learners. In addition to outlining expectations, it is critical to discuss the value of involvement and engagement in activities in terms of improving conceptual understanding. Instead of focusing on the drawbacks of online education, consider the benefits of this virtual environment, such as establishing a skill set with virtual programmes and preparing learners for a workplace they may encounter in the future. Learning online offers learners autonomy and often brings together people from different parts of the world (Oliveira et al., 2019). Building trust in a secure and cooperative learning environment is made possible through the AI-driven Kritik platform's peer evaluation and peer learning features. To address these issues and assist in developing the essential soft skills and critical thinking abilities, Kritik employs features such as anonymous peer evaluation, team-based learning, and class debate (ibid).

Molina Roldán et al. (2021) developed a framework that identifies seven steps teachers must consider in designing an effective collaborative learning classroom. These steps are developing and maintaining teaching practice, creating and sustaining a learning community, scaffolding learning, knowledge in action, fostering social presence, exploring cognitive presence, and participating in critical discourse. Figure 2 below illustrates the framework as proposed by Molina Roldán et al. (2021).
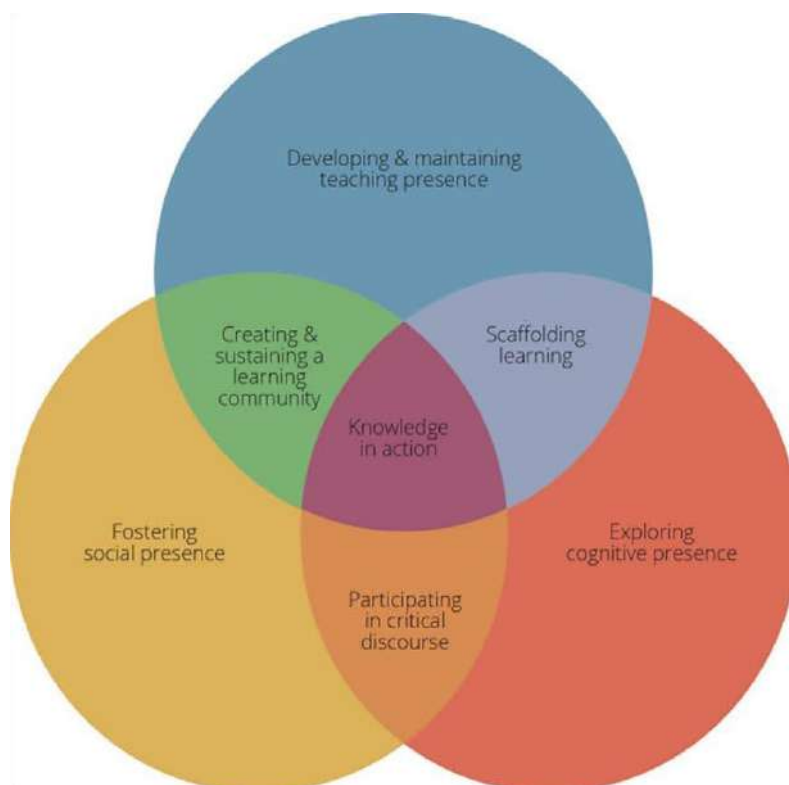
Source: Redmond and Lock (2006)

11.9 The role of teacher/facilitator in the collaborative

The role of a teacher in facilitating collaborative learning in the classroom has not changed. In collaborative classrooms, teachers play a crucial role in ensuring that learners are meaningfully engaged in academic work and that lesson objectives are achieved through interactive participation.

Teachers, therefore, serve as task setters, classroom managers, group facilitators, and synthesizers.

The Teacher as Task Setter
How well the first activity that students must complete in groups is designed will determine the effectiveness of the collaborative model. For this reason, any observer must pay close attention to the teacher's position as the task-setter (Bower & Richards, 2006).

The Teacher as Classroom Manager
The teacher's role in classroom management is the second component of collaborative learning that assessors should consider. How does the teacher facilitate collaboration once the task is set? What social structure does the teacher create to enable learning? Are students able to form groups quickly and with ease? Are the chairs arranged in thoughtfully separated clusters to prevent group discussions from overpowering one another? Do group members demonstrate cooperation by allowing one person to speak at a time while the others listen? Are deadlines clear, typically met, yet accommodating? As the designated end point approaches, does the teacher check in with the groups to assess how much more time they might need, and does she/he encourage them to continue working on their tasks? If a reporter or recorder is needed—a member of each group who synthesises the discussion—are their roles evident? In a collaborative classroom, teachers must consider each of these questions (Bower & Richards, 2006).

The Teacher's Role During Group Work
It is imperative to scrutinise the behaviour of teachers during group work, which is the third component of collaborative learning. Teachers should be seen moving between groups to respond to questions, facilitate group discussions, guide responses, probe further, and maintain learners' attention on the topic at hand (Bower & Richards, 2006).

The Teacher as Synthesizer
The teacher's performance as a synthesiser following the conclusion of the group activity is the fourth facet of collaborative learning. After the groups have completed their work, it is crucial for the teacher to inform the class of the group's decision. Once this is done, the teacher must help the class sort through and make sense of the occasionally contradictory and conflicting opinions (Bower & Richards, 2006).

11.10 Benefits of collaborative learning

There are numerous benefits of collaborative learning, as suggested by Laal and Ghodsi (2012) and Yang (2023). These can be organised into social, psychological, academic and assessment benefits as follows:
i.   **Social benefits**
       - Helps to develop a social support system for learners;
       - Leads to build diversity and tolerance among students and staff;
       - Establishes a positive atmosphere for modelling and practising cooperation, and;
       - Develop learning communities.
ii. **Psychological benefits**
       - Student-centred instruction increases students' self-esteem;
       - Cooperation reduces anxiety, and;
       - CL develops positive attitudes towards teachers.
iii. **Academic benefits**
       - Promotes critical thinking skills
       - Involves students actively in the learning process
       - Classroom results are improved
       - Models appropriate student problem-solving techniques
iv. **Assessment benefits**
Collaborative learning:
       - Large lectures can be personalised
       - CL is especially helpful in motivating students in specific curriculum
       - Alternate student and teacher assessment techniques;
       - Collaborative teaching techniques utilise a variety of assessments.

In summary, collaborative learning helps learners develop critical thinking abilities, which are essential for success in the workplace and in life. The 'thinking curriculum' is said to incorporate the sharing of knowledge

(Laal & Ghodsi, 2012). This implies that it teaches students how to study independently and to think deeply and critically about ideas. When debate and discussion are included in the curriculum, students can analyse topics more thoroughly and see how they relate to other areas of study, thereby improving their problem-solving abilities. In a collaborative learning environment, learners are expected to take charge of their own education and work with their peers to resolve challenges. This shift away from passive knowledge consumption increases the need for collaborative problem-solving. As suggested by Chandra (2015), coming together is the beginning, and staying together is the goal.

11.11 Disadvantages of collaborative learning.

Despite the overwhelming body of research demonstrating its benefits as a social learning strategy, there are definite dangers and drawbacks to collaborative learning. In collaborative learning, for example, students might not engage in equitable participation as a community; instead, some might dominate the environment, potentially resulting in disputes (Forsell, Forslund & Hammar, 2020). Because of this, teachers must closely monitor the learning process. The ability for students to learn from one another is another advantage of collaborative learning. Hence, the team's strengths must be carefully considered, and the teacher must oversee the process (Rathner & Graeme, 2014). Similar skill levels within the team are likely to impede the learning curve, so teams should consist of a range of learners with different ability levels. A group of learners with similar learning abilities is more likely to inhibit learning and promote boredom rather than excitement and curiosity in the process. In addition to potentially discouraging team engagement and sociability, mismatched learning styles within the team may require the teacher to prepare extensively (Kraml, 2024). This outlines a few potential risks and disadvantages of collaborative learning that, if not planned and managed well, could outweigh its advantages.

11.12 Techniques in Effective Collaborative Learning

As much as cooperative learning positions learners at the core of their development and learning, this process is managed and mediated by the teacher. For instance, when forming groups, learners need to be purposefully and intentionally structured (Yang, 2023). Some techniques to ensure effective collaborative learning include:

i.   **Make goals and expectations clear:** It is important for the teacher, as the mediator of learning, to explain specific goals and expectations (Keiler, 2018). If learners are unclear about the goals they are expected to meet, group work can potentially devolve into socialisation or apathy. With mutual agreement, a clear division of labour is critical in collaborative learning (Yang, 2023). As collaborative learning is a democratic space, learners may negotiate and renegotiate boundaries among themselves (Ibid).

ii. **Foster a culture of cooperation:** It's crucial to recognise that these abilities do not come naturally; anyone who has witnessed a group activity devolve into a fight will attest that this is often not the case. Cooperation skills require instruction, much like the majority of other competencies. This includes essential skills such as:
     - Listening: Effective teams need good listeners, a rare skill to find. This can be facilitated by establishing rules such as "three before me," which requires that at least three people share their thoughts before anyone speaks again.
     - Posing insightful inquiries: Investigation and critical thinking are built on compelling questions. Learners should be encouraged to consider what they need to know about a subject and how to formulate questions to elicit the best responses.
     - Conciliation: Occasionally, a group may struggle to reach a consensus, so it is vital that learners learn how to work towards agreement and compromise (Yang, 2023).

iii. **Deliberately select which learners will work together:** If left to their own devices, learners will group themselves into friendship circles based on common connections. However, when a teacher sets up the groups, they can match students according to their strengths and limitations, purposefully blending abilities, variety, and social aptitude (Darling-Hammond et al., 2020).

iv. **Size the groups for maximum effectiveness:** If a group is too small, the ideas and discussions may lack diversity and energy; if it is too large, some learners may not engage. The optimum group size tends to be four to five participants.
     - Teach your learners how to listen to one another.
     - Set the rules of language and collaboration.

There will always be one or two learners in each group who are more likely to take the lead—or take over. Take the time to teach these learners how to clarify issues, paraphrase, disagree constructively, and build on what others have contributed (Stump et al., 2011).

11.13 Conclusion

It can be concluded in this chapter that collaborative learning has social, psychological, academic, and assessment benefits, which also help learners develop certain values such as respect, selflessness, democracy, interdependence, and celebration of inclusivity. This means that collaborative learning subscribes to the Ubuntu philosophy, which advocates togetherness. In the collaborative classroom atmosphere, a teacher plays the role of a mediator by identifying, communicating the rules of engagement, and ensuring that these rules are understood by all learners. The goals of collaborative learning need to be explicitly outlined. As collaborative learning is a social space, the identification of the team members becomes paramount, as group members need to embrace each other's contributions rather than undermining and destroying one another. In line with Ubuntu principles, collaborative learning is about sharing ideas, collaboration, interaction, problem-solving, mutual engagement, and a sense of communality.

11.14 Reflective Questions

1. What are the characteristics of collaborative learning?
2. Explain the values that guide collaborative learning.
3. What are the benefits of collaborative learning?
4. Which steps are followed in creating an effective collaborative learning classroom?

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Chapter 12: Cooperative Learning in Classrooms

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12.1. Concept Map

12.2 Learning Outcomes

- Define cooperative learning method.
- Identify theories that underpin cooperative learning in the classroom,
- Prepare for productive cooperative learning in the classroom,
- Discuss the advantages and disadvantages of cooperative learning.
- Explain what practices to avoid in a cooperative learning environment.
- Apply the techniques for effective cooperative learning in an English First Language classroom.,

12.3 Clarification of Key Terms

Cooperative learning: Cooperative learning is a technique in which learners collaborate in small groups to complete a predetermined task.

Learning strategy: A learning strategy is a way of organizing and applying a series of skills to understand specific contents or perform given tasks more effectively and efficiently in the classroom, school as well as in non-academic settings.

Jigsaw: In the jigsaw technique each learner is encouraged to take responsibility by performing assigned tasks and share is a cooperative learning team goal achievement (Thomas, Hegarty, and Holdsworth, 2012).

Social interaction: Engagement between two or more learners, and between learner(s) and teacher.
Think-pair-share: Refers to the technique where learners are given challenging tasks, each learner is provided time

to think and write an answer to the task. After this more time is given to the group to discuss their answers and then come up with an agreed response before presenting their conclusion to the class.

Zone of proximal development: A learner's zone of proximal development is the space between what they can do without any assistance and what they can do with adult supervision or in cooperation with more experienced peers.

12.4 Introduction to Cooperative Learning as a learning strategy

Cooperative Learning is one of the strategies in which learners work together in small groups to undertake tasks to achieve a common learning goal. Under corporative learning, the teacher provides clear instructions to achieve the given task. Teacher also guides individual members of the group to complete their assigned task to achieve the expected learning outcome. Cooperative learning when used effectively as a learning strategy develops the 21st century skills in learners. Learners are able to gain the core competencies necessary for developing the individual learner for the world of work. Rigacci (2020) attests that cooperative learning strategies offer learners the possibility to learn by applying knowledge in an environment more like the one they will encounter in their future work lives. Yassin, Razakand Maasum (2018) differentiated cooperative learning from group work and collaborative learning. In cooperative learning, learners are given equal opportunities to participate to produce the output; however, in group learning, tasks may be undertaken by specified members of the group without involving the entire group members. Collaboration is concerned with the process of working together. Cooperative learning has many advantages that promote inclusive learning and social justice in the classroom; however, the strategy also has some disadvantages if not effectively used. This chapter will consider techniques for an effective cooperative classroom, the advantages and disadvantages as well as the dos and don'ts in a cooperative learning classroom.

12.4.1. Cooperative Learning Frameworks

Several theories may be utilised as a framework for cooperative learning. Among these are social interdependence, behaviourism, cognitivism, and social constructivism theories. However, this chapter is underpinned by cognitivism, social constructivism and social interdependence theories. Piaget (1985) and Vygotsky (1978) made significant contributions to the development of social constructivism theory. Piaget emphasised that cognitive or individual constructivism is based on how individuals construct knowledge. This is anchored on the cooperative learning construction process. Piaget on the other hand opined that individual learners develop cognitively through conversations. Vygotsky further explained that the cognitive growth of an individual depends on the extent of their social interaction and that knowledge is formed when learners work together. Therefore, interacting with peers in cooperative learning can help learners understand concepts and improve their performance. Under the constructivism theory, Vygotsky introduced the zone of proximal development (ZPD). Vygotsky (1978) defines ZPD as the gap between the actual development when the learners perform tasks on their own and the potential development that takes place when guided by adults or working together with more knowledgeable others who can be peers or teachers. Vygotsky emphasised that the learner in the ZDP cannot excel in language learning, except through the social interaction with peers and teachers which involves the interaction between learners sharing knowledge and ideas. This demonstrates the importance of cooperative learning, According to Piaget (1953) and Vygotsky (1978), cooperative learning effectively encourages learners to generate new cognitive structures that allow them to work together with peers or those more knowledgeable others.
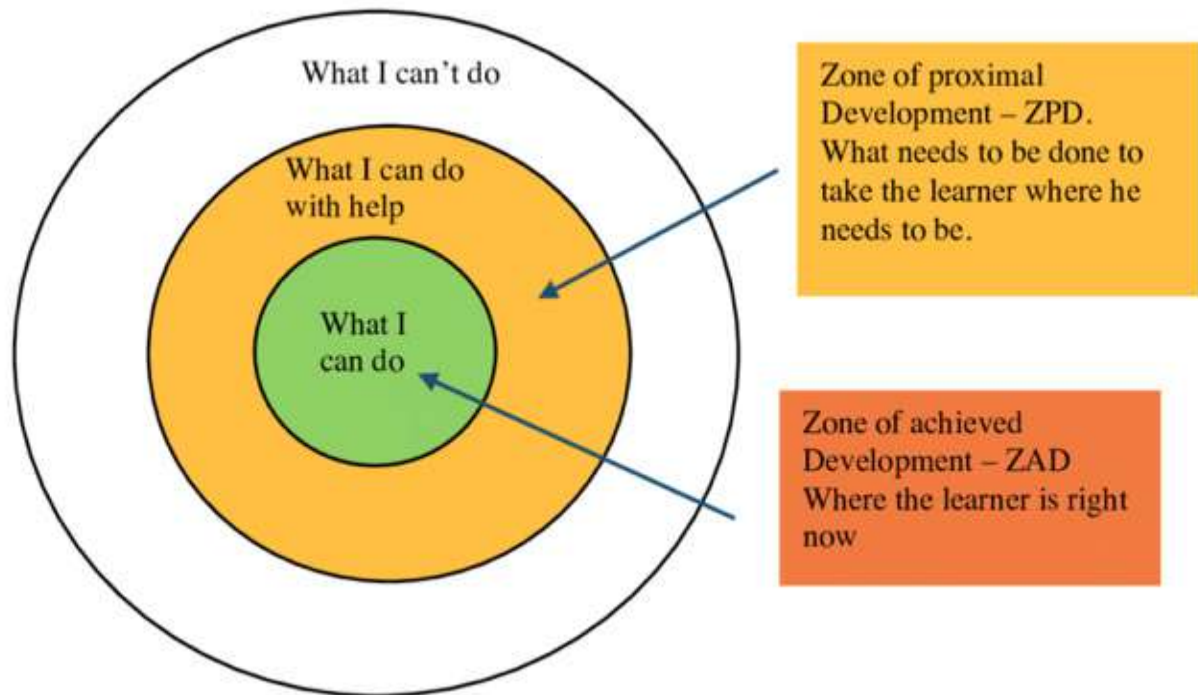
Fig 1. Frameworks & Theories Vygotsky's Zone of Proximal Development and Scaffolding
Adopted from Frame Works and Theories Vygotsky's Zone of Proximal Development and Scaffolding (Kurt, 2020).

12.5 Cooperative Learning in Classrooms

The fundamental purpose of learning in a cooperative classroom is to enhance learning through cooperation in which knowledgeable individuals may encourage classmates to understand and complete the assigned work (Yassin, Razak, & Maasum, 2018). Cooperative learning in classroom provides the environment to use techniques in which learners work in small groups with the assistance of the teacher to complete shared learning objectives (Rigacci, 2020). The goal-achievement rates are positively high among learners, each member of the group believes they can meet their aims if the other members of the group do the same. Therefore, a learner seeks results that are favourable to both himself or herself and all other learners with whom they are cooperatively linked. Hence, learners maximize their own and each other's learning (Johnson, Johnson, & Holubec, 2013). Cooperative learning in the classroom is an example of the learner-centred approach, which sees learners as responsible and active participants in the learning process.

12.6. Preparing productive cooperative learning lessons

To achieve productive cooperative learning, before the class; the teacher needs to make adequate preparations. Cooperative learners are divided into diverse abilities and genders in pairs or small groups of four or five. Group members learn through cooperation in performing tasks by sharing ideas to achieve the learning objectives.
It is the responsibility of the teachers who organise cooperative learning in classrooms to provide clear instruction on the assignment given. Traditional teaching can be used to explain the task, in which the teacher carefully explains the lesson objectives and any related concepts, and also assesses whether the learners have understood the concept by question-and-answer method. The teacher in a cooperative learning classroom oversees the distribution of the relevant materials for effective and efficient use. (Johnson & Johnson, 2014). Belmekki and Kebiri (2014) indicate that teachers should carefully monitor how each group member uses the materials while the learning takes place within the group.

12.6.1 The Role of the Teacher in A Cooperative Learning Classroom

Teachers act as the creators, promoters, and facilitators of cooperative learning (Hong, Chen, Huang, Tsai, and Chang, 2022). Classroom teaching is learner-centred, with group activities as the primary teaching mode. The teacher's function shifts from information provider to facilitator of learners' learning.

According to Alhebaishi (2019), the role of the teacher in cooperative learning is to:

12.6.1.1 Introduce cooperative learning to learners: Teachers should expose learners to knowledge on a variety of topics, such as team building, effective interaction with group members, role and responsibility assignments, and assessment processes.

12.6.1.2 Give clear instructions about the objective of the session: Teachers should give learners instructions and directions that clearly describe what they are expected to do, what skills they should develop, what signals and expressions to use when responding to their teacher, and what skills they should internalise during group work.

12.6.1.3 Establish a supportive climate: Cooperative learning needs teachers to offer a friendly, calm, and interactive environment in which learners may assist one another in learning freely, safely, and pleasantly.

12.6.1.4 Form groups: Learners should be divided into heterogeneous groups based on their academic ability, competence level, gender, and race. This group type is preferred because it allows for the inclusion of diverse abilities, styles, skills, and experiences, increasing learners' possibilities of gaining from one another.

12.6.1.5 Select the group size: The best solution for teachers to do is to keep groups small and inclusive. Smaller groups of four to five that caters for the differences of learners can complete tasks more rapidly than bigger groups. The utilization of smaller groups promotes learner involvement and participation while requiring fewer management tactics.

12.6.1.6 Assign roles: Teachers should assign duties to each member to ensure that each member understands what is expected of him or her.

12.6.1.7 Introduce tasks: Tasks should be designed so that learners work together to attain common goals. Learners, for example, can work in groups to solve a problem, debate an issue, share ideas, create a product, prepare a presentation, or design a project.

12.6.1.8 Setting a time limit: Time limitations are beneficial because they assist learners in learning time management skills, especially when one learner in each group serves as a time checker. If the time restriction is surpassed, the teacher may extend it; nevertheless, most groups operate within the time limit.

12.6.1.9 Adequate planning and resource mobilisation: adequate planning for the cooperative learning classroom should ensure availability of adequate resources will make for effective cooperative learning classroom.
These are the things that the teacher should take note of for the success of the cooperative learning lessons.

12.6.10. The role of the learner in cooperative learning: The learners may assume specific roles in cooperative learning. Almuslimi (2016) defines the Learner's role in cooperative learning as one of the following:
i.   Academic roles
      a) Facilitator: Learners focus on the achievement of the given task,
      b) Questioner: one who asks questions,
ii.   Social roles
      a) Reporter: presents the group's output to the other groups.
      b) Praiser: encourages group members by using positive remarks.
iii. Group processing roles
      a) Recorder: records all activities within the group
      b) Summariser: oversees summarising all learners' responses.
      c) Timekeeper: monitors the length of each task.

12.6.2. Elements to consider in cooperative classroom

The elements and ideas listed below should be included when creating a lesson in cooperative learning classroom.

12.6.2.1 Positive goal interdependence: Positive interdependence occurs when there is mutual benefits among group members, a benefit to one member of the group results in a benefit to the other members. Individual learners' commitment to personal and group performance generates equal dependence among group members. Learners see that group success necessitates the efforts of each member of the group, thus, those of higher

ability can take the initiative to assist those of low ability. Both ability groups benefit, learners with higher ability sharpen their own learning, while those of lesser ability can learn more effectively with the assistance and encouragement of their peers. They can improve their understanding and improve their success rate by working with a more capable group in an equal ZPD (Erbil, 2020).

12.6.2.2. Positive role interdependence: In a cooperative learning environment, learners work as a team to create and learn, but ultimately, each learner is accountable for his or her own performance, therefore eliminating social loafing (Rigacci, 2020). The implication is that individuals are responsible for developing their own ZPD within the small group interaction. This is reflected when each member of a group is willing to accomplish their share of the task while also creating the circumstances for others to do their part.

12.6.2.3 Positive reward interdependence: Learner's assist, encourage, support and praise, each other's efforts to learn and contribute equally to the outcome. Learners interact and share what they have learned with one another and help one another understand and complete assignments (Zhou, 2017).

12.6.2.4 Cooperative Skills: Cooperative learning requires subject knowledge, interpersonal and small-group skills to function as part of a group. According to Jacobs and Seow (2015), other crucial skills necessary for cooperative learning, include asking for assistance, providing suggestions and feedback, reacting constructively to suggestions and feedback, providing justifications when asked, disagreeing to agree, and expressing personal gratitude are encouraged. At the same time skills such as effective communication, interpersonal, group, leadership, decision-making, trust-building, friendship development, and conflict management skills are learned (Zhou, 2017). This is accomplished through interaction, dialogue, and politely listening to and commenting on others' opinions.

12.6.2.5 Positive task interdependence: Members of the group discuss how effectively they are meeting their objectives and keeping successful working relationships. Rather than competing, learners are given the opportunity to express their opinion on exceptional activities by member that was beneficial to the group as well as what each learner might have done to make the group even better. The goal is to improve on the effectiveness of the group's effort to attain its objectives (Zhou, 2017). Primary school learners associate group work activities with intellectual progress and the possibility of learning new things through interaction (Jakavonyt-Stakuvien, 2021). This increases self-regulated learning.

12.7 Advantages and Disadvantages of Cooperative Learning

Cooperative learning has advantages and disadvantages to learning.

12.7.1 Advantages of cooperative learning in classrooms

NEEDU (2018) and Keramati and Gillies (2021) highlight the benefits of cooperative learning as follows:
• Learners participate and enjoy secure learning atmosphere,
• A cooperative classroom environment provides an appropriate setting for deep learning,
• Increase learners' reading, comprehension, speaking, writing abilities,
• Enhance learners' social skills by promoting active participation and teaching them how to communicate or resolve conflicts,
• Enhances sense of accomplishment as each learner contributes to the success of his or her group,
• Reduces the degree of anxiety,
• Enhances abilities for teamwork,
• Increases sense of responsibility and desire for new tasks,
• Enhances the retention of relevant information,
• Improves communication abilities,
• Inspires positive relationships among learners,
• Help learners build general abilities that will prepare them for their future careers,
• Improves academic performance.
• Enhance learners' self-esteem by making them realize how vital they are to the success of a group,
• Improves the critical thinking skills of learners, when they talk with others in their group, learners hear various perspectives and viewpoints.

12.7.2 Disadvantages of cooperative learning in classrooms

Keramati and Gillies (2021) indicate some of the disadvantages of cooperative learning:
- Relying on the efforts of others for completion of a task or solution to a problem,
- constitutes hinderance to completion of the curriculum,
- Learners may lack cooperation skills,
- A lack of motivation among learners,
- It may be difficult to arrange classroom to suit cooperative learning,
- Learners require some time to adjust to cooperative learning resulting in low teaching effectiveness.
- It may be difficult to use a cooperative learning strategy in a multicultural classroom and classrooms that are overcrowded,
- Teachers may lack understanding of the cooperative learning procedure and fail to use it resulting in ineffective learning experience.
- Other disadvantages include
- Learners may raise questions that the teacher cannot answer,
- The method may prevent the teacher from showing his/her expertise in subject content,
- Students may resist cooperative learning,
- May result in conflict between fast and slow learners over unequal contributions,
- May result in stereotyping based on ability, gender, and race,
- The method prevents individualised attention by the teacher,
- It may be used as a way of avoiding teaching responsibilities.

Considering the advantages of the cooperate learning classroom, it is the responsibility of the teacher to minimise the disadvantages to make effective use of the method.

12.8 Techniques in Effective Cooperative Learning

There are several techniques to be used in cooperative learning. However, for this chapter, two techniques emphasized by Brame and Biel (2015) are highlighted.

12.8.1 Think-Pair-Share

The teacher poses a discussion question. Learners are urged to individually think or write about an answer to the topic before sharing the solution with a peer. Following that, groups present their findings to the class.

12.8.2 Jigsaw

With this method, groups of four or five members work together to become experts on a single section of new content while other expert teams in the class focus on different sections of new information. The class then rearranges itself into new groups with a representative from each expert team. The new team members then alternate, instructing one another in the subject areas they are knowledgeable about.

12.9 Don'ts in Cooperative Learning

In cooperative learning, several factors should be considered. Some of the don'ts of cooperative learning are itemized below:

12.9.1. Finding new concepts: Learners should not be expected to find new concepts for themselves in a cooperative learning classroom. Tricky and complex ideas generally need detailed instruction at the initial stage. One of the most common mistakes in cooperative learning is the method can replace teaching. However, this is not a cooperative learning idea.

12.9.2. Over-complicated duties: Group duties should not be overcomplicated. Group exercises with intricate or convoluted instructions can easily cause cognitive overload, resulting in little or no learning.

12.9.3. Cooperative learning not working: If a cooperative learning task is not working; considering the advantages of the method, teacher should strategize, develop new learning materials, and address shortcomings encountered during the lesson.

12.9.4. Temptations to be in charge: Teachers should avoid the temptation to take charge of the groups. In co-operative learning, A teacher's position has shifted from knowledge transmitor to thought facilitator. Praising and encouraging team members who are less academically proficient is beneficial.

12.9.5. Learners' questions: Teachers should not respond to learners' questions unless the group members are unable to handle the issue on their own (Oxford, 1997).

12.10 Case Study in Cooperative Teaching

12.10.1 Case study

Mr Letlhaka is a primary English First additional language teacher. He desires to prepare and choses to use strategies to prepare his learners for work life. He considered enhancing positive interdependence, individual and mutual accountability, social skills, and team spirit in the EFAL learners by using a debating activity. He started by creating space on the teaching schedule by blocking a one-and-a-half-hour time slot for this process. He divided the class into groups of five learners. He let learners choose to debate in support or against the motion. He then distributed the guiding material prepared for the theme and encouraged them to share ideas using the library resources, and even interview the persons they think can provide them with the information they needed. He guided them to write down their facts or points and come back to the class to discuss the information they gathered in their groups and write down their findings.

In the next stage, Mr Letlhaka merged all groups who supported the motion together into one group and all the negative side groups also did the same. He let each group merge similar information and help each other construct authentic arguments for debate. Both sides chose five speakers: a chairperson, a timekeeper, a judge and the rest became the audience. The above process applied to both sides (positive and negative).
During the debate process, every learner in the audience participated by noting down what they thought needed attention during debriefing as listening to debaters. He organised a debriefing session where the judges provided feedback and the outcome of the process. The judges let the learners in the audience comment or ask questions they felt were not covered during the debating session.

12.10.2. Reflections

1. Identify the skills acquired by the learners because of the different roles played by learners in the case study.
2. Dew to the roles played by the teacher, discuss the effectiveness of the cooperative learning method in the case study.

12.11 Conclusion

The chapter commenced with clearly stated objectives and the detailed description of cooperative learning as a method used by teachers to impart knowledge, and develop competencies and skills needed to survive in the society. The chapter identified the advantages and the disadvantages of cooperative learning, the roles of the learner and the role of the teacher in a cooperative classroom were discussed. The chapter also elucidated on the theories and considerations for cooperative learning as well as the don'ts of in a cooperative learning environment for effectiveness.

12.12 Reflective Questions

1. Define cooperative learning strategy.
2. Identify theories that underpin cooperative learning in the classroom,
3. Prepare for productive cooperative learning in the classroom,
4. Discuss the advantages and disadvantages of cooperative learning
5. Apply the techniques for effective cooperative learning in an English First Language classroom.
6. Explain practices to avoid in a cooperative learning environment.

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13.1. Concept Map
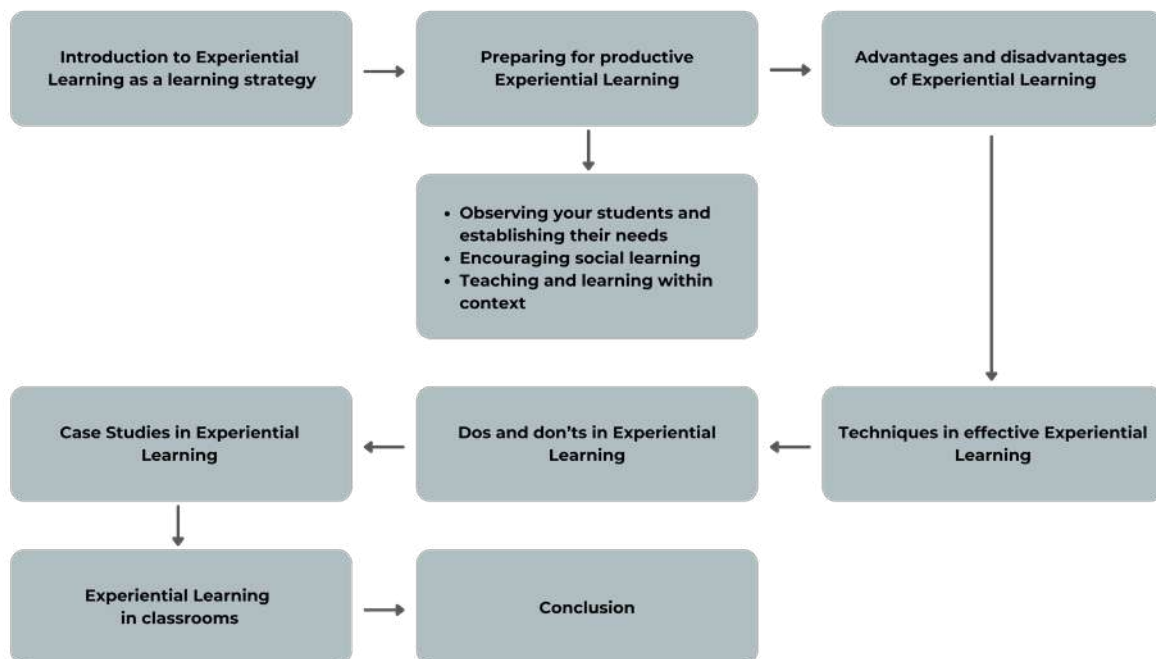
13.2. Learning Outcomes

This chapter aims to introduce teachers to the pedagogical strategy of experiential learning, as well as the advantages, disadvantages, and techniques to achieve the teaching and learning goals and objectives.
After reading the chapter, teachers are expected to be able to:
- Use experiential learning as a teaching strategy
- Identify the advantages and disadvantages of experiential learning
- Prepare for productive learning in experiential learning classrooms
- Employ the techniques of experiential learning for productive learning
- Recognise the 'dos' and 'don'ts' with respect to experiential learning

13.3. Clarification Of Key Terms

Experiential learning: An educational approach that emphasises personal or practical experience in the acquisition of knowledge, skills, values, and attitudes.
Concrete experience: Personal involvement in a particular experience.

13.4. Introduction To Experiential Learning As A Learning Strategy

Experiential learning, also referred to as involved or evidential learning, is a process in which new data is comprehended by the learner and transformed through experience (Kolb, 1984). It involves components such as skills, techniques, and the environment, which ensure that the learner gains relevant knowledge. In its simplest form, experiential learning refers to the construction of knowledge and meaning from real-life experiences (Yardley, Teunissen & Dornan, 2012). This type of learning also incorporates active and participatory elements, as the learner becomes an active participant in the lesson.

In the context of learning through experience, knowledge is activated by students' authentic experiences. Therefore, experiential learning is 'situated' in a context relevant to students' future careers. In this framework, the teacher creates a learning atmosphere that enhances the learner's capacity. It involves learning by doing, where students need to be personally involved in the learning process, making the content relatable to them. For knowledge to have substantial meaning and lead to changed behaviour, it must be discovered by the learner themselves.

In experiential learning, the strategy shifts from being teacher-centric to a model where the learner learns through experiences directly related to real-world problems (Bartle, 2015). This approach requires active participation from the learners. Hawtrey (2007) further describes experiential learning as participatory and situational learning. Dewey (1938) argued that without experience, something essential is missing in the learner's understanding, and that the starting point for all learning and education should be meaningful experiences.

For a type of learning to qualify as experiential learning, it must meet four characteristics: concrete experience, reflective observation, abstract conceptualisation, and active experimentation, as illustrated in the Kolb learning model diagram below:
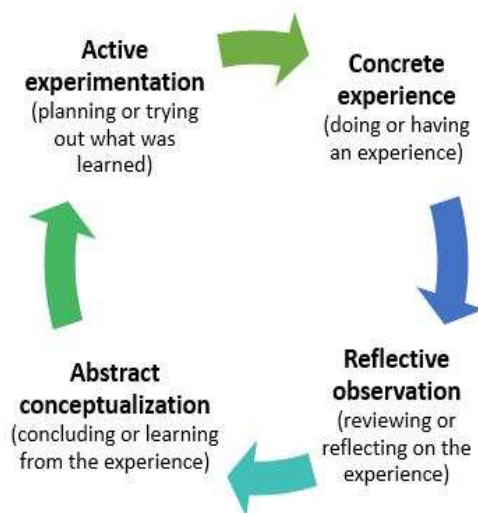
Figure 3.1 The Kolb Experiential Learning Model. Source: Kolb (1984)

As the cycle continues, the learner will have a new "concrete experience," and the process will begin anew, characterised by constant learning, reflection, and improvement. By learning in this practical manner, the teacher can expect to see higher retention of knowledge and a natural refinement of soft skills.

13.5. Preparing For Productive Experiential Learning

The best practices in instructional delivery require the teacher to prepare for the learning experience to ensure it yields the desired outcomes.

13.5.1. Observing your learners and establishing their needs

A teacher in an experiential classroom needs to observe their learners to establish their needs. Do the learners have any prior experience with the particular topic? At what level of maturity are they? What are the cultural variations among the learners? What types of diversity exist within the group? As the teacher prepares for a productive experiential learning experience, they must recognise that learners are different and have been raised in diverse environments, which will significantly impact their experiential learning outcomes.

13.5.2. Encouraging social learning

Social learning involves information sharing. When information is shared, it is repeated, and repetition enhances retention. Small group exercises, in-class mentoring, and learning networks—whether formal or informal—enable learners to exchange questions and ideas, creating memorable learning experiences.

13.5.3. Teaching and learning within context

A teacher seeks to create learning experiences that reflect the environment in which the learner will use the information. This means that the teacher presents information in a way that allows learners to construct meaning based on their own experiences. Sometimes referred to as contextual learning (Morris, 2020), this type of learning brings concrete experiences into the classroom, enabling the teacher to merge the learning content with the learners' experiences.

13.6. Advantages And Disadvantages Of Experiential Learning

13.6.1. Advantages of Experiential Learning

Each learning model has its strengths and weaknesses that often extend to its practical application. Some of these may have both positive and negative impacts on their application. Among the many advantages of experiential learning as a learning strategy, Krbec and Currie (2010) list the development of learners' interpersonal and communication skills, an understanding of course concepts, the promotion of a collaborative culture, the enhancement of listening skills, and the improvement of critical-thinking and problem-solving skills. Experiential learning stimulates conversations, interactions, and engagements in class. For effective learning to take place, the teacher must foster the learner's desire to learn; therefore, the teacher needs to create a balance between the content to be taught and the strategy used when delivering that content. According to Senge (2006), learners only remember a fraction of what they are told. Thus, with experiential learning, learning becomes a real-world, subjective, reflective, and lived experience. With experiential learning, the learner becomes a participant in the process, which enhances the absorption and retention of knowledge. A significant advantage of experiential learning is that it assists learners in making connections between subjects, their knowledge and skills, and their personal goals (Hawtrey, 2007). Learners grasp concepts more easily, have the opportunity to become more creative, can reflect on their experiences, find value in their mistakes, and teachers often observe improved attitudes towards learning.

13.6.2. Disadvantages of Experiential Learning

One of the disadvantages of experiential learning is that it can be more time-consuming than a lecture. Spencer and Van Eynde (1986) indicate that experiential learning is more of a process than an event, involving sequences of activities in the classroom. The rationale behind this is that the entire learning process needs to begin with a concrete experience that other learners in the class may not possess. This calls upon the teacher or instructor to evaluate each learner's experience and connect it to the day's lesson or lecture. Experiential learning often requires patience and guidance from the teacher, as there may be more than one right answer to the questionsposed.

Another crucial disadvantage related to this form of instruction is that it is less applicable in subjects where students have little experience. In such cases, the teacher or instructor must use an example of structured experience and relate it to new content. On one hand, experiential learning is often excluded as an instructional delivery approach because many educators assume that what they need to impart will be entirely new to their students. On the other hand, Kolb (1984) points out that it is inadequate for teachers to assume that the learner's mind is as blank as the paper on which they design their lesson plans; every learner enters each learning situation with a more or less clear set of positions, views, and ideas about the topic at hand. Teachers need to develop the skill to

tap into those experiences for the experiential lesson to be effective. Furthermore, experiential learning may result in false conclusions based on learners' varied experiences.

13.7. Techniques In Effective Experiential Learning

There are several techniques that a teacher can use for effective experiential learning in the classroom. These techniques are grouped based on the following criteria:

13.7.1. Autobiographies

Lee and Caffarella (1994) suggest the use of autobiographies, where learners write down personal chronologies related to school and learning, as a way of creating their own experiences leading up to learning. Furthermore, teachers can adopt large group discussions, reflective journals, small group collaborations, and individual life-lines, where learners chronicle the history and development of their personal and professional viewpoints on critical issues.

13.7.2. Role plays and games

Lewis and Williams (1994) indicate that the following techniques of experiential learning are currently in use: role plays, games, case studies, critical events, socio-drama, and values clarification exercises. When these techniques are employed in class, learners find it easy to experiment with new behaviours and receive feedback in a secure learning environment. These experiential learning techniques help learners relate theory to practice and analyse their real-life experiences against the instructional content taught in class.

13.7.3. Field trips and interactive classroom games

In experiential learning, learners need to be engaged. Here are some activities that will ensure their involvement: field trips, art projects, science experiments, mock cities and trials, role-playing, reflection, internship opportunities, and interactive classroom games.

13.8. Dos And Don'ts In Experiential Learning

Experiential learning accelerates the learning process because a practical, hands-on approach is more effective and enduring than a theory-based one. Learners can comprehend the guiding ideas, practices, and processes, and they are able to experiment with and modify these practices to achieve the best results. However, experiential learning is constrained by the limitations imposed by those transferring knowledge. At times, rules can become restrictive, depriving learners of their free will and making them uncomfortable in their working environment. This can lead to hesitation when they attempt to implement their plans, ideas, and techniques in real-world situations. Experiential learning is beneficial only when material is applied in practical contexts. In other words, it enables students to engage in the learning process by exploring concepts and topics through real-world application and reflecting on the experiences gained. Thus, there is a need to highlight the "dos" and "don'ts" that should guide teaching and learning.

13.8.1. Dos

- **Emphasise understanding above rivalry:** Students should be encouraged to be empathetic rather than to see each other as rivals. Empathy is "the experience or understanding of another person's thoughts, feelings, and condition from his or her point of view, rather than from one's own." Practising empathy not only fosters kindness but also enables students to view the world from multiple perspectives.
- **Provide opportunities to investigate:** Students should be asked questions about life, such as "What does it mean to live a decent life?" or "What makes you happy?" in addition to history and maths studies. You may provide them with tools to better comprehend their internal states and feelings and give their education more purpose by engaging in open, reflective talks and involving them in other mind-searching exercises.
- **Set time for recreation and exercise:** Children are very energetic. Interactive play not only provides a variety of physical health benefits but also enhances attention span, memory, and interest in learning by activating and connecting various regions of the brain.

- **Make allowance for inquisitiveness:** Children naturally exhibit curiosity. If young people are to grow up to be useful, content adults, they must learn a great deal in a relatively short time. Be willing to answer seemingly foolish inquiries and handle all creative endeavours carefully and respectfully. Allow students the time to explore subjects and areas of their choosing to encourage curiosity, inventiveness, and a love of learning.
- **Build resilience by adopting a dynamic attitude:** Goals can be attained through diligence, commitment, and self-improvement, rather than being limited by one's current skills or knowledge. Teach your children how to set goals that are both realistic and challenging. Remember that maintaining a lively attitude as an adult also aids in your development as a teacher, enhancing the impact you have on your students (Lynch, 2019).

13.8.2. Don'ts

- **Do not create instability by changing rules and structure without cause:** Adaptability is critical, but it must be done in a thoughtful, intentional manner that doesn't undermine the sense of stability in the classroom. When making changes of any magnitude, make them clear to the class, provide specific reasoning, and stick to your changes for the sake of your students' feelings of security and consistency regarding academic standards and goals.
- **Do not harp on avoiding mistakes and failure:** Part of instilling a growth mindset involves addressing failure. Read more about what to do and what not to do when teaching students to overcome their fears of failure and making mistakes.
- **Do not confine learning to lesson plans or core curriculum:** Kids who don't want to learn won't learn. Sticking to the bare basics of lesson plans and curriculum may strip children of their natural passion for understanding and acquiring information. Foster excitement for learning by allowing kids to choose additional topics that they are most passionate about.
- **Do not take a one-size-fits-all approach:** Learning styles vary widely from child to child, from class to class, and from school year to school year. Take time to reflect on your teaching style and consider making necessary changes, such as finding new ways to use technology for your students' benefit.
- **Do not make rote memorization the only way to succeed:** While memorisation has a place in learning, it is far from the best method for succeeding in school and beyond. Relying too heavily on memorisation stunts creativity and the ability to integrate knowledge in innovative ways (Lynch, 2019).

13.9. Case Studies In Experiential Learning

Case study 1: Mrs Chat is a form 3 food and nutrition teacher at St Mary's Girls Grammar School.

The class consists of 10 students, and the topic for the next lesson was "How to Bake a Cake." She began by asking the following questions: How many of you like eating cake? Who among you has baked cakes or cookies before? She then assigned 5 students to create a list of the ingredients they would need, while the other 5 were tasked with making a list of the utensils and equipment required for baking. After that, the students were asked to nominate 5 of their peers to go and buy all the items they had listed, which included flour, eggs, sugar, fat (usually butter), salt, a form of liquid (usually milk), and leavening agents (such as baking soda), as well as measuring cups, wooden spoons, an egg whisk, and kitchen scissors.

Case study 2: How to Bake a Cake (Mrs. Chat took her students to the Cookery Laboratory, gave them all they needed, posted the instructions below, and asked the students to bake the cake in groups of two)

The first stage is to prepare the baking pans, followed by allowing the ingredients to reach room temperature and then preheating the oven. The second stage involves stirring together the dry ingredients while mixing the butter and sugar. Then, add the eggs bit by bit, alternating with the addition of dry and wet ingredients. Finally, pour the batter into the pans and bake.

13.10. Experiential Learning In Classrooms

Experiential learning is the process of education where students "learn by doing." It allows them to think critically about their assignments and fully understand the principles they are learning. This approach provides students with opportunities for practical learning that promotes their overall development. As they apply their newly acquired theoretical knowledge, experiential learning ensures their active involvement in the learning process. Retention of knowledge is likely to be higher when students actively participate. Moreover, through exposure to

real-world events, experiential learning equips students with the skills they need to tackle challenges as they arise. It is crucial for helping students develop their skills and increase their competency. With an enhanced ability to handle a variety of situations, students will have an advantage in their future endeavours. The concept of experiential learning is gaining popularity as schools move away from rote learning towards more practical approaches. Experiential learning, in contrast to traditional methods, fosters a practical learning ecosystem. We must incorporate experiential learning into our educational pedagogies. Below are some examples of experiential learning:

- You can learn about processes like photosynthesis by independently observing plants.
- Visit a zoo in person to observe animals and gain an understanding of their way of life.
- To gain a better understanding of how domesticated birds are raised, visit poultry farms.
- Visit an aviation hangar to learn about how specific airplanes operate (Bordia, 2022).

Experiential Learning can be integrated into pedagogical methodologies in the following ways:
Incorporating experiential learning into the learning process of students can significantly influence how they learn. Students often have a better understanding of the topics when experiential learning is incorporated since they are actively involved in the learning process. They are able to observe and feel multiple facets of a notion and apply those facets to their everyday life. Experiential learning can be applied in a variety of ways in the classroom; it can create a lasting effect on the students. As a teacher, you can have your students participate in several activities that aid in their understanding of concepts. To offer students a broader understanding of the issues you are covering, try to identify activities that revolve around them. After this, encourage them to come up with a creative way to apply the principle. This enables students to express their creativity while also allowing the teacher to understand how they have viewed the subject.

As was already mentioned, a key responsibility of teachers is to find situations that require students to think critically, cooperate, and solve problems. Decide what the pupils should discover or acquire because of the learning experience. Here are some key ideas to keep in mind when incorporating experiential learning into your instruction.

- **Plan:** Once the experiential learning activity has been chosen, plan it by connecting it to the course learning objectives and identifying the requirements for students to be successful, such as resources like readings, worksheets, research materials, rubrics, supplies, and directions to off-campus locations. Determine the logistics as well. How long will the students have to complete the experience? Will it be a full class period, a week, or longer? Do pupils have extracurricular obligations? What will happen at the end of the activity? Which assessment techniques will you use? Will you conduct ongoing evaluations through journals and observations (known as formative assessment), evaluations after the experience through written reports and projects, evaluations of oneself and/or others, or a combination of all three?
- **Prepare:** Prepare resources, rubrics, and assessment tools once the planning is complete, ensuring everything is ready before the experience begins.
- **Facilitate:** Like the majority of instructional techniques, the instructor should initiate the activity. Once instruction has begun, you shouldn't continue by providing students with all the course material, details, and comprehensive responses to their queries. Instead, assist students in the process of identifying and choosing **answers on their own.**
- **Evaluate:** Discussions, reflections, and a debriefing session can be used to evaluate the success of an experiential learning exercise. Debriefing can help prolong and reinforce learning by serving as a culminating experience. Additionally, utilise the previously planned assessment strategies (Northern Illinois University Centre for Innovative Teaching and Learning, 2012).

13.11. Conclusion

Experiential learning is a process that enables students and learners to acquire knowledge and experience by completing assignments. It involves taking notes, conducting analyses, creating summaries, and applying the knowledge gained. By fostering problem-solving, judgment, and critical thinking skills, experiential learning equips students for real-world situations. It takes many forms, including in-studio performances, community-based research, internships, and fieldwork. Through these diverse methods, experiential learning helps students prepare for opportunities in the real world, contributing to its growing popularity over the past several years.

13.12. Reflective Questions

1. Explain experiential learning in your own words.
2. What are the advantages of using experiential learning in the classroom?
3. List any three techniques you would employ in experiential learning.
4. What are the dos and don'ts in an experiential learning lesson?

13.13. Reflective Answers

1. This is the type of learning that occurs through experience and is more narrowly defined as learning through reflection or doing.
2. Learners can better grasp concepts that you teach and have the opportunity to be more creative and to reflect.
3. These can include outdoor group activities, team building, field trips, simulations, role-playing, case studies, and project-based learning activities.
4. Allow learners to ask questions and to investigate, and do not confine learning to lesson plans or core curriculum, but allow them to share their experiences.

13.14. Activity

Design an experiential lesson in your field or subject. Use the following as a guide to prepare your lesson plan: introduction, exploration (doing it), sharing (what happened?), processing (what is important?), generalising (so what?), application (now what?), assessment, and self-evaluation.

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14.1. Concept Map
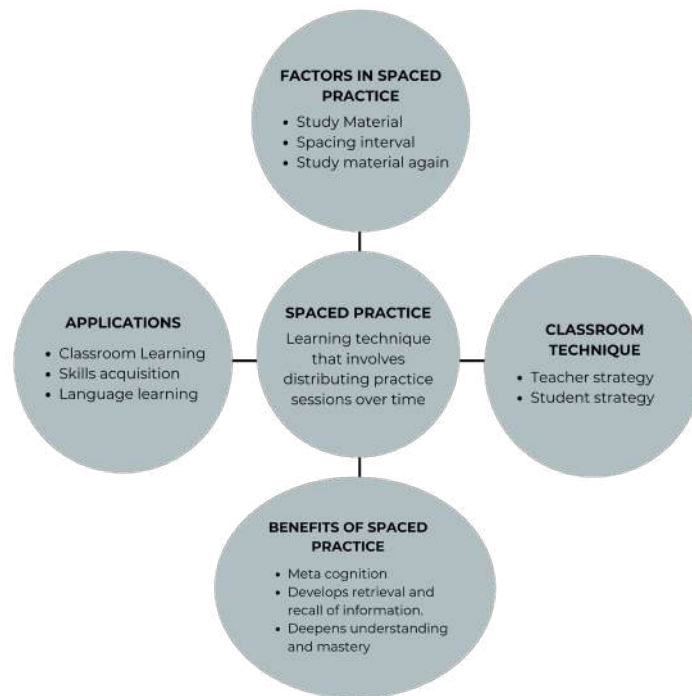
14.2 Learning Outcome

After studying this chapter, you should be able to
- Explain the meaning of spaced practice in classroom contexts.
- Distinguish between spaced practice and cramming as learning methods.
- Demonstrate proficiency in using the concepts learned over time with spaced practice.
- Enumerate the advantages and disadvantages of spaced practice in classrooms.
- Discuss the strategies involved in spaced practice in classrooms for effective retention of information learned.

14.3 Clarification of Key concepts

Spaced Practice: Spaced Practice is a learning technique that involves spreading out study or practice sessions over time, rather than cramming all at once. It is a highly effective strategy for improving retention and long-term learning.
Cramming: Cramming is a learning technique where students learn a chunk of information within a short period.
Learning technique: A method or approach used to facilitate the learning process. For example, spaced practice is a learning technique that focuses on distributing study or practice sessions over time.
Retention: The ability to remember and recall information or skills learned over an extended period. Spaced practice enhances retention by reinforcing learning through repeated sessions.
Forgetting curve: A graphical representation that illustrates how memory retention of learned information decreases over time when no practice is undertaken.

14.4 Introduction

Traditional learning methods have gradually fallen out of favour in the present era due to numerous distractions that affect our attention spans, alongside information overload. The key to effective learning and long-term memory retention lies in smoothing out the process with spaced practice. Research has shown that spaced practice is an effective learning strategy (Kahana, 2012). By incorporating spaced practice in the classroom, students can learn more efficiently and acquire more substantial and lasting knowledge and skills (Kornmeier & Sosic-Vasic, 2012).

14.5 What is Spaced Practice?

Spaced practice, also known as spaced repetition or distributed practice, is a cognitive learning strategy that involves spreading out study or practice sessions over time, rather than cramming all learning or practice into one intense session. This approach incorporates attention, perception, and the formation of memories. In this cognitive method, teachers strategically design lessons and assignments that encourage students to revisit previously covered content at spaced intervals. Some scholars suggest that students typically require three to four encounters with new content to process and store it in long-term memory effectively. Each session serves as a rehearsal that scaffolds future learning opportunities (Agarwal et al., 2020).

The concept is based on the idea of the spacing effect, which states that information is better retained and learned when it is presented and reviewed repeatedly over time, with increasing intervals between each session (Kahana, 2012). This indicates that spacing between learning opportunities results in more attentional processing, whereas massed learning leads to less processing (Koval, 2019). This learning technique has proven effective for long-term retention and a deeper understanding of the material.

Instead of studying for several hours in one sitting, spaced practice suggests studying for shorter periods over multiple sessions, with intervals of days or weeks between each session. By reviewing the material repeatedly at spaced intervals, the brain is continually engaged, strengthening memory and reducing the forgetting curve.

A Sample framework of Spaced Practice in the classroom
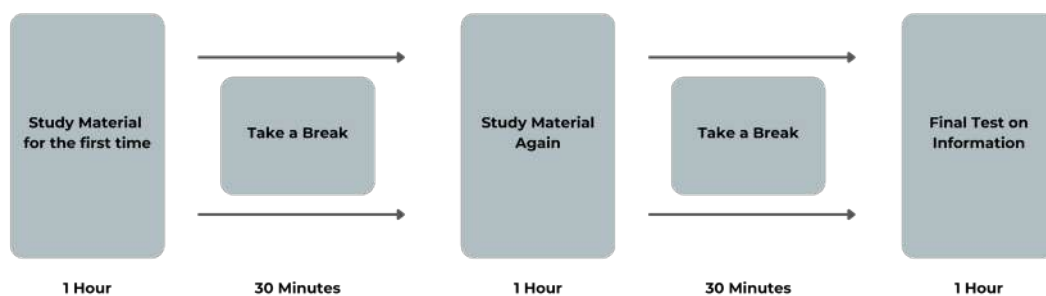
Figure 14.1: A diagrammatic representation of the spaced practice technique, which involves two study periods and two break intervals.

14.6 Spaced Practice Classroom Teaching Technique.

There are several teaching techniques and strategies that teachers adopt to explain concepts to students. However, in this chapter, we will discuss the use of spaced practice as a classroom teaching technique and a learning strategy for teachers and students, respectively.

14.6.1 Teachers' implementation of Spaced Practice as a Teaching method in Classrooms.

The following are some techniques that teachers can incorporate into their teaching methods for spaced practice to enhance effective retention of information:

- **Distributed Practice:** This implies that teachers should divide the learning material into more manageable chunks and space practice sessions over time. Instead of covering everything in one study session, teachers should provide students with regular opportunities to review and apply what they have learned. This can be accomplished through in-class exercises, homework tasks, and tests. The act of retrieval facilitates long-term learning and performance (Kim & Webb, 2022).
- **Spaced Review Sessions:** Teachers should arrange frequent review sessions to revisit information that they have already covered. To reinforce important ideas and ensure long-term retention, these sessions could be held at regular intervals throughout the course or unit. Teachers can allocate a specific amount of time during class or assign individual review tasks or practice questions to students.
- **Feedback and Reinforcement:** Teachers should provide students with prompt feedback and support regarding their learning efforts. Feedback should be specific, helpful, and aimed at enhancing comprehension and application. This feedback helps students improve their knowledge and skills. Teachers can offer feedback on tests, assignments, and class discussions. They should highlight areas that need improvement and recommend further practice or resources.
- **Retrieval Practice:** Teachers should assist students in actively recalling knowledge from memory as opposed to merely reviewing it. Teachers should create exercises and tests that call on students to apply what they have learned in earlier lessons. Teachers should organise quizzes, brief answers, and exercises requiring problem-solving for students to practise on a regular basis.
- **Metacognitive Strategies:** Teachers should encourage students to consider their own understanding and reflect on their learning experiences. This process helps students develop their cognitive skills. Teachers should assist students in developing effective study strategies by promoting metacognition. This approach enables students to recognise their strengths and weaknesses. For instance, teachers can guide students to evaluate their understanding following each study session or to actively reflect on how they have learned thus far.
- **Interleaving:** Teachers should adopt a strategy of combining several subjects or ideas in a single study session to make learning more engaging and interesting. They should also intersperse related or unconnected topics rather than concentrating solely on one. By using this method, students can learn to distinguish between various ideas and apply the relevant information in different contexts.
- **Use of Technology:** Teachers ought to leverage technological tools and platforms that incorporate spaced repetition algorithms. Tools and apps such as Anki, Memrise, SuperMemo, Duolingo, Mnemosyne, RemNote, and Quizlet can enhance learning by optimising the timing of study or review sessions.

It is imperative that teachers explain the rationale behind spaced practice to students and help them understand its benefits. Teachers must use careful planning to map out regular intervals for study sessions. These short, frequent review sessions provide learners with ample opportunities to revisit and reinforce their understanding of key concepts (Main, 2022). Thus, students feel reinforced and motivated when they make significant or landmark progress. However, motivation can vary among students; therefore, teachers should be flexible and adaptive in their approach, considering individual differences.

14.6.2 Students adoption of Spaced Practice as a learning strategy

In order to maximise the benefits of spaced practice, students can employ a variety of strategies. Here are some effective tips for learning:

- **Retrieval Practice:** A potent learning strategy is actively retrieving facts from memory. Students should be encouraged to recall information actively. Quizzes, practice questions, and attempting to remember essential

topics without consulting notes are effective ways for students to practise information retrieval. This method aids in transferring knowledge into long-term storage while enhancing memory (Kang, Lindsay, & Pashler, 2014).

- **Seeking Feedback:** Learning can be enhanced by actively seeking feedback from classmates or teachers. Critiques from instructors or peers can significantly improve the learning experience. Students should be encouraged to request feedback and share their work or study materials with others. Constructive criticism can help identify areas that require improvement and provide recommendations for further reading and practice.
- **Self-Testing:** Students actively self-testing encourages memory retention and information retrieval. Students need to test their understanding of previously studied information by using flashcards, summarising important ideas, or responding to questions about the subject matter. Self-testing on a regular basis improves memory and encourages long-term retention of information.
- **Spacing out Study Sessions:** Students should schedule multiple study sessions over an extended period rather than cramming all the material into one. By spreading out their study time, they can review and revisit the content at regular intervals, which aids in long-term retention.
- **Reflective Journaling:** Students must strengthen their comprehension skills by reflecting on the educational process and journaling their ideas and insights. They might discuss what they have discovered, what still challenges them, and any connections they draw between various subjects in their writing. Reflective journaling encourages metacognition, helps students track their development, and identifies opportunities for improvement.
- **Interleaved Practice:** Similar to the teacher's technique, students should blend various topics or concepts while studying, much like a teacher might. They can move between numerous topics during study sessions rather than concentrating solely on one. This approach enhances the ability to apply knowledge in different situations and tests the mental capacity to distinguish between various concepts.
- **Elaboration:** This helps students grasp and retain information when you encourage them to elaborate or provide their own explanations. They can attempt to teach the content to someone else or come up with explanations that connect new knowledge to their prior understanding. This method enhances comprehension and facilitates a deeper level of understanding.
- **Use Technology and Spaced Repetition Apps:** Students must utilise the various apps and tools available that employ spaced repetition algorithms to help them review material at optimal intervals. These can be used for vocabulary, facts, or other discrete pieces of information.

14.7 The following are some Advantages associated with spaced practice technique:

- **Stronger Retrieval Strength:** Studies show that when knowledge is actively retrieved from memory during spaced practice, the brain connections and pathways associated with that knowledge are strengthened. As a result, recalling the information when necessary becomes simpler and quicker.
- **Reduced Forgetting:** The forgetting curve can be slowed down by frequently reviewing previously learned content. Learners can strengthen their memory and prevent material from fading by spreading out practice sessions, ensuring that it remains accessible in the future (Van & Sweller, 2015).
- **Enhanced Learning Efficiency:** The use of study time is optimised through spaced practice. By breaking up learning sessions, students can concentrate on one idea or topic at a time without feeling overwhelmed, maximising their capacity to absorb and process knowledge.
- **Improved Long-Term Retention:** Studies show that the best way to improve long-term retention of information is by encoding and consolidating knowledge into long-term memory through spaced study sessions. This approach can enhance the retention and retrieval of information over an extended period.

14.8 The following are some disadvantages associated with the spaced practice technique:

- **Potential for Procrastination:** Experience shows that, when using a spaced practice strategy, there may be a tendency to postpone studying because you believe you'll have plenty of time to review later. This can result in inefficient time management, adding unnecessary stress and reducing the technique's effectiveness.
- **Requires Time Management:** Effective implementation of spaced practice necessitates long-term planning and scheduling of study sessions. It can be challenging for individuals with hectic or erratic schedules to set aside time and establish a routine that allows for regular reviews. If care is not taken, the likelihood of individuals giving up on the technique is high.

- **Lack of Immediate Gratification:** Spaced practice emphasises long-term learning rather than cramming, which creates an illusion of short-term proficiency. Success and happiness for learners may not be immediate, as the benefits of spaced practice become evident only over time.
- **Increased Perceived Difficulty:** Due to the constant effort and repetition required for spaced practice, it may initially seem more challenging than cramming. Occasionally, particularly during review sessions when learners believe they should have mastered the material, they may feel dissatisfied or discouraged.

14.9 Application of Spaced Practice

Spaced practice is a valuable teaching technique that can be applied across various fields of study and at different grade levels. Below are some ways in which spaced practice can be utilised as an instructional method:

- **Language acquisition:** By spacing out practice sessions for vocabulary, grammar, or speaking skills, spaced practice can be utilised for language acquisition. For reinforcement and to avoid forgetting, learners should practice and review language topics regularly. This can involve routinely engaging in conversations, listening to podcasts, or reviewing flashcards.
- **Education:** Students can use spaced practice to improve their knowledge acquisition and memory. Students can routinely review their content over an extended period rather than studying for significant periods right before an exam. They can strengthen their understanding and enhance long-term retention by spreading out their study periods and going over the content occasionally.
- **Test Preparation:** Strategies for exam preparation can incorporate spaced practice. Students can spread out their study sessions over time, revising the content at regular intervals rather than cramming just before the deadline. This approach reduces forgetfulness and enhances exam performance.
- **Employee Training:** To improve learning and knowledge retention, employee training programmes might utilise spaced practice. Organisations can create training plans with separated practice intervals rather than conducting a single intensive training session. Employees are more likely to remember the material, apply it on the job, and avoid the "forgetting curve" if learning sessions are spaced out and regular review activities are included.
- **Skills Acquisition:** For the acquisition of skills and the enhancement of performance, spaced practice is very helpful. Spacing out practice sessions enables better learning consolidation, whether studying a sport, rehearsing dance moves, or playing an instrument. Students can practice particular abilities or techniques over time, progressively increasing their expertise.

14.10 Conclusion

This chapter has shown that spaced practice, often referred to as distributed practice or spaced repetition, involves spacing out the exercise or review of material over time, rather than cramming it all in at once. Long-term learning and retention are greatly facilitated by this strategy. By employing this approach, students can improve their study habits, deepen their comprehension of the subject matter, and enhance their overall academic performance. Spaced learning tools are increasingly accessible to learners worldwide, offering multilingual support and culturally relevant content.

14.11 Reflective Questions

1. What is spaced practice?
2. How does spaced practice improve learning?
3. State and explain four (4) advantages of spaced practice.
4. Distinguish between spaced practice and cramming methods of studying.
5. What are some strategies for implementing spaced practice in your study routine?

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15.1. Concept Map

15.2 Learning Outcomes

After going through this chapter, readers should be able to:
*   explain the concepts used in the LUR.
*   identify guiding principles for preparing a productive LUR.
*   outline the advantages and disadvantages of LUR.
*   describe techniques for an effective LUR.
*   discuss the Dos and don'ts in LUR.

15.3 Clarification of Key Terms

The key concepts in this chapter, Learning, Unlearning, and Relearning (LUR), are explained below:

- In this chapter, learning is contextualised as the continuous ability to acquire competencies relevant for the 21st century. This form of learning enables people to continuously improve their performance, expand their horizons, and equip themselves for the future. It further allows individuals to grow and develop personally and professionally throughout their lifespan. Turk (2023) observes that this type of learning occurs in various contexts, such as formal education, informal learning, and experiential learning.
- Unlearning means leaving behind old, outdated, and obsolete knowledge that is deemed inefficient in addressing current challenges. It therefore entails questioning one's assumptions and beliefs, and opening up to new perspectives that can help solve present problems. No wonder Turk (2023) postulates that the unlearning process may be challenging, as it necessitates confronting personal biases and preconceptions.
- Relearning is the process of learning something again, often in a new or different way. It involves building on previous knowledge and experiences to gain a deeper understanding of a subject or skill. Relearning is important because it allows individuals to update their knowledge and skills in response to new information and changing circumstances (Turk, 2023).

15.4 Introduction to LUR as a Learning Strategy

In the current dynamic and changing world, knowledge gaps are an everyday reality. Being aware of these gaps is critical for growth and development, requiring courage and a willingness to address them. LUR, as a learning process, has features that aid in filling these knowledge gaps since it is an endless cycle of learning. It is essential for individuals to remain relevant and significant (Talerngsri, 2014), which Dunlop and Lowenthal (2011) refer to as lifelong learning, an important concept for retooling and reskilling. Lifelong learning empowers learners to engage in LUR, as it involves reexamining and scrutinising the significance of learned material against incoming information while discarding what is irrelevant. Survival in the 21st century, therefore, requires people to learn, unlearn, and relearn, as long projected by futurist Alvin Toffler, who observed that illiteracy in the 21st century consists of those who cannot learn, unlearn, and relearn—not necessarily those who cannot read and write (Bhuwalka, 2021).

According to Klein (2008), LUR exposes individuals to new techniques, activities, and skills, enabling learning in a completely holistic way. This experience has the ability to transform and enhance practice. Talerngsri (2014) explains that this strategy occurs in a circular manner, allowing individuals to adapt to constantly changing technology, methods, and attitudes without insisting on knowledge accumulation and storage for future use. This book chapter will explore LUR as a learning strategy for 21st-century classrooms.

15.5 Preparing a Productive LUR

For learning to occur, unlearning must create space for relearning (Rozzetti, 2023). The following are steps for producing a productive LUR.

1. Design activities that offer varied learning experiences: Learning, unlearning, and relearning align with constructivism as a theory of learning. This theory posits that exposure to and engagement with varied experiences provide learners the opportunity to construct their own knowledge as they reflect upon existing schemas. In designing productive LUR, it is essential to set clear goals and formulate objectives to drive the process. At this stage, critiquing existing knowledge, beliefs, biases, assumptions, and misconceptions concerning the topic is vital for progress. This can be achieved through the use of credible resources with updated information to verify facts. Furthermore, to implement these, one must create a manageable guide that outlines which tasks and skills are to be acquired. This is in line with Talerngsri's (2014) proposal that LUR begins with a learning phase that involves the acquisition of knowledge, skills, and strategies, allowing newly acquired knowledge to be assimilated and accommodated for daily use.
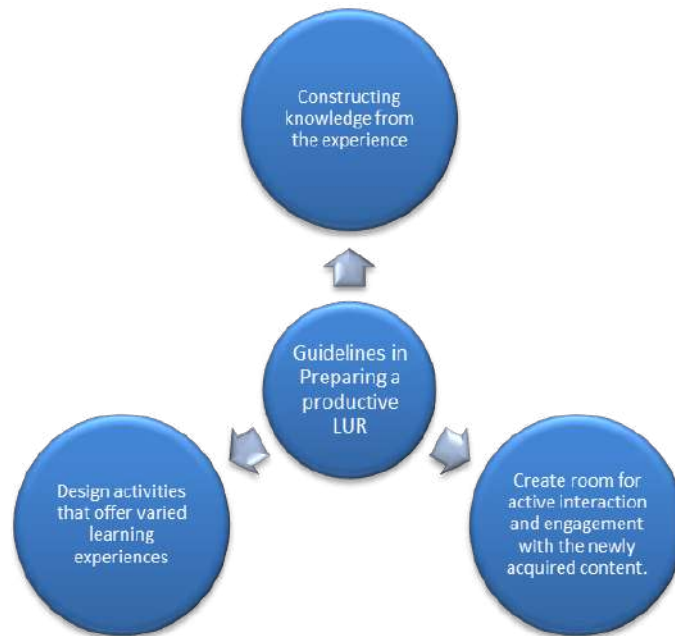
Figure 15.2: Guidelines in Preparing a Productive LUR

2. Create room for active interaction and engagement with the newly acquired content: Providing opportunities for interaction and engagement facilitates unlearning. It involves letting go of old, obsolete knowledge, skills, and attitudes. According to Rozzetti (2023), this process demands an objective critique of acquired knowledge and an evaluation of it against emerging beliefs and assumptions to ensure relevance to current ideas. To achieve this, space must be created for active involvement through activities such as summarising and note-taking, communication, collaboration, and the use of technology. Participation in such activities diversifies one's ideas, expands understanding, and challenges existing beliefs. At this point, it is important to have activities that allow for personal assessment and reflection on learning progress and understanding of new concepts. These can involve critical thinking, problem-solving, creativity, and innovation to aid in identifying gaps, questioning, analysing, and making necessary adjustments. Furthermore, feedback from mentors, facilitators, and peers can significantly enhance valued perspectives and contexts essential for improving learning progress. According to Macleod et al. (2020), "… the unlearning process is both influenced by the individual's private world, their personality, beliefs, and experiences, and by their professional context and its nuances" (p. 193).

Source: Etraing (2024) A portrait of old people embracing technology

To successfully undergo unlearning, McLeod et al. (2020) proposed five critical principles:

i.   **Anticipating the discomfit of disruption:** The process of disintegrating what is already held involves some physical and emotional struggle. The individual must be prepared to anticipate the physical and emotional reactions that may accompany the unlearning of deeply held knowledge and skills.

ii. **Making small acts towards contexts that matter.** It is important to acknowledge settings that matter but are outside the area of interest in a collaborative context. While these may provide a wide range of learning opportunities, the illustrations and comparisons used in such settings can become vital sources of reflection, insight, and fresh understanding. Consequently, they may contribute to a better comprehension of the idea when it is finally presented.

iii. **Shifting attention to unlearning encounters:** This belief posits that in a collaborative setting, the environment and materials presented are relationally co-constructed to create opportunities for individuals to experience unlearning encounters. Engagement with varied reflective activities in a collaborative context, for instance, evokes a new and uncomfortable reconfiguration of what it means to 'practice' collaboration. In this process, unlearning begins as an act of balancing between experts and novices.

iv. **Attuning to the potential of the new.** This principle requires individuals to be transformed in ways that enable further collaboration, resulting in the awakening of practice. According to Macleod et al., this is similar to unlearning, as unlearning unfolds within awakening practice, leading to ecological and sustainable growth, as evidenced in professional identities.

v.   **Accepting the ongoing mix of un/learning.** In this principle, the 'unlearner' adapts to the ongoing process of combining learning and unlearning to accommodate new ideas. This may require blending some familiar notions with incoming ones to facilitate acceptance, as stated by McLeod et al. (2020).

The production of an effective LUR thus requires an environment that allows for interaction with the knowledge, including asking and answering questions, critiquing the applicability and significance of the knowledge to the context, weighing the new knowledge against existing interests, and ultimately letting go of previously held beliefs, which results in unlearning.

3. Constructing knowledge from the experience: This step allows for relearning and involves incorporating what has been acquired from the unlearning process. Klein (2008) explains that relearning encompasses embracing new and emerging skills that can be utilised to more proficiently address 21st-century problems through active learning processes.

In the preparation for the LUR process, creating opportunities for real-life application of newly learned knowledge aids in reinforcing and developing practical skills. This requires adopting a growth mindset (Suntantro, 2014), which enables one to embrace challenges, accept failures as learning experiences, and focus on potential improvement and the creation of new skills. While demonstrating a growth mindset, a painting student's experience while using LUR included the following:

> "While the extreme immersion experience in relearning how to paint did not alter her entire approach to painting, she acknowledged that meshing these new ideas with her original concepts of painting would make her a different painter. In the marathon course, she had unlearned her deeply held ideas about how to see and paint, relearned these concepts as understood by her teacher, and in doing so, learned new strategies for painting" (Klein 2008, p. 79).

Even though the student acknowledged she would return to her painting work, she claimed that her new outlook would never be the same, stating, "… some of what I have absorbed in the last few weeks will now permeate everything I paint" (Klein 2008, p. 79).

At this stage of LUR, staying motivated is critical. One must, therefore, be resilient and persistent, focusing attention on the rewards of LUR to remain on course. It is important to celebrate any small achievements and progress as motivation.

The LUR methodology employs active learning techniques, which are discussed in other chapters of this book, that facilitate the development of competencies and skills for the 21st century.

15.6 Advantages and disadvantages of LRU

The LUR has the advantage of engaging more critical thinking skills and encourages individuals to continuously analyse, appraise, and test knowledge to ensure its relevance and currency. Murray (2021) succinctly states: "our ability to unlearn and relearn comes down to neuroplasticity — the foundation of a growth mindset" (p. 2). Taylor and O'Reilly (2021)) further emphasises that unlearning is vital for continuous performance, as it enables teams to collaborate effectively and build a shared future. In companies, it fosters innovation and helps them stay ahead of the curve.

Suresh (2023) adds the following advantages:
- It allows for the expansion of individuals' horizons and innovativeness, subsequently creating room for more prospects and opportunities.
- It enhances one's adaptability to changing circumstances due to its dynamic nature, leading to personal growth and the relevance of knowledge.
- It enables the development of skills and abilities for the achievement of success, ensuring forward movement towards goal attainment.
- It improves a person's problem-solving skills as a result of the continued relearning and unlearning of relevant skills and knowledge
- It improves critical thinking, as the process of unlearning requires evaluating information, critiquing assumptions, and confirming decisions against logical reasoning.
- It instills resilience in learners, enabling them to counter problems and difficulties, making them sharper, more relevant, and time-wise.
- It develops and improves one's communication skills, leadership, management abilities, negotiation, persuasion, and influence.
- Personal Growth: LUR, as a lifelong process, stimulates personal growth and self-improvement. It expands knowledge, broadens perspectives, and enhances overall intellectual and emotional well-being.
- Enhances professional development: The new skills and knowledge acquired enable one to remain updated and relevant, thereby improving their career paths.
- It can be inculcated through imitation and modelling of personal proficiencies and observations of others who have undergone similar transitions.

The disadvantages of LUR include:

- Discarding obsolete knowledge can be difficult due to attachment.
- Learning Unlearning and Relearning (LUR) requires engagement with various resources, attending classes, or seeking out mentors, which can be time and energy-consuming.
- Inadequate resources may prevent many disadvantaged individuals from embracing new ideas.
- LUR can be challenging due to personal resistance. Attachment to old knowledge, habits, and beliefs may hinder progress
- Given the fast-paced nature of the world and technology, keeping up with LUR can be overwhelming, leading to stress and burnout.
- Without caution, there is a risk of using unreliable information that may mislead, compromising the goal of being well-informed
- This may result from the realisation that previously held beliefs or knowledge were incorrect, or from a fear of failure among learners due to uncertainty about success with the new knowledge.

15.7 Techniques in effective LRU

Learning, unlearning, and relearning strategies are essential for adapting to new information, changing circumstances, and evolving knowledge. Here are some techniques that can be helpful in these processes:

- **Self-directed learning:** Take ownership of your learning by setting goals, developing learning plans, and seeking out resources and opportunities for growth. This can involve reading books, taking online courses, attending workshops, or participating in relevant communities or forums. Similarly, engage in regular self-reflection on your learning, unlearning, and relearning experiences. This involves analysing your thoughts, actions, and assumptions to identify areas for improvement and growth. Continuously updating your knowledge and skills must go hand in hand with regular practice. This is the best way to ensure you retain information and improve proficiency.

- **Commit to lifelong learning and cultivate growth mindset:** A growth mindset will enable the learner to become aware of their existing beliefs, biases, and mental schemas. This awareness will help them recognise when unlearning and relearning are necessary, allowing them to approach new information with an open mind. Continuous learning supports the LUR approach, encouraging learners to consistently seek new knowledge and update their understanding of various subjects.
- **Critical thinking and questioning:** Develop a habit of asking critical questions to challenge your existing knowledge and assumptions. This involves questioning the validity of information, seeking alternative perspectives, and exploring different possibilities. LUR as a technique requires learners to pay deliberate attention to the unlearning process by critically analysing new content and the competencies needed to accomplish new tasks (Klein 2008). Likewise, challenging existing ideas will create space for information that does not fit into existing mental schemas, as one reconceives old knowledge in the context of new information.
- **Collaborative learning and seeking diverse perspectives:** Engage in collaborative learning experiences where you can learn from others and share your knowledge and experiences. This can involve participating in group discussions with individuals from different backgrounds, reading diverse literature, engaging in cross-cultural experiences, joining study groups, or contributing to collaborative projects. The learner should actively seek out diverse viewpoints and perspectives to broaden their understanding and challenge their existing beliefs.
- **Discovery learning and experimentation:** Embrace curiosity and experimentation as a means to test new ideas, strategies, and approaches. Seek feedback from others to gain insights and make necessary adjustments in your learning and unlearning processes.
- **Embracing discomfort:** Recognise that unlearning and relearning can be uncomfortable and challenging. Embrace this discomfort as a sign of growth, and push yourself to step out of your comfort zone to expand your knowledge and perspectives.

15.8 Dos and don'ts in LRU

When approaching learning, unlearning, and relearning, it is important to keep in mind certain dos and don'ts to ensure an effective and productive process. Here are some guidelines to consider:

The Dos in LUR:
- **Cultivate an open mindset:** Approach the learning process with an open mind, willing to consider new ideas, perspectives, and information that may challenge your existing beliefs or knowledge. A growth mindset supports LUR through the development of learners' curiosity and experimentation with a variety of new learning resources.
- **Actively engage in questioning:** Inquisitiveness and seeking clarification enliven learners' discussions and thinking processes (Maryville University, 2023). Essentially, it unearths new information and expands an individual's perspective, which helps deepen learning. Ask questions to enhance your understanding and challenge assumptions.
- **Seek diverse perspectives:** Seek out diverse viewpoints and perspectives to broaden your understanding. Engage in discussions with individuals from different backgrounds and cultures to gain new insights.
- **Self- reflection and self-assessment:** Engage in regular reflection on your learning progress and conduct a self-assessment of your understanding and skills. Identify areas requiring improvement and establish goals for further development.
- **Continually practice:** Encourage learners to apply what they have learned and put it into practice. Take action to reinforce your learning and gain practical experience.
- **Embrace discomfort:** Accept challenges with a flexible and open mind. Recognise that the learning process can be uncomfortable, especially when it involves unlearning and relearning. Embrace this discomfort as a sign of growth, and push yourself to step out of your comfort zone.
- **Seek feedback:** Seek feedback from others, such as mentors, peers, or instructors, to gain diverse perspectives and insights. Use this feedback to make necessary adjustments and improvements.

The Don'ts in LUR

Das (2020) postulates that unlearning can be hindered by certain don'ts outlined herein. These include:

- **Don't be resistant to change:** Avoid being resistant to change or clinging to outdated or incorrect information. Don't hold onto self-limiting beliefs that deter you from pursuing the unfamiliar. Embrace the need for unlearning and be open to new ways of thinking and doing.
- **Don't be afraid of failure:** Learning, unlearning, and relearning can be challenging, so teachers should create

learning environments where students can make mistakes, learn from them, and grow without the fear of failure. Students should be persistent and embrace failure as a normal part of the learning process.

- **Don't rush the process:** Be patient and persistent in your pursuit of knowledge and growth. Learning, unlearning, and relearning require time and effort. Avoid rushing the process or expecting immediate results.
- **Don't rely solely on one source:** Refrain from relying exclusively on a single source of information or perspective. It is essential to consult multiple sources, consider diverse viewpoints, and utilise credible resources to acquire a comprehensive understanding. Furthermore, it is advisable to avoid restricting oneself to interactions with like-minded individuals, as this may hinder the process of unlearning.
- **Don't fear making mistakes:** Mistakes are an inherent aspect of the learning process. Individuals should not fear making errors or being incorrect. Rather, such experiences should be perceived as opportunities for personal growth and intellectual development.
- **Don't isolate yourself:** Avoid working alone; instead, collaborate with other teams or communities of practice to receive continued support in achieving your goals. Do not isolate yourself during the learning process. Engage with others, participate in discussions, and seek support from mentors or peers. Collaboration and interaction can significantly enhance your learning experience.
- **Don't be afraid to unlearn:** Unlearning can present significant challenges, as it necessitates the relinquishment of previously held beliefs or knowledge. Individuals should not hesitate to engage in the process of unlearning and to critically examine their own assumptions. Embracing this process can serve as a substantial avenue for personal growth and improvement.

15.9 Case Studies in LRU Learning

The following informal learning context represent a case of LUR.

Case Study 1

Son: Mum what is the spelling of the word receive?
Mum: Is it "receive or recieve?" as the mother gazes into the air
Daughter: Mum what is troubling you?
Mum: I am trying to recall the spelling of the word "recieve". The daughter quickly types the word in a word document and through the spelling check quickly confirms the correct spelling of the word "receive" to the mother. The mother is impressed by the speed and ease with which the answer is obtained. She requests the daughter to show her how she went about this and henceforth uses a word document to compile her reports.

It is significant to note that the entire process of LUR is dependent on reevaluating stances and weighing their suitability (Ohiri, 2023). The mother was able to embrace technology as it helped to solve the problem they were confronted with in a shorter and more relaxed way. This reaffirmed McLeod et al. (2020)'s assertion that LUR, as a strategy, brings about a transformational role by deconstructing and interfering with the individual and the work environment norms that instigate growth and the uptake of new approaches (McLeod et al., 2020). Therefore, the daughter was able, through the application of the computer, to help the mother discard old thinking and embrace the use of modern technology.

Case Study 2

Evaluation of the Case Study on Personalized Language Learning and Educational Technology (Maheswara & Rifai, 2023)

The study used LUR as a technique to aid University Language students in moving from conventional pedagogy to embracing Personalized Language Learning (PLL). The success of PLL can be attributed to the flexibility allowed in assignment submission and the pace at which individual students completed the course. In this context, the course facilitators acted as mentors and coaches, customising technology and teaching to suit each student. Additionally, the availability of varied technological tools, websites, and resources improved students' networking and interaction, enabling them to select what, when, and how they wanted to learn.

It is worth noting that not all students were able to fully embrace PLL. This was attributed to a number of reasons. For some, its individualised nature acted as a demotivating factor, while others held the belief that conventional methods are the best for learning due to the anticipated success at the end of semester examinations. Additionally, some students experienced mistrust in the communications received from lecturers or lacked confidence in using technology.

15.10 Conclusion

Embracing LRU in the education sector yields better teaching and learning and may help both teachers and learners stay current and conversant with the latest innovations relevant to the 21st century. LRU is the most appropriate tool for advancing individuals to the next level, given that its dynamism suits the fast pace of the 21st century. All that is needed is for one to accept and embrace LRU as the vehicle for competing in this dynamic world.

15.11 Reflective Questions

1. Explain the key concepts used in the LUR.
2. What are the guiding principles for preparing a productive LUR?
3. What are the advantages and disadvantages of LUR?
4. Describe at least six techniques for an effective LUR.
5. What are the Dos and don'ts in LUR?

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Chapter 16: Exemplification Learning in the Classroom

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16.1. Concept Map

16.2 Learning Outcomes

After studying this chapter, you should be able to:
- Recognise the prospects of exemplification learning as a hands-on approach in higher education and training.
- Determine the critical theoretical and real-world evidence supporting exemplification learning, and discuss its experiential applications and future directions.
- Identify the benefits and limitations of exemplification learning, as well as the challenges and opportunities for its implementation in various contexts within higher education and training.
- Explore the effectiveness of tangible examples in learning, and make recommendations for future research and practice in higher education and training.

16.4 Introduction to Exemplification Learning

(i) Introduction

Exemplification learning is an educational approach that highlights the study of specific examples or cases rather than applying general principles or rules (Morgan, 2019). Recently, this approach has gained significant recognition as a powerful tool for improving learning outcomes, especially in complex or abstract domains within higher education and training. In exemplification learning, students are provided with examples of what is being taught to help them understand abstract concepts or ideas described in the lesson. This learning approach has been applied in various educational contexts, from blended learning to classroom dialogue. It is highly effective in enhancing the demonstration of lesson objectives, thereby strengthening student learning outcomes. This chapter discusses the theoretical foundations of this learning approach and provides examples of its application in various classroom settings. This includes the learning outcomes, exemplification of learning in the classroom, preparing a productive exemplification of learning, and the techniques of effective exemplification learning, as well as some case studies on exemplification learning (Chiva-Bartoll & Fernández-Rio, 2022). Additionally, it explores the potential of exemplification learning in improving learning outcomes, focusing on its practical applications and future directions.

The chapter is based on the teachings and practical experiences of the authors, alongside a review of relevant literature on the theoretical foundations of exemplification learning in higher education and training, including both theoretical and empirical research. It also draws on case studies and examples of successful implementation of exemplification learning in the broader natural sciences and Economic and Management Sciences classrooms.

(i) Theoretical foundations

Exemplification learning is rooted in cognitive psychology and learning theory. This theory focuses on cognition, which includes all conscious and unconscious processes by which knowledge is gained, such as perception, memory, attention, and problem-solving (Barkay, 2017). Jean Piaget is acclaimed for developing the first cognitive psychology theories in the 1930s. One of the principles of this theory is that when information is presented in abstract form, it dramatically affects students' cognitive ability to process and retain that information. Therefore, any teaching strategy that offers less abstract information will significantly help to improve students' learning. This means that using specific examples, as conceived in exemplification learning, to illustrate abstract concepts can strengthen students' cognitive abilities. This can be attributed to the concrete and realistic mental images that examples can present, as well as their ability to facilitate the transcription and retrieval of information during learning.

Furthermore, exemplification learning proposes that students are more likely to transfer what they have learned to new situations if they have been consistently exposed to multiple views illustrated by examples of the same concept or idea (Barkay, 2017). Introducing numerous examples can enable students to develop a more reliable and flexible mental interpretation of the concept, which they can apply to different contexts and situations to enhance their learning.

16.5 Exemplification of Learning in Classrooms

Gone are the days when teachers entered the classroom intending to use traditional teaching methods, such as rote memorisation, and expecting desirable outcomes and lifelong knowledge from students. Teaching in the 21st century requires educators to go the extra mile to acquire knowledge that fits into today's education system, applying relevant examples to explain topics in a way that students will understand. Exemplification in learning environments today should be considered paramount for sustaining effective education. According to Ramos-Rodríguez et al. (2017), using examples in the classroom has been proven to be particularly beneficial for students classified as "slow learners" or those who struggle to engage in their respective classrooms. In this chapter, exemplifying learning in the higher education and training sector refers to the ability to use trending, simple, and appropriate examples connected to the topics, which aids in explaining issues or concepts to the best of the instructor's knowledge, thereby helping students acquire an in-depth understanding. Another aspect that instructors need to consider regarding the use of examples is their relevance to real-world situations and how they fit into the topics being taught (Barkay, 2017).

Oliveira and Brown (2016) have criticised the long hours spent teaching 'theory' without infusing the practical aspects of the topic or concept under discussion. For instance, based on observations, I have heard students complain about sitting for two hours listening to lectures without being actively involved. Consequently, they become uninterested and develop the tendency to skip classes. The good news about exemplification in learning is that it can be applied to any subject, regardless of the topic. The following paragraphs discuss how exemplification could be used across various research fields, domains, or subject content.

Quantitative analysis: Students can employ exemplification learning techniques to analyse quantitative informational material, including data derived from experiments, observations, or simulations. This approach can enhance students' comprehension of the underlying patterns and relationships within the data and assist them in cultivating critical thinking skills, logical reasoning abilities, and evaluative thinking capabilities.
Designing representations: Exemplification learning can be used to create models that mimic natural phenomena, such as climate or environmental systems. This approach can help students understand complex natural systems and how they interact with one another.

Significance testing: Students can use exemplification learning to test hypotheses by investigating and adapting data to determine whether it supports or contradicts a particular theory being examined. This approach can help students understand the procedure and develop their reasoning skills.

Problem-solving: Exemplification of learning can be applied to solve practical problems in various contexts. For instance, in the natural sciences, it can be used to project the spread of a disease or to develop new materials with distinct characteristics. In the social sciences, problem-solving can help explain contemporary social issues such as unemployment, HIV/AIDS, and rape. Moreover, problem-solving can assist students in developing skills and learning how to apply knowledge to resolve real-world problems.

Visual aids: Students can use exemplification of learning to create visualisations of scientific and non-scientific data, such as maps or graphs, which help them understand and communicate scientific concepts to others.

16.6 Preparing a productive exemplification of learning lesson.

In this section, we discuss the preparation for a productive exemplification of learning lessons in higher education, including subjects such as Natural Science, Economic and Management Sciences, or any other classroom setting. This process will involve, but not be limited to, the following steps:

Define the learning objectives: The instructor should define the learning objectives that exemplification of learning can help achieve in the classroom. This may include developing logical reasoning abilities, improving problem-solving skills, and enhancing scientific literacy in the context of commercially oriented or industry-specific problems.

Determine the correct information: Select information relevant to the learning objectives and curriculum in the natural sciences, economic and management sciences, or any other learning area you are facilitating. This may include information from real-world scenarios, such as environmental conservation, ecological restoration, market analysis, and human resource management.

Preprocess and generate visual information: Preprocess and visualise the information to help students understand its underlying patterns and relationships in the context of real-world problems. This may involve techniques such as visualisation using tools like Excel.

Develop exemplification of learning activities: Design exemplifies learning activities that engage students and help them acquire relevant concepts and skills. This may involve visual information processing, model building, and model interpretation, where students utilise exemplification techniques to explore and understand the information and its implications for decision-making.

Provide guidance and feedback: Provide advice and feedback to students as they work through exemplifying learning activities. This may involve one-on-one support, peer-to-peer collaboration, and instructor feedback, allowing students to learn from their mistakes and improve their skills.

Evaluate student learning: Evaluate student learning using appropriate assessment methods that measure their ability to demonstrate the learning objectives. The evaluation of student learning may involve project-based assessments, case studies, or written assignments, which allow students to showcase their understanding of learning concepts and skills in real-world problem-solving.

16.7 Advantages and disadvantages of exemplification learning

(i) Advantages

Improved understanding: Exemplification of learning uses concrete examples, real-world scenarios, and case studies to help students understand complex or abstract concepts better. Students can more easily see how the concept applies to different situations and contexts by providing specific instances of how an idea works in practice (Oliveira & Brown, 2016).

Improved memory: Exemplification of learning can improve the retention of information by providing memorable and engaging examples that students can connect with. By creating more meaningful and precise mental representations of information, students are more likely to remember what they have learnt.

Increased motivation: Exemplifying learning can increase students' motivation by making it more exciting and engaging. When students see how a concept applies to real-world situations, they are more likely to feel motivated to learn more about it.

Improved problem-solving skills: Exemplification learning can help students develop better problem-solving skills by exposing them to various examples and case studies that require different problem-solving approaches. Students can create more flexible and creative problem-solving strategies by practising with multiple examples.

Improved knowledge transfer: Exemplification of learning can improve the transfer of knowledge and skills to new situations by providing students with examples and demonstrating the application of concepts in different contexts. By seeing how an idea works in different situations, students can better understand how to apply the concept in new and unfamiliar contexts.

(ii) Disadvantages

Restricted perspective: Exemplification learning is most effective when clear and relevant examples are used to illustrate concepts. However, in some instances, relevant examples or cases may not be available, which can limit the effectiveness of this approach.

Demanding in terms of time: Creating and analysing examples and cases can be time-consuming compared to traditional instructional approaches, such as lectures or readings. This can be disadvantageous for instructors who are working within a limited time frame or have restricted resources for lesson planning and preparation.

Relying too heavily on cases: Exemplification learning can lead to an overreliance on specific examples or cases, which may not accurately represent a concept's broader context, perspective, or complexity. This reliance can limit students' ability to apply concepts in new and unfamiliar situations.

Incorrect understanding of cases: Students may need to be more precise and comprehend the examples provided, depending on the depth of the concept being taught. This can result in an incorrect or incomplete understanding of the concept.

Difficulty in drawing general conclusions: Exemplification of learning may not lead to generalising concepts beyond the specific examples provided due to the limited ability to extend findings. Therefore, students may struggle to apply concepts to new situations that do not closely resemble the examples given.

16.8 Techniques in Effective Exemplification of Learning

- **Define the area of knowledge or skill to be taught:** The first step in effectively exemplifying a topic is identifying the concept or skill that students need to learn. This may be a new concept or a skill that students have already been introduced to but require further clarification on.

- **Decide on relevant and captivating sample scenarios:** Once the concept or skill has been identified, choose suitable and engaging scenarios to help students understand and remember the idea being studied. The criteria for selecting a relevant scenario should include enjoyment and memorability, as well as the ability to demonstrate the critical aspects of the concept or skill being taught.
- **Assess and break the examples into components:** After selecting the desired topic, analyse it into its parts. Identify the specific features or characteristics that make the examples relevant to the concept or skill being taught, and explain how these features relate to the overall concept or skill.
- **Provide instruction and offer constructive feedback:** As students work through the examples, the facilitator or lecturer is responsible for providing guidance and constructive feedback to help them understand the critical aspects of the concept or skill being taught. Offer explanations and clarifications as needed, and encourage students to ask questions and share their understanding of the examples.
- **Advocate for the practical use and broader integration of information:** Once students have worked through the examples, the facilitator or lecturer should encourage them to apply the concept or skill to new situations and contexts. Additional examples or scenarios should be provided that require students to use the concept or skill in unfamiliar ways, with guidance and feedback offered as needed.
- **Evaluate and ascertain the effectiveness of learning:** Finally, evaluating and assessing students on the learning outcomes of exemplification learning is essential. Therefore, using assessment methods such as quizzes, tests, or real-world application tasks will help determine the effectiveness of this approach in promoting learning and skills development.

By following these steps, facilitators and lecturers can implement effective exemplification of learning that engages students, promotes understanding and retention, and supports the transfer and application of concepts and skills to new situations and contexts.

16.9 Dos and Don'ts in Exemplification Learning

The following outlines what can and cannot be achieved through the exemplification of classroom learning.

i. Dos of Exemplification Learning

Examine and evaluate the outcomes of the learning process: Use real-life scenarios and case studies to illustrate concepts and theories. Relate theoretical knowledge to practical applications in the world, demonstrating how these concepts are applied in real organisations.

Stimulate thoughtful inquiry: Prompt students to analyse and evaluate the examples provided during the lesson. Encourage them to consider multiple interpretations, identify cause-and-effect relationships, and make connections between the exemplars and the underlying principles.

Cultivate engaged involvement: Engage students in discussions and activities that require them to actively apply the concepts learned. Encourage them to share their own experiences or observations related to the topic, fostering a collaborative and interactive learning environment.

Make use of current developments: Stay updated with current news and events, using relevant examples to demonstrate the application of concepts in real-time situations. This approach helps students understand the dynamic nature of the world and how theories and practices evolve.

Incorporate examples from various sources: Utilise various examples from different cases. This exposes students to contexts that may apply to a familiar case and allows them to understand the universality of certain principles while appreciating the unique challenges specific to each case.

Incorporate tangible and visually stimulating illustrations: Utilising tangible objects, visual aids, and interactive simulations to illustrate scientific concepts, along with hands-on experiments and demonstrations, can help students observe phenomena directly and reinforce their understanding of abstract ideas.
Transfer theoretical knowledge to practical applications: Relate scientific concepts to everyday life and practical applications by highlighting how scientific principles operate in the natural world, technology, medicine, and environmental issues. This approach helps students appreciate the relevance and significance of scientific knowledge.

Simulate curiosity-driven learning: Foster curiosity and critical thinking by posing questions and problems that prompt students to investigate and find solutions. Encourage them to explore scientific phenomena, gather evidence, analyse data, and draw conclusions. This active engagement enhances their skills in scientific inquiry. Encourage collaborative educational practices: Promote group discussions, laboratory work, and project-based activities that encourage students to collaborate in exploring scientific concepts and solving problems. Collaboration enhances their communication skills, teamwork, and ability to share and analyse data collectively.

Highlight the most recent developments in scientific research: Introduce recent discoveries and ongoing research in relevant fields. Share up-to-date information, news articles, or scientific publications to familiarise students with the dynamic and evolving nature of scientific knowledge.

ii. Don'ts of Exemplification Learning

Avoid making excessive generalisations based on isolated cases: Avoid using examples that oversimplify or generalise complex situations too broadly. Ensure that the frameworks capture the distinctions and complexities of real-life scenarios to help students develop a deeper understanding.

Don't limit yourself to textbook illustrations: While textbooks can provide a good foundation, it's important to avoid relying solely on their examples. Supplementing them with real-world cases can bridge the gap between theory and practice, offering students a more comprehensive learning experience.

Don't overlook ethical principles: Ensure that ethical concerns are adequately addressed when providing examples. Avoid using examples that promote unethical behaviour or disregard social and environmental responsibilities. Instead, emphasise ethical decision-making and responsible practices.

Avoid using misleading or incorrect illustrations: Ensure that the examples used are scientifically accurate and supported by evidence. Avoid perpetuating common misconceptions or using outdated information that could mislead students.

Don't overlook safety concerns: When conducting experiments or providing examples that involve practical work, prioritise student safety. Follow proper safety protocols, provide clear instructions, and ensure that students are aware of potential risks and necessary precautions.

Concentrate on a particular subject matter for illustration: While focusing on specific scientific disciplines may be necessary, pay attention to the interdisciplinary nature of sciences. Incorporate examples that bridge multiple scientific disciplines to help students understand the interconnectedness of scientific knowledge.

16.10 Case Studies in Exemplification Learning

The following are case studies involving the exemplification of learning:

Case Study A: Applying Advertising Strategies in the Real Estate Industry
In a marketing-focused course, the instructor introduces a case study that examines the application of advertising strategies within the real estate sector. The students are organised into groups and provided with a real-world scenario in which they assume the role of marketing consultants for a real estate agency named Tintin & Gloria (Pty) Ltd. Their task is to develop a comprehensive advertising plan to promote a new housing development. The students analyse the target market, conduct market research, and apply marketing concepts such as product, price, place, and promotion to formulate a strategic marketing plan. They present their projects to the class, which include strategies for digital marketing, social media engagement, and traditional advertising. Through this case study, students acquire practical insights into the application of advertising and marketing principles in a specific industry (real estate), thereby enhancing their analytical skills and understanding of marketing strategies within a real-world context.

Case study B: Exemplification of learning through a field study of an ecosystem.
In an ecology course, the educator utilises exemplification of learning through a field study focused on ecological interactions and biodiversity within an ecosystem. Students participate in a visit to a local nature reserve to observe and gather data regarding various ecological factors. They examine plant and animal species, measure abiotic factors such as temperature, humidity, and soil composition, and analyse the relationships between organisms (biotic factors) and their environment. Within the classroom setting, students collaborate to interpret the collected data, identify patterns,

and construct ecological models to elucidate the observed interactions within the ecosystem. Through this case study, students acquire practical experience in environmental fieldwork, develop skills in data collection and analysis, and enhance their understanding of the interconnectedness and complexity of ecosystems. Additionally, the case study fosters an appreciation for the significance of biodiversity and the effects of human activities on ecosystems, thereby reinforcing the relevance of ecological concepts in real-world contexts.

16.11 Conclusion

Exemplification of learning has the potential to transform higher education and training by equipping students with effective tools for utilising examples to acquire knowledge and skills in complex and abstract domains. This book chapter examines the exemplification of learning in relation to its theoretical foundations, as well as its benefits, advantages, disadvantages, strategies for implementation, and associated challenges and concerns. Case studies illustrating successful implementation of exemplification of learning are also presented. Moreover, the exemplification of learning offers insights into the application of examples to render abstract concepts more meaningful and relatable, as well as how knowledge acquired in one domain can be transferred to analogous or familiar contexts in other domains. This chapter aims to contribute to the ongoing discourse regarding the significance of practical learning approaches and their role in shaping the future of higher education and training by elucidating both the benefits and challenges inherent in these methodologies.

Reflective Questions

a. What is your current understanding of the term "exemplification of learning"? Has this chapter challenged or confirmed your previous assumptions regarding the hands-on approach to exemplification of learning?
b. Can you think of specific examples from your learning experiences where using concrete examples or cases improved your understanding and/or memorisation of information? How will you apply this approach in future learning situations?
c. What do you think are some potential limitations or drawbacks of this learning approach? What further questions or areas of inquiry does this chapter raise for you?
d. How do you intend to address these limitations in your future learning regarding the question in (c) above?

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This chapter presents the crucial roles played by educators in developing desired values and attitudes alongside the content knowledge they are tasked with imparting in their classrooms. Educators are often not fully aware of how their behaviour, which is always on display and visible to students, impacts the development of desired behaviour patterns. The cultivation of positive behaviour in students is essential for harmonious human co-existence and serves as a powerful tool in building fully functioning societies. The chapter explores the relationship between effective educator role modelling and its impact on students' academic performance, social skills, and overall personal growth, while acknowledging that societal values in the 21st century are influenced and shaped by culture, technology, and socio-economic factors. The chapter aims to provide educators with an understanding of how role modelling and exemplification learning can be used as powerful strategies for shaping students' knowledge, skills, values, and attitudes, ultimately helping them become responsible, empathetic, and well-rounded individuals.

17.1 Learning Outcomes

- After studying the Chapter, one should be able to
- Explain role modelling as a strategy.
- Understand the use of role modelling in the classroom.
- Discuss how to prepare a role-modelling learning strategy.
- State the advantages and disadvantages of exemplification learning.
- Identify the techniques of ineffective exemplification of learning.
- List the dos and don'ts in exemplification of learning.

17.2 Clarification of key terms

- Role modelling and exemplification learning are powerful educational and behavioural concepts that involve observing and emulating the actions, behaviours, and qualities of others to acquire knowledge, skills, and values.
- Role modelling refers to the process of individuals imitating or adopting the behaviours, values, and attitudes of role models who serve as examples.

- Exemplification learning involves providing concrete examples, models, or prototypes to convey abstract concepts or ideas.
- Role models can employ exemplification techniques to convey their values and behaviours more effectively.

17.3 Introduction to Role modelling as a learning strategy

Role modelling is a highly effective learning strategy that involves observing and emulating the behaviour, actions, and attributes of individuals who serve as role models. These role models can be people who excel in a particular field, possess admirable qualities, or have achieved success in areas of interest. This learning approach is based on the premise that we can learn valuable lessons and acquire new skills by studying the actions and attitudes of those we admire.

Role modelling relies on the power of observation. By closely observing the actions and behaviours of a role model, students can gain insights into how to approach challenges, make decisions, and navigate various situations. Role modelling is not limited to the development of character traits or values; it can also be applied to skill development. Observing and imitating the actions of an expert can help students acquire new skills more effectively. The educational value of observing and imitating is a primary way to train individuals in skills-based professions, such as nursing, education, and engineering, to name just a few.

17.4 Role modelling in classrooms

Role modelling is a powerful classroom strategy where a teacher, through their actions, behaviours, and reasoning, serves as an example for students to emulate. The teacher demonstrates the expected values, skills, attitudes, and ways of thinking that students are encouraged to adopt. Modelling helps students acquire various skills that are often more beneficial than verbal and physical activities. In a classroom setting, role modelling can be defined as an activity that communicates to students vital information, enabling them to see what they should be learning by observing how the teacher presents themselves. Humans, by their very nature, imitate what they see. One need only observe how a young child acquires behaviour patterns by watching those in their immediate environment. Unfortunately, children do not have inbuilt 'filters' to distinguish between 'good' and 'bad' behaviour patterns.

This is where teachers have a role to play. Students imitate what they see their teachers doing. Chowdhury (2016) states emphatically that good character comprises virtues that should be imitated. As students observe their parents and learn how to perform household chores, they also learn a great deal by observing the teacher during instruction. The practice of role modelling is especially effective when applied to young children who learn quickly through demonstration or observation. In this technological age, many teachers incorporate technological devices into their instruction to enhance the technological skills of students. Ungar and Baruch (2016) reported that teachers act as role models when they integrate technology into their teaching. This suggests that by imitating their teachers, students will be guided on how to use technology in learning.

Albert Bandura's social cognitive theory defines modelling as 'learning by observing others' (Bandura, 1997). Bandura explains that learning occurs through observation of others. He further elaborates on how children observe the actions of others, especially those who are competent, powerful, prestigious, or even celebrities, who influence their lives in various ways. They imitate their virtues and aspire to be like them in the future if they believe they can achieve their goals. Likewise, teachers should practise role modelling in the classroom for the future development of their students. The psychological processes underpinning effective modelling include attention, retention, production, and motivation (Bandura, 1997).

17.5 Preparing a productive role modelling learning environment.

Effective productive role modelling consists of attention, retention, production, and motivation. These elements are crucial for students to achieve their objectives. Since observation is the key factor in modelling, students should pay attention when observing. Therefore, teachers must ensure that any form of distraction is eradicated to create a conducive environment in the classroom, enabling students to focus on learning through observation. Students watch their teachers as they walk, talk, write, type, and speak, among other activities.

Secondly, when students pay attention to observational learning in the classroom, they can retain what they have seen. Teachers should direct students' attention to how they can retain what they have observed through verbal steps, visual images, and rehearsal or practice. The next step is production. Teachers should instil in students' minds that actual practice is vital for them to reproduce the virtues or behaviours they have learned, which will help them become experts. The use of reinforcement techniques, such as acknowledging and praising the desired behaviour, motivates students to practice the desired actions often. These steps can help students remember what they have learned. Reinforcement is a powerful strategy that can motivate students to learn. When students see others being positively reinforced, it can encourage them to do the same. Teachers should follow the steps in observational learning in classroom settings, which include:

- Directing students' attention to the actions they want them to observe.
- Fine-tuning already learned behaviour by telling the students the right action to imitate.
- Inhibit or shun bad action so that other students will not imitate it.
- Teaching new behaviours to the students that will be beneficial to them in future.

17.6 Advantages and disadvantages of exemplification learning

Exemplification learning is a learning paradigm that focuses on learning by examples or learning through examples. In this learning paradigm, the student is presented with examples and is expected, through a process of extracting, defining, and applying from the example, to perform several actions which could range from making decisions and predictions to solving problems. It is an educational technique that can be used to help students understand concepts, ideas, or skills that can only be made explicit through real-world applications and concrete scenarios. The use of this learning paradigm, as with all other approaches, has both advantages and disadvantages.

17.6.1 Advantages of Exemplification Learning

Exemplification learning, as a powerful tool, offers several advantages in educational settings. Primarily, because it makes use of real-life examples, it helps students attain a better understanding of abstract concepts. Students are often challenged with theoretical ideas without practical examples. In teacher training and education, where the aim is to induct pre-service teachers into the planning and presentation of a lesson, first-year students struggle to find synergy between and align identifying learning outcomes, learning activities, and assessment. By the time pre-service teachers exit after four years of training, they are required to demonstrate their ability to do all of the above while tapping into the child's prior knowledge, using teaching resources effectively and appropriately, and maintaining order in a class of 30 or more students. In this scenario, teacher educators not only model the desired competencies in their classrooms but also send pre-service teachers into school classrooms to learn from professional teachers.

Observing professional teachers integrate theory taught in university classrooms demonstrates the link with practice, making the theory come to life and 'stick' in the minds of pre-service teachers, which is crucial for long-term learning. At the same time, being present with a host teacher in a real-life classroom, dealing with potential problems, becomes a template for future solutions across different contexts. It offers the future practitioner the opportunity to reflect on their practice and interrogate their own beliefs that underpin their practice. The pre-service teacher takes away and incorporates from what is observed those aspects which appeal to their learning styles and personalities.

Exemplification learning helps students gain confidence in their ability to understand and apply abstract concepts when they see concrete examples of how those concepts work (consider the pre-service teacher not knowing how to, for example, introduce a lesson). The element of actively engaging with what is presented and/or observed in a teacher-training context provides opportunities for discussions and reflection on how to adapt what is learnt to future situations, which, according to Bloom's taxonomy (Stayanchi, 2017), is a higher-order cognitive exercise. Pre-service teachers are encouraged to gain experience in schools of their choice during the first two years of their training. This implies that they gain experience in environments where they feel comfortable and at 'home'. Watching their former teachers demonstrating the concepts they learn about in a language they understand is powerful in aiding comprehension while bridging linguistic divides that exist in university settings.

Exemplification learning is a versatile and effective teaching strategy that can improve comprehension, retention, and application of knowledge across various educational domains and levels..

17.6.2 Disadvantages of exemplification learning

As with any learning and teaching strategy, exemplification has some disadvantages. There is a risk that one may choose to model their own behaviour with examples that lack depth. The chosen example may aid in understanding the concepts but may not encompass every aspect that some concepts require. Imagine pre-service teachers who model their teaching style on that of someone whose fashion sense, vocabulary, and habits they admire, without fully grasping the person's underlying teaching philosophy. This is an example of modelling one's behaviour on surface-level aspects rather than the essence of teaching. Poorly chosen examples may lead to misunderstandings or misconceptions.

Some examples may also offer limited transferability across contexts. What works in one context may not work in another. This is especially true when one teaching approach succeeds in School A but not as well in School B, or even across two classes within the same school. Group dynamics play a significant role in human interaction, which accounts for success in one environment but not in another. Young, inexperienced teachers may become despondent and develop a narrow understanding if what they planned so meticulously is not successful in a particular context. Every failure offers an opportunity to learn if one engages actively and asks themselves, "Why did it not work?"

Some students are always looking for a 'how-to' template, thereby limiting their creativity. Teachers ought to carefully consider the educational impact of presenting students with examples first before asking them to develop their understanding of a concept. Students indeed vary in their comprehension of the examples presented to them. What makes sense to the teacher does not always resonate with the students. One should, therefore, always be prepared to offer additional examples and support to those who did not connect with or understand the example. In fast-paced learning environments, teachers often may not have the time to present multiple examples. The teacher is the subject-content expert and will know when examples alone are insufficient to generate the required understanding of complex concepts. It requires skilful teachers to know how and when to present theoretical background alongside examples.

17.7 Techniques in Effective Exemplification Learning

Choosing appropriate examples to illustrate difficult concepts is part of the skill set of experienced teachers. These teachers do not only know their content area well, but they are well versed in student dynamics such as learning styles and other factors which may or may not impact how well students can connect with the presented example. Teachers must select relevant examples. The selected examples must directly relate to the concept that is taught, as well as connect with the student's prior knowledge. Good examples are clear and directly support the learning objectives or outcomes the teacher attempts to achieve. Closely related to the issue of relevancy is the choice of a range of examples that caters to different learning styles and, at the same time, allows for a comprehensive understanding of the concept. The use of many different examples to illustrate the same concept enables students to have a broader understanding of the concept. If possible, teachers should incorporate real-time examples, which work well in all learning areas. In explaining concepts, whenever possible, incorporate current, real-time examples that link up with students' experiences and interests.

Another technique that is explained in more detail in Chapter 19 of this book is the use of visual images to illustrate an abstract concept. In a 21st-century classroom, teachers need to incorporate visuals like diagrams, images, or videos to complement the examples and provide a visual context for better understanding. The use of concrete and vivid imagery greatly adds to students' ability to remember the information beyond the classroom. The educational value of well-chosen examples increases when teachers can point to real-world applications of the concept. An example of this is when Year 4 teachers in a Mathematics class connect their lessons on 2-D and 3-D shapes to how this information becomes relevant and applicable in a real-life setting.

In language classrooms, storytelling works well in explaining difficult abstract concepts. Framing examples within a story setting and getting students to discuss and reflect with their peers to reach a common understanding taps into the benefits of peer collaborative learning. Stories have a charm of their own, which can captivate students' attention and help them grasp meaning. It is advisable to begin with simple, straightforward examples and gradually introduce more complex ones as students become more comfortable with the concept. Teachers should strive to set up interactive activities which require students to apply the concepts using the provided examples in peer and group settings. Working in peer and group settings opens a space for students to share their examples or experiences related to the concept under discussion. Such activities promote collaboration and provide students

with diverse views, which all enhance the learning experience. Teachers must remember to close the feedback loop by providing feedback on peer-shared examples and, most importantly, align assessment activities to the exemplified concept.

Therefore, using these techniques, educators can effectively harness the power of exemplification learning to create engaging and meaningful learning experiences for their students.

17. 8 Do's and don'ts in exemplification learning

If examples are to be used effectively to illustrate concepts which otherwise difficult to grasp, teachers must keep the following in mind:

Do's:
- Choose relevant examples which the students can easily relate to.
- Offer a variety of examples that cater to different student learning styles and perspectives.
- Use real-world situations which students can relate to.
- Start simple and progress to more complex examples.
- Choose examples that relate to students' prior knowledge.
- Incorporate visuals, diagrams, and other multimedia elements in lessons.
- Provide feedback on student-generated examples.
- Use examples to stimulate peer interaction and collaboration among students.

Don'ts
- Avoid using examples that are not closely related to the concept being taught. Students may get confused.
- Do not choose complex examples which are too difficult for students to understand. This calls for a keen understanding of students' level of cognitive development.
- Do not rely only on examples to get your point across. Supplement examples with information on theory to ensure that students fully understand the concept.
- Be careful not to use examples which may be biased or controversial. Teachers must not spread or maintain stereotypes or reinforce prejudices. Examples used in a classroom must always be respectful and inclusive of all students.
- Before using any example, teachers must check their facts and ensure that the chosen example is well-researched and that the information is accurate.
- The overuse of examples can also be counterproductive. Do not overwhelm students with too many examples. The aim is to go for well-chosen ones that adequately illustrate the content being taught.
- Do not ignore student feedback on the chosen examples. If the chosen example is too confusing, it is better to change one's approach or add another example.

The purpose of using exemplification learning as a technique is to enhance student learning. This can be achieved by selecting examples that contribute to creating meaningful and engaging learning experiences.

17.9 Case Study: Exemplification of learning

In the following short excerpt, the teacher provides students with examples that help them understand the concept of 'joint demand'. Pay careful attention to how the teacher chooses examples that the students are already familiar with.

Teacher: Do you recall what we said about joint demand, that when two commodities are demanded together to satisfy human wants?
Teacher: Can you think of two commodities that can be demanded together to satisfy a want?
Lucy: Tea and Milk
Teacher: Good. Another example?
Ambrose: Fuel and car
Teacher: Excellent!
Doris: Bread and butter
Teacher: What will happen if the price of one increases?

Felix: The price of the other one will also increase.
Teacher: Yes, the price of the other one will increase because the two of them will be jointly demanded to satisfy a want.

17.10 Conclusion

In this chapter, the educational merits of role modelling and exemplification learning are presented for teachers to consider as additional techniques to enhance student learning. The chapter aims to illustrate the relationship and effect of teachers' displayed behaviour patterns on student learning when using well-chosen, carefully designed examples to explain abstract concepts. In the section on role modelling, the impact of teacher behaviour on student learning is further explored. The aim is to create an awareness that teacher behaviour and practices in a classroom affect the attainment and mastery of learning objectives, whether the teacher is aware of it or not. The section on exemplification learning provides information on techniques and what to consider when using this strategy. It unpacks the advantages, disadvantages, techniques, and aspects for the reader's consideration. A short case study illustrates the use of the strategy in an Economics class. In conclusion, teachers and lecturers need to be aware of how the hidden curriculum—manifested in their own behaviour patterns and classroom practices—implicitly impacts what students take away from the educational environment.

17.11 Reflective questions

1. Explain role modelling as a strategy.
2. What are the uses of role modelling in the classroom?
3. Discuss how to prepare a role-modelling learning strategy.
4. State the advantages and disadvantages of exemplification learning.
5. Identify the technique's ineffective exemplification of learning.
6. List the dos and don'ts in exemplification of learning.

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Chapter 18: Interleaved Practice in Classrooms

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18.1. Concept Map

Interleaved practice is a teaching method that involves mixing or alternating between different types of problems or topics during a single study session. It is based on the idea that varied practice can enhance learning outcomes by challenging learners to recall information from previous sessions and apply different strategies or rules based on the problem at hand. This chapter aims to provide a guide for teachers (both preservice and in-service) at all levels of education on how to select and implement interleaved practice in their classrooms. Figure 1 illustrates the conceptualisation of interleaved practice in this chapter.
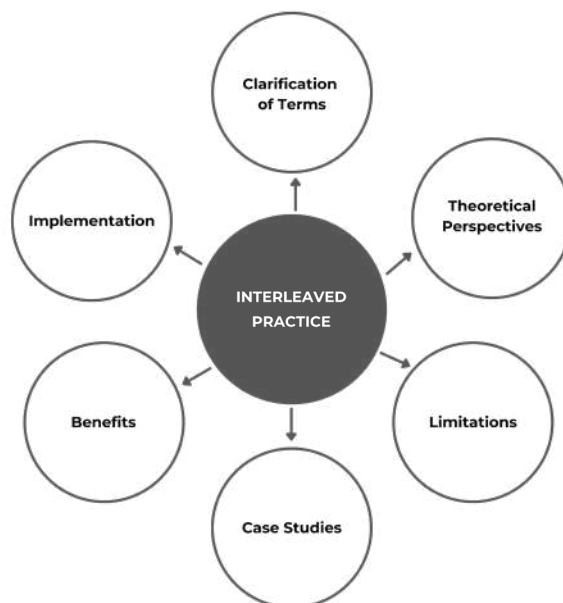
Figure 1. Chapter Map on Interleaved Practice in Classrooms

This chapter concludes by highlighting the importance, future directions, and emerging trends of interleaved practice in classrooms. It also provides reflective questions and references for further reading.

18.2 Learning Outcomes

- By the end of this chapter, readers should be able to:
- Define interleaved practice and differentiate it from blocked practice.
- Explain the theories that underpin interleaved practice in classrooms.
- Describe how to implement interleaved practice in a classroom setting.
- Identify the benefits of interleaved practice in classrooms.
- Understand the limitations of interleaved practice in classrooms.
- Apply interleaved practice in one's subject area of specialisation.
- Analyse case studies for successful implementations of interleaved practice.
- Discuss potential areas for further research and emerging trends.

These learning outcomes provide a roadmap for what the readers should know or be able to do by the end of the chapter.

18.3 Clarification of Key Terms: Blocked versus Interleaved Practice

Interleaved practice is a learning technique that involves mixing different topics or forms of practice, which can play a crucial role in developing holistic and adaptable learners in the 21st century. According to The Learning Agency Lab (2019), interleaved practice is the opposite of blocked practice, where students focus on one concept, one problem type, or one physical movement for a while. For example, after learning about the circumference of a circle, students would solve several problems on the same concept in blocked practice.

In contrast, interleaved practice involves cycling through multiple topics or subjects to learn each one. For example, students would solve problems on different concepts, such as volume, area, and perimeter, simultaneously in interleaved practice. Research shows that interleaving is generally more effective for long-term learning and application (Carvalho & Goldstone, 2019; Schorn & Knowlton, 2021).

Table 1 provides a sequence in which three mathematical concepts—circumference of a circle, area of a circle, and volume of a cylinder—could be presented, comparing both the blocked and interleaved practice approaches. Table 1. Matrix representing the three geometric concepts taught in three blocked and interleaved sessions.

	Blocked Practice	Interleaved Practice
Session I	Students focus on calculating the circumference of a circle for an entire session.	The concept of circumference is mixed with other topics such as area and volume. Students solve a variety of problems in one session.
Session II	Students concentrate on calculating the area of a circle for a whole session.	The concept of area is interspersed with other topics. In one session, students might solve a problem related to circumference, the area, and the volume.
Session III	Students spend an entire session on calculating the volume of a cylinder.	The concept of volume is combined with other topics. Students might work on a problem related to circumference, the area, and then the volume in one session.

In blocked practice, students focus on one type of problem at a time, which can lead to better performance during practice but often results in poorer long-term retention and transfer of skills. In contrast, interleaved practice involves switching between different types of problems within a single study session. While this approach can be more challenging during practice, it typically leads to better long-term learning outcomes.

18.4 Historical Background and Theoretical Perspectives

Interleaved practice has a long history of research and development, dating back to the early 20th century. One of the pioneers of interleaved practice was William Battig, who conducted a series of experiments on verbal learning in the 1960s and 1970s. He found that learners who studied different categories of words in a random order performed better on a final test than those who studied the same categories in a blocked order (Battig, 1972). He coined the term "contextual interference" to describe the phenomenon whereby interleaving creates more interference and difficulty during practice than blocking but leads to better retention and transfer of learning. Since then, many researchers have investigated the effects of interleaved practice in various domains, including mathematics, science, art, sports, and music (Chen et al., 2021; Koh et al., 2018; Schorn & Knowlton, 2021; Wong et al., 2020). Different theoretical explanations for why interleaving works have also been established, such as the discriminative-contrast hypothesis (Birnbaum et al., 2013), the retrieval practice hypothesis (Kang & Pashler, 2012), the elaboration hypothesis (Reigeluth, 1999), and the reconstruction hypothesis (Lee & Magill, 1983).

The discriminative-contrast hypothesis posits that interleaving helps learners notice and compare the similarities and differences between concepts or skills, thus forming more accurate and generalisable representations of them. Based on their review of literature, Chen et al. (2021) established that the discriminative-contrast hypothesis explains interleaved practice by suggesting that interleaving assists learners in discriminating between topic areas. The retrieval practice hypothesis suggests that interleaving enhances learning by requiring learners to frequently retrieve and use prior knowledge in different contexts, which strengthens their memory and understanding (Kang & Pashler, 2012). In a classroom setting, retrieval and interleaved practices can be combined to enhance learning outcomes. For instance, teachers can structure their lessons so that different topics are covered in each session (interleaving), while students are regularly asked to recall and apply what they have learned in previous sessions (retrieval practice). This approach not only helps students form stronger and more flexible memory representations of the material but also enables them to transfer their knowledge and skills to new contexts (Ruitenburg et al., 2021). This aligns with the principles of constructivism, which assert that learners construct new knowledge based on their existing knowledge.

The contextual interference effect is a phenomenon in which interleaving practice, rather than blocking practice, results in greater difficulty and more errors during the learning process. However, in the long term, interleaved practice leads to improved performance and better retention. Chen et al. (2021) explain that interleaved practice is based on the contextual interference hypothesis originally proposed by Battig (1972). This hypothesis, which aligns with the discriminative-contrast hypothesis, suggests that introducing higher contextual interference during practice can encourage learners to engage in more distinctive and elaborate cognitive processes, enabling them to differentiate between similar categories of information (Chen et al., 2021). This effect can also be explained through the elaboration hypothesis (Reigeluth, 1999), which asserts that interleaving fosters more comprehensive processing and encoding of information. Additionally, the reconstruction hypothesis (Lee & Magill, 1983) posits that interleaving compels learners to reconstruct their knowledge each time they switch between different topics or skills.

This suggests that the reconstruction hypothesis bears some resemblance to Bruner's (1960) notion of the spiral curriculum, an educational approach involving the repeated revisitation of the same concepts throughout a student's education. In both the reconstruction hypothesis and the spiral curriculum, the act of revisiting and reconstructing knowledge plays a vital role in enhancing learning. Both concepts acknowledge that learning is not a linear process but rather a cyclical one, necessitating continuous building and refinement of understanding. These hypotheses indicate that interleaving promotes more distinctive, elaborative, and reconstructive cognitive processes that help learners form more accurate and generalisable representations of the material. Interleaving is now widely recognised as a powerful learning strategy that can deepen learners' understanding, enhance their problem-solving skills, and facilitate their knowledge transfer (Abel, 2023; Carvalho & Goldstone, 2019; Foster et al., 2019; Nemeth et al., 2021; van Peppen et al., 2021). However, interleaving is not a panacea for all learning situations. Some factors may influence the effectiveness of interleaving, such as the characteristics of the learners,

the tasks, and the learning context. Therefore, teachers need to carefully consider how to implement interleaving in their classrooms in a way that maximises its benefits and minimises its drawbacks.

18.5 Implementation of Interleaved Practice in Classrooms

Research has shown that interleaving can encourage students to adopt intelligent and adaptable learning approaches, rather than relying excessively on memorisation and repetitive actions (Nguyen, 2021). The following are some methods to integrate interleaved practice into the classroom:

Varied Problem Sets: Instead of providing problem sets centred around one specific concept or topic, educators can design sets that incorporate a blend of problems covering various topics. In the context of mathematics, learners could engage in exercises that involve calculating the volumes of cubes, cuboids, and cylinders concurrently, rather than focusing solely on one type of prism at a time. This method compels the mind to engage in robust retrieval of prior knowledge and to decide which techniques or strategies to apply in their solutions. Based on the illustration provided, learners can understand that the formula for calculating the volume of any prism remains the same, with the only variation being the cross-sectional area specific to different types of prisms. For instance, a cube is characterised by a square cross-section, a cuboid by a rectangular one, and a cylinder is distinguished by its circular base. This highlights the beautiful uniformity underlying the diversity in geometric shapes.

Interleaved Schedule: This approach entails the strategic structuring of lesson plans to facilitate a dynamic interchange between various concepts or topics. It diverges from the conventional method of exhaustively exploring one topic before transitioning to the next, promoting a more integrated and diverse learning experience. This can be achieved by combining different concepts. In the context of life sciences, for example, the teacher may focus on identifying the most suitable conditions for specific types of plants rather than teaching about various plant types first and then exploring different growth conditions in another session. This approach encourages students to actively apply their knowledge rather than passively absorb it.

Cumulative Assessments: The practice of consistently evaluating students on previously covered content, rather than focusing solely on the most recent material, can significantly enhance their understanding and long-term retention of earlier concepts. This approach is particularly effective in subjects like mathematics, where knowledge is cumulative. Students may begin with fundamental topics such as basic arithmetic and progressively advance to more complex areas like algebra, geometry, and calculus. Each new topic reinforces previously learned knowledge while providing context for the introduction of new information. This method aligns with the concept of the spiral curriculum proposed by Bruner (1960). The spiral curriculum emphasises that revisiting learned material can lead to a deeper understanding of the concept. Each time learners revisit past material, they gain a more profound understanding, thereby solidifying their grasp of the subject matter.

Station Rotation Approach: The station rotation method offers an interactive structure for experimenting with interleaved learning, enabling students to move swiftly among various interconnected concepts in small groups (Fulbeck et al., 2020). This is facilitated by a combination of teacher-led instruction, online learning, and collaborative activities. In the classroom, teachers can implement the station rotation model by creating different learning stations, each dedicated to a specific concept or topic. Students rotate through these stations at timed intervals, engaging in activities such as group discussions, online quizzes, and hands-on experiments at each station (Larsari et al., 2023; Skolastika, 2020). This approach ensures that students encounter a mix of subjects and encourages them to actively apply their knowledge as they transition between stations.

Using Interleaving with Other Learning Strategies: To maximise the benefits of interleaving, it is advisable to combine it with other proven learning strategies such as repeated retrieval practice, regular testing, and varying study environments.

18.6 Benefits of Interleaved Practice in Classrooms

Interleaved practice is a teaching method that contrasts with traditional blocked practice. This approach has been gaining attention due to its numerous benefits in classroom settings. Consequently, several researchers and educators (e.g., Chen et al., 2021; Morkunas, 2020; Nguyen, 2021) have highlighted key advantages associated with interleaved classroom practices.

One of the primary benefits of interleaved practice is the "Interleaving Effect." This psychological phenomenon suggests that students learn more effectively when their study materials are interleaved rather than blocked (Yan & Sana, 2021). Other benefits of interleaved practice include the following:

Improved Retention: Interleaved practice has proven to be an effective method for enhancing long-term retention, allowing students to retain information over extended periods. This beneficial outcome can be attributed to the varied practice approach, which requires learners to repeatedly recall information from prior sessions. Consequently, this process strengthens their memory and ultimately contributes to the prolonged retention of the material.

Faster Acquisition of New Skills: When learners blend various types of problems or subjects, they are prompted to employ a variety of strategies and principles. This, in turn, can lead to a more rapid acquisition of new skills due to the challenges it presents.

Enhanced Proficiency in existing Skills: Interleaved practice enhances the mastery of existing skills by requiring learners to apply their knowledge across diverse situations and scenarios.

Deeper Learning: Interleaving promotes long-term skill development and retention, as well as a smoother transfer to other contexts.

Enhanced Problem-Solving Skills: Interleaved practice helps learners identify distinctions among similar materials, ultimately enhancing their problem-solving capabilities. It encourages learners to identify, recognise, and differentiate between various problem types or concepts before engaging in problem-solving tasks.

Improved Knowledge Transfer Capability: The diverse practice inherent in interleaving can enhance one's ability to transfer acquired knowledge to new and unfamiliar contexts.

18.6.1 Limitations of Interleaved Practice in Classrooms

Although interleaved practice has demonstrated its capacity to enhance learning outcomes, it is not without challenges. The following are some potential limitations:

Slower Initial Learning: Interleaved practice may result in a slower rate of initial learning compared to blocked practice. This discrepancy arises from the need for students to switch between different types of problems or topics, which can impose greater cognitive demands.

Increased Cognitive Load: Interleaved practice increases the cognitive load on students, requiring frequent transitions between different problems or subjects. This heightened cognitive load can be particularly challenging for students who may already be struggling with the material.

Requires Careful Implementation: The effective application of interleaved practice requires careful consideration and execution. It is crucial to curate a thoughtful selection of interleaved practice problems for students, allowing them to engage deeply rather than hastily.

Not Universally Applicable: Interleaved practice may not be universally suitable for all topics or subjects. Its efficacy is more pronounced in disciplines that emphasise problem-solving, such as mathematics or science, compared to subjects that primarily involve rote memorisation.

Demands Greater Teacher Planning: Implementing interleaved practice requires a higher level of planning from educators. Teachers must carefully select and sequence the problems or topics to be interleaved, ensuring that the instructional design aligns with pedagogical objectives.

Notwithstanding these challenges, many educators and researchers (e.g., Chen et al., 2021; Morkunas, 2020; Nguyen, 2021) maintain that the advantages of interleaved practice outweigh its potential drawbacks. As a teaching methodology that fosters profound comprehension and superior retention, interleaved practice is a valuable and effective tool within the educational realm.

18.7 Case Studies in Interleaved Learning

In the contemporary educational landscape, characterised by heightened complexity, interleaved practice presents an innovative and effective alternative to the conventional blocked practice paradigm, in which learners typically focus on mastering a single skill or concept in isolation. Embracing interleaved practice can thus be seen as a promising strategy to meet the evolving demands of 21st-century education, capitalising on its inherent capacity to enhance the breadth and depth of knowledge acquisition. Here are a few case studies in different subjects that demonstrate the effectiveness of interleaved practice in learning:

Mathematics Learning: In research conducted by Rohrer et al. (2014), published in the Psychonomic Bulletin & Review, it was discovered that interleaved practice had a significant impact on student performance compared to blocked practice. The study involved 140 seventh-grade students who were subjected to either blocked or interleaved practice over a span of nine weeks. An unexpected test was administered two weeks after the practice period. The findings revealed that students who engaged in interleaved practice scored higher (72%) on the test compared to those who used blocked practice (38%), indicating a large effect size of d = 1.05. Interestingly, this interleaving effect was observed even when the problems presented were not similar to each other, unlike previous studies on interleaved mathematics, where the problems were almost identical. The study concluded that interleaved practice enhances mathematics learning not only by aiding in distinguishing between different types of problems but also by reinforcing the link between each problem type and its respective solution strategy.

Language Learning: A study published in the Journal of Educational Psychology by Pan et al. (2019) provides evidence that interleaved practice can significantly enhance language learning. The research involved four experiments in which college students employed either interleaved or blocked practice to learn verb conjugation in the Spanish preterite and imperfect past tenses. The results indicated that interleaved practice led to superior verb conjugation skills compared to blocked practice when utilised across multiple training sessions. In a separate study by Schneider et al. (2002), it was found that interleaved practice improved relearning, particularly when the initial learning involved the more challenging English-French translation direction. The study also demonstrated that interleaving reduced forgetting over a one-week delay when learning involved the more challenging English-French translation direction or mixed pairs. These findings suggest that interleaved practice may serve as a powerful tool for foreign language acquisition.

Physics Learning: In a peer-reviewed article published in the Memory & Cognition Journal by Schorn and Knowlton (2021), the advantages of interleaved practice in the context of physics learning were demonstrated. The study revolved around a serial reaction time task in which participants practised three distinct eight-item sequences. These sequences were organised in either an interleaved or blocked manner on both Day 1 (during training) and Day 2 (during testing). Experiment 1 aimed to evaluate the participants' ability to retain the three training sequences on Day 2, while Experiment 2 involved the performance of three entirely new sequences on Day 2 to assess knowledge transfer. Furthermore, the researchers sought to gauge the participants' awareness of

the sequences, investigating whether the benefits of interleaved practice extended to sequences that were implicitly learned. This research revealed that despite exhibiting inferior initial acquisition performance, interleaved practice yielded superior long-term retention outcomes. Moreover, it was discovered that even among participants who reported no conscious awareness of the sequences, interleaving demonstrated advantages in both retention and transfer, compared to participants who practised sequences in a blocked manner.

Music Education: A recent study conducted by Wong et al. (2020) serves as an illustrative example of how interleaved practice can facilitate the acquisition of skills for playing new musical compositions. The motivation behind this study stemmed from the recognition that the ability to recognise and differentiate between diverse musical styles plays a pivotal role in the development of aural proficiency and musical competence. However, this task can be particularly challenging for music learners, especially those who lack extensive experience. To address this challenge and offer guidance for music education practices, the study leveraged cognitive psychological principles to explore the impact of presenting music compositions by various classical composers in an interleaved fashion. Participants with four or fewer years of musical experience were exposed to musical pieces from six composers in an interleaved manner, alternating between listening to works by different composers, while they encountered pieces from another six composers in a blocked format, which entailed listening to the compositions of one composer consecutively before moving on to the next. Subsequently, a test was administered in which participants were required to classify unfamiliar compositions created by the same 12 composers. The results demonstrated the superiority of interleaved presentation over blocked presentation, even though the majority of participants initially perceived blocking as the more effective method, highlighting the effectiveness of interleaved practice in the instruction of music composers' distinctive styles.

18.8 Conclusion

This chapter has illuminated the concept of interleaved practice as a potent learning strategy characterised by the mixing of diverse topics or problem types within a single study session. Its demonstrable effectiveness in enhancing learning outcomes across multiple domains, including mathematics, language, music, and science, among others, has been well established. Nevertheless, it is worth acknowledging that the field of interleaved practice is not without its challenges and areas of inquiry.

One noteworthy challenge lies in the need to differentiate between the theoretical underpinnings of spaced and interleaved practices, both of which are effective learning strategies but are occasionally conflated. A deeper understanding of the distinct mechanisms governing these practices could pave the way for more precise and efficacious implementation strategies. Moreover, we concur with the sentiments expressed by other scholars regarding the necessity for additional research aimed at elucidating how interleaved practice can be effectively applied within diverse learning contexts. For instance, investigating its impact on learning outcomes in online and blended learning environments remains an essential avenue of exploration.

Furthermore, we have identified emerging trends that have the potential to shape the trajectory of interleaved practice in 21st-century classrooms. These include the integration of digital technology to facilitate the seamless interleaving of various topics or problem types, the gamification of learning activities to enhance engagement among students, and the customisation of interleaved practice to align with each student's unique learning requirements.

Overall, interleaved practice unquestionably stands as a valuable and effective learning strategy, replete with numerous benefits. Nonetheless, its continued refinement and widespread adoption demand ongoing research and thoughtful implementation. As we navigate the educational landscape of the 21st century, interleaved practice emerges as a powerful tool for optimising learning outcomes in contemporary classrooms.

18.9 Reflective Questions

1. How do you think the implementation of interleaved practice could affect your students' long-term retention of the material?
2. What potential challenges do you anticipate when implementing interleaved practice in your classroom, and how might you address them?
3. How do you plan to integrate digital technology or gamification into your implementation of interleaved practice?
4. In what ways do you think the interleaved practice could influence the pace and depth of learning in your classroom?
5. How do you plan to tailor the selection and sequencing of topics or problems in interleaved practice to meet each student's unique learning needs?

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19.1. Concept Map

This chapter delves into the powerful imagery tool for visualised learning and its potential to enhance learners' experiences in both classrooms and online settings. By harnessing the cognitive benefits of visualisation, educators can create more engaging and effective learning environments that cater to diverse learning preferences, promoting active learning and deeper understanding. Furthermore, it appeals to the current generation of learners, who are attracted to visual messaging through social media platforms such as TikTok and Instagram. The chapter explores various aspects of imagery and visualised learning, including theoretical foundations, practical implementation strategies, and potential outcomes for learning.
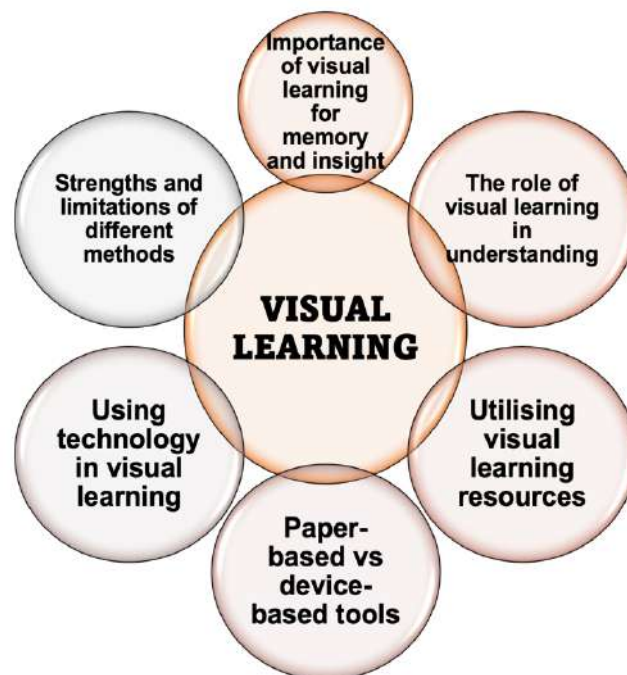

Figure 19.1: Concept Map of Chapter Outline (Source: https://flic.kr/p/2qg6tYR)

Figure 19.1 illustrates the relationship between visual learning and active participation, emphasising the crucial role of engagement in memory retention. To ensure effective and impactful learning in the context of current technological advancements, educators must prepare learners for a digitally integrated world that increasingly incorporates technology-driven visual learning methods.

19.2 Learning Outcomes

- After reading this chapter, the reader should be able to:
- Understand the impact of imagery and visual tools on engagement, comprehension, and critical thinking.
- Identify and apply visual learning techniques to enhance instruction.
- Analyse the cognitive benefits of visual aids for diverse learning preferences.
- Effectively integrate visual learning activities into lesson plans.
- Evaluate the effectiveness of visual learning across different educational contexts.
- Design visual learning strategies based on successful case studies for improved outcomes.

19.3 Clarification of Key Terms

Cognitive strategy instruction: Teaching specific strategies like summarising and questioning to improve comprehension and retention.
Cycle: A series of stages forming a loop, illustrating a continuous process.
Frayer model: A four-square graphic organiser to help understand vocabulary.
Imagery in learning: Using imagery to enhance understanding and retention.
Infographics: An image that combines text and images to present complex data.
Think boards: Classroom visual tools that encourage critical and creative thinking, often used for brainstorming and reflection.
Timeline: A linear visual representation of events in chronological order.
Visual learning: A learning preference where information is processed through visual aids like diagrams and charts to simplify complex concepts.

19.4 Introduction to Imagery and Visualised Learning Strategies

Extensive research highlights the benefits of imagery and visual learning, supported by dual coding theory (Paivio, 2014) and constructivism, accommodating various learning preferences—including visual, kinaesthetic, and auditory. Cognitive strategy instruction enables learners to simplify complex information and link it to prior knowledge. Social constructivist pedagogies emphasise the role of social interaction and collaboration in constructing knowledge (Figure 19.2). The use of smartphones and QR codes has enhanced visual learning by providing quick access to resources, emphasising the importance of adapting teaching methods to diverse learner needs. Imagery and visual learning improve comprehension, retention, and engagement by forming mental pictures that aid understanding and recall. Visual learning involves using aids like diagrams, charts, and videos to organise information; for instance, a timeline of Nelson Mandela's life can visually represent key events. Visual learning has been shown to improve higher-order thinking skills (Raiyn, 2016), allowing learners to develop schemas and organise knowledge within existing frameworks (Cochrane & Bateman, 2010; Retorta & Cristovão, 2017).

Understanding how factual, declarative, and procedural knowledge work together is crucial, with structural knowledge bridging basic knowledge to practical application. Visual aids enhance active learning by engaging learners in discussions and critical thinking, particularly in real-world contexts. Learning preferences, styles, and strategies often overlap and may need clarification. Learning preferences refer to how individuals approach learning tasks; teaching preferences relate to methods that support these preferred approaches; and strategies are the approaches educators select to enhance learning. Jawed et al. (2019) indicated that approximately 65% of learners are visual learners. Visual strategies enhance engagement and accelerate comprehension by catering to these visual learners.
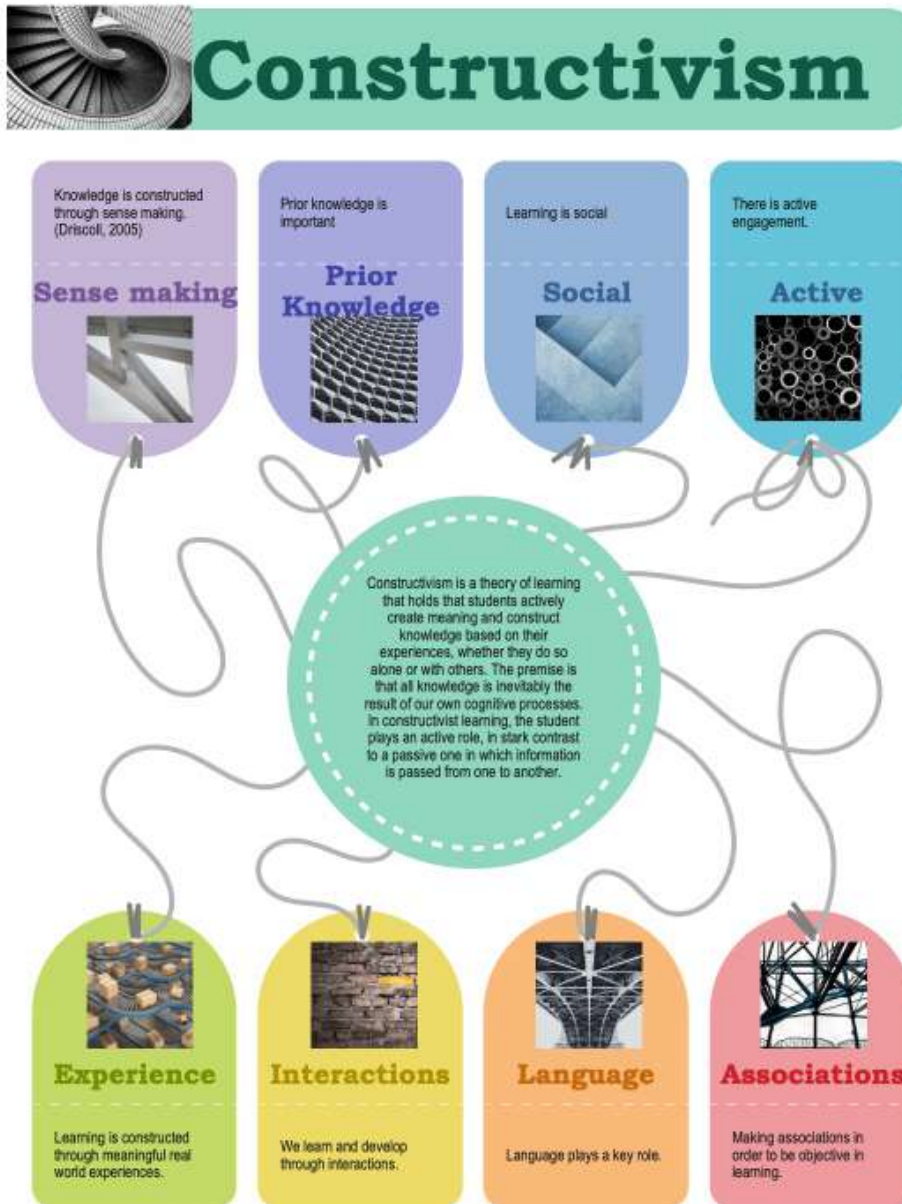
Figure 19.2: Infographic on Constructivism (Source: https://flic.kr/p/2qevDKQ)

- **Summarisation:** Distilling key points to reinforce understanding and focus.
- **Active engagement:** Interacting with material meaningfully, often using visual aids to enhance memory.
- **Spelling and pronunciation:** Focusing on how words are spelt and pronounced to improve recall by connecting sounds and meanings.
- **Personalisation:** Linking new information to personal experiences or prior knowledge to aid memory retention.

The more personally relevant something is, the more likely you will remember it.

19.5 Preparing Productive Imagery and Visualised Learning

Learning through visualisation, planning, self-regulation, memorisation, analysis, prediction, establishing associations, utilising signals, and metacognition (thinking about thinking) are some tactics to help learners achieve various educational goals. By exposing learners to multiple approaches, we aim to refocus our efforts on teaching them how to learn, rather than merely helping them understand the subject matter of the curriculum. Knowledge, concepts, and ideas can all be visually represented, and there are many ways to organise information.

Each visual tool offers advantages in making learning more accessible and engaging for learners, depending on the content and the learner's preferred style. Some of these are:

- **Visualisation:** Encouraging learners to create mental images to enhance comprehension of text by imagining the content.
- **Mind mapping:** A visual tool starting with a central idea, branching out to organise thoughts and show connections to a main topic.
- **Concept mapping:** A tool that shows relationships between ideas, allowing for multiple connections and directions, useful for brainstorming and note-taking.
- **Mnemonics:** Memory aids, using catchy phrases or images, that help retention.
- **Flow charts:** Outlining steps in a process, for decision-making or sequences.
- **Storyboards:** Comic strip-like visuals that sequence events, often used for planning creative writing projects.

Visualisations include a variety of visual aids, such as diagrams, infographics, sketch notes, mind maps, and videos, which can be integrated into different subjects across various age groups. We will focus on popular tools: mind mapping, infographics, and think boards.

19. 6 Advantages And Disadvantages of Imagery and Visualised Learning

Advantages

- **Enhanced visual learning:** Applications support visual learning by enabling the manipulation of images, videos, and visuals to clarify meaning.
- **Engagement:** Visual aids make learning interactive and interesting.
- **Comprehension and memory:** Combining words and images improves understanding and retention (Paivio, 2014; Mayer, 2017).
- **Critical thinking:** Visual tools like concept maps enhance higher-order thinking and problem-solving.
- **Active learning:** Visualisations promote active learning and simplify complex concepts (Roberts et al., 2017).
- **Conceptual connections:** Imagery helps link new and prior knowledge for deeper understanding (Collins & Olson, 2014).
- **Accessibility Visual** tools improve accessibility for non-native speakers.

Disadvantages

- **Accessibility:** Limited device or internet access can hinder participation.
- **Technical issues:** Software glitches disrupt learning and waste time.
- **Learning curve:** Varying tech skills among learners can slow tool adoption.
- **Ineffectiveness for some:** Auditory or kinaesthetic learners may struggle with visual aids.
- **Cognitive overload:** Poorly designed visuals can be overwhelming.
- **Misinterpretation:** Unclear visuals can cause misunderstandings.
- **Time-consuming:** Developing visual aids can be resource-intensive for educators.

19. 7 Techniques in Effective Imagery And Visualised Learning

There are various techniques to customise visual tools for designing visually appealing presentations, handouts, and interactive materials that align with the learning outcomes. Collaborative online platforms, such as Google Drive, allow learners to work together on a learning task. For instance, they can add and create materials that suit their learning preferences, such as pie charts or graphs. Integrating technology in teaching and learning is becoming increasingly sophisticated, as new developments offer multiple options for use. While paper-based visual methods are still widely used, technology has expanded the possibilities to include computer-based (e.g., desktops and laptops) and mobile devices (e.g., mobile phones and tablets). Software to support learning in the

classroom should prioritise free access and educational licences before opting for "paid-for versions" to ensure equity in access for the diverse learners in our classrooms.

Visual learning using paper-based methods offers many advantages. Despite the shift away from this conventional approach, it remains an effective tool for visualising learning. Advantages of using paper-based visual methods include:

- **Accessibility:** Materials are available to all learners.
- **Focus:** Learners can concentrate on tasks without digital distractions.
- **Tactile interaction:** Physical activities like drawing or writing enhance kinaesthetic learning and improve retention, offering a unique cognitive experience.

Technologies, such as those made available by Google (www.google.com) and Microsoft (www.microsoft.com), have become more widespread, especially as they become increasingly accessible to educators and learners. They provide affordances that would otherwise not be possible, such as:

- **Interactive learning:** Can be synchronous or asynchronous, allowing flexibility.
- **Deeper learning:** Hyperlinks and layered content provide access to expanded resources.
- **Visual tools:** Technology enables dynamic visuals like 3D animations to illustrate complex concepts, such as the movement of a pumping heart in Human Biology.
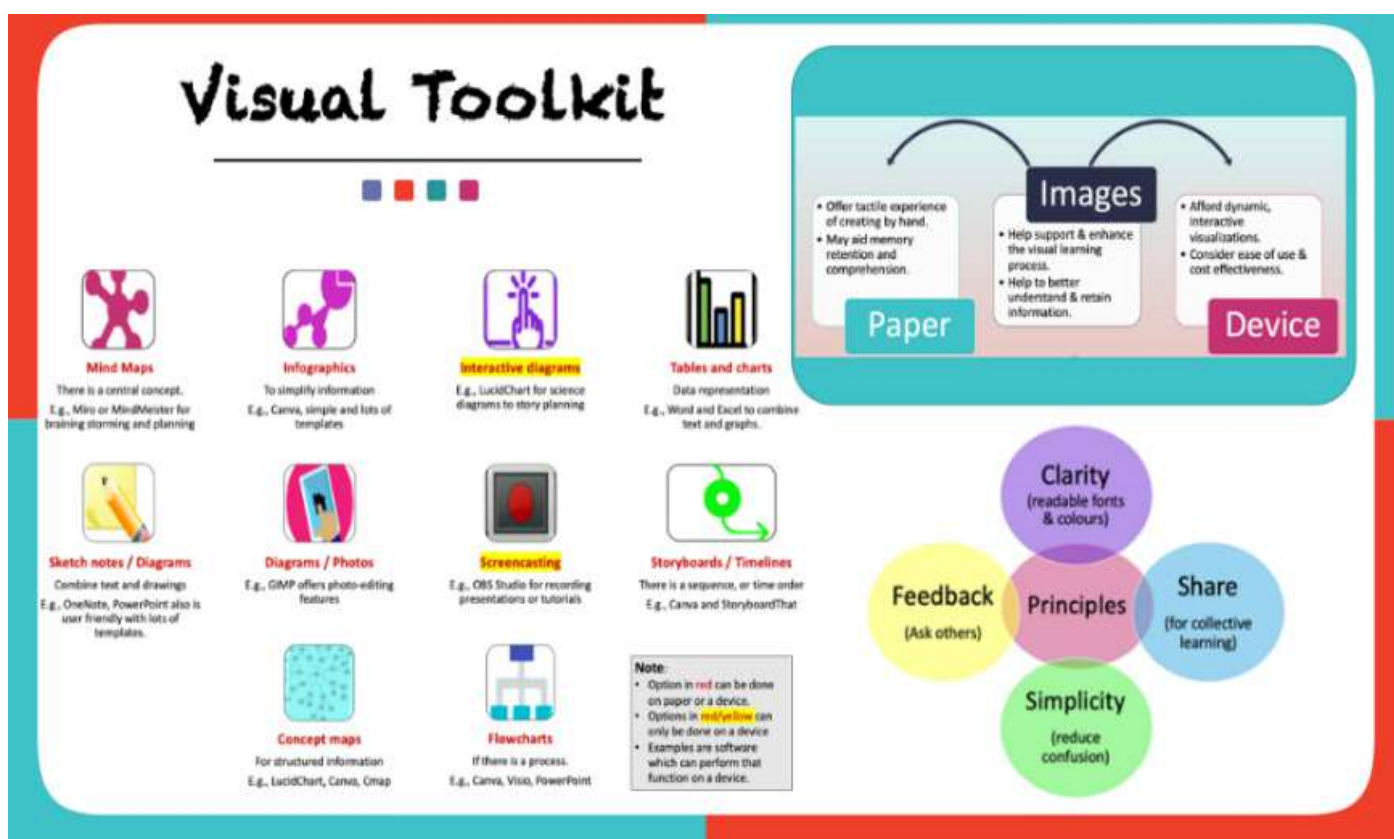
Figure 19.3: Visual Learning Toolkit (Source: https://flic.kr/p/2qeAdvk)

The Visual Toolkit image above (Figure 19.3) provides an overview of popular technology tools and platforms that facilitate visual learning. Follow the URL to see the enlarged version.

Example: Image - Fuel Tanker (Science)

The HAZCHEM image is connected to a science-focused environment. It is also useful in Problem-Based Learning (PBL) scenarios, where it can stimulate learning by presenting a series of questions that provide insights into specific topics.

For instance, this visual can enhance education in a Physical Science classroom through inquiry-based learning.

Please answer the following questions regarding the enlarged orange image at the bottom right of the tanker below.
1. Where are you likely to see such an information table? What does the HAZCHEM code "3YE" mean?
2. What type of liquid is likely being transported by this tanker?

*Figure 19.4: Fuel Truck
(Source: https://flic.kr/p/2qeBpze)*

*Figure 19.5: Infographic
on Exam Study (Source:
https://flic.kr/p/2qeBR2s)*

Example: Infographic – Study Skills (Various subjects)

There are several reasons to use infographics for visual learning. Combining text and visuals can capture and hold learners' attention better than text alone. Presenting information in a clear and organised manner can make it easier for most learners to understand. Infographics can break down complex ideas into smaller 'chunks', facilitating the learning process. Therefore, analysing an infographic or any diagram requires critical thinking to interpret the information presented. This type of visual can be used in various subjects, from grammar rules and book summaries to human anatomy, the process of photosynthesis, art movement timelines, types of joints in woodworking, and anything in between. The overarching rule is that they must be clear, accurate, and relevant to the learning objectives for which they are used. Remember, infographics are a supplementary tool to enhance understanding, not a replacement for detailed teaching.

Depending on your subject and content, you might consider one of the following types of infographics:
- **Informational:** Combines graphics and text to explain concepts (e.g., events leading to World War I).
- **List:** Bullet points or checklists (e.g., common foreign phrases with translations).
- **Statistical:** Charts to present data (e.g., survey results on favourite school lunches).
- **Comparison:** Venn diagrams to compare options (e.g., plant vs. animal cells).
- **Geographic:** Maps to present location-based data (e.g., major world rivers).
- **Timeline:** Displays key dates (e.g., art movements from the Renaissance to Modern Art).
- **Process:** Flow diagrams to explain processes (e.g., the water cycle).

Example: Mind Map – Entrepreneurial growth (Economics / Accounting)

In its simplest form, mind mapping is a visual tool used to organise information. Psychologist Tony Buzan first popularised it as a note-taking and summarisation tool that maximises the different functionalities of the brain's two hemispheres. The left hemisphere is responsible for words, logic, sequences, and analysis, while the right hemisphere handles tasks associated with colours, emotions, shapes, and imagination. Mind mapping engages both sides of the brain and, in this way, serves as an active strategy to facilitate the learning process and enhance the mind's natural ability to think (Gavens et al., 2022; Van Rensburg et al., 2023).
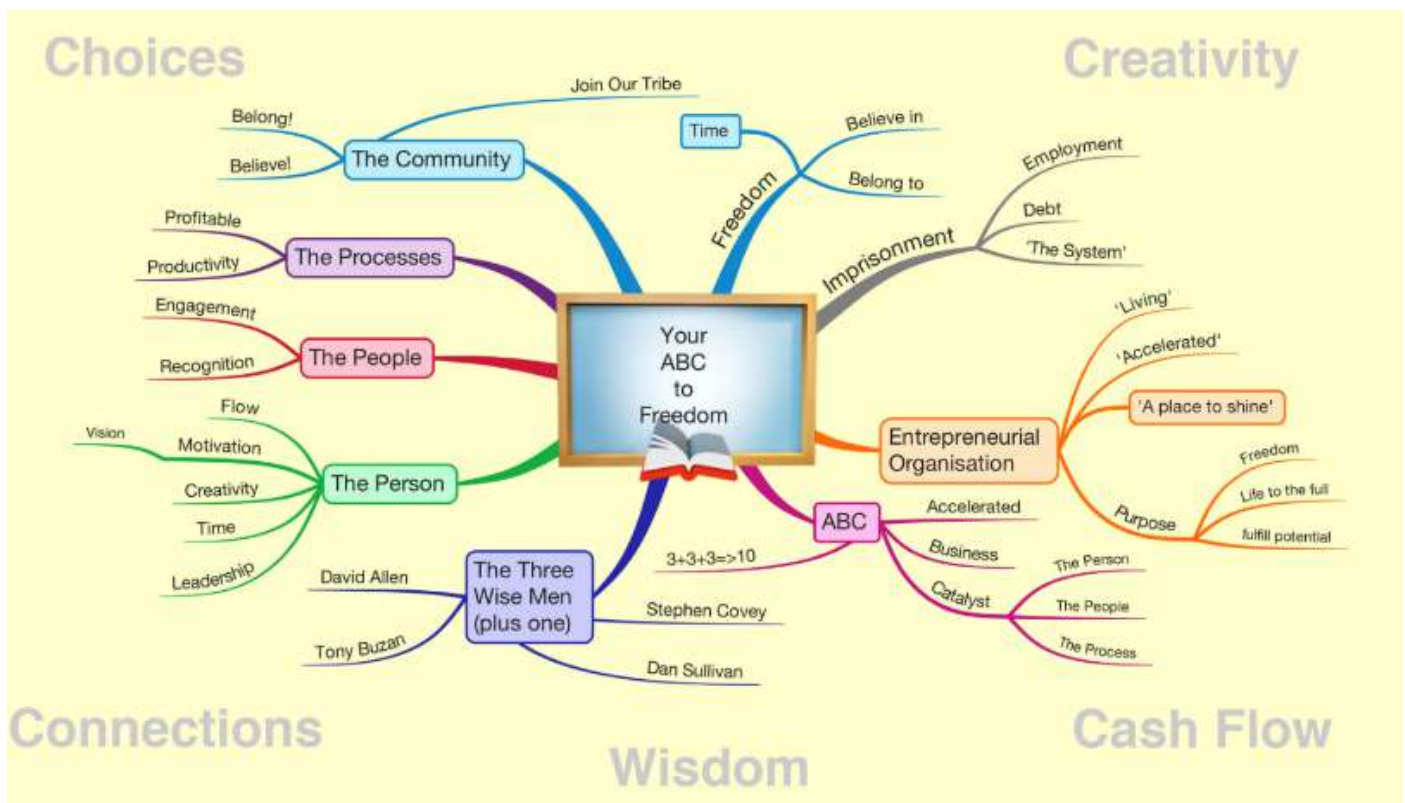

Figure 19.6: Example of Mind Map (Source: https://flic.kr/p/SGKCby)

In mind mapping, words, images, and other concepts are typically added to a core thought, while supporting ideas radiate from it. When creating a mind map, the primary subject is first positioned in the middle of the page or screen. Branches are then drawn by joining lines that extend from the primary word. Each subtopic branch represents a single thought related to the main topic. Images and diagrams can also be included to clarify concepts further. The objective is to transfer ideas from the abstract to the more tangible. Mind mapping encourages natural thought processes and creative expression. With eye-catching use of colour and images, mind maps are an excellent tool for stimulating the interest of artistic pupils and enhancing their engagement with the material. Additionally, visual appeal is expected to improve memory and recall, thereby accelerating the learning process.

Example: Think Board – Vocabulatory (Languages)

Dorothy Frayer and her colleagues initially developed the four-square think board model to assist learners in vocabulary development (Frayer et al., 1969). The Frayer Model is a four-square graphic organiser designed to help learners understand vocabulary. It includes the definition (what the word means), characteristics (key features of the word), examples (instances of the word), and non-examples (what the word is not). This model helps learners grasp and remember new terms by engaging with them in multiple ways. Frayer's model has also been used for various other purposes, including developing the conceptual knowledge of prospective educators (Akhtar & Saeed, 2022) and as a means for formative assessment to inform lecturers about learners' progress in meeting course outcomes (Keeley, 2013; Akhtar & Saeed, 2022).

Frayer's graphic and visually-oriented model can help learners select, represent, and organise information related to a critical concept. The representation of an idea or graphic concept aimed at activating learners' thinking about the topic during and after a lecture has been successfully adapted. An example Think Board can be seen in Case Study 2 below.

19.8 Do's and Don'ts in Imagery and Visualised Learning

Incorporating visual aids such as images, diagrams, and videos enhances learning by improving comprehension, retention, and engagement. These tools simplify complex information, making it more accessible to learners. Visual aids like mind maps and concept maps promote active learning, higher-order thinking, and problem-solving while catering to diverse learning preferences and fostering inclusivity. Additionally, imagery helps connect new knowledge to prior understanding and enhances accessibility for non-native speakers by providing extra context and clarity.

It's important to avoid the pitfalls of visual learning. Poorly designed visuals can cause cognitive overload, reducing their effectiveness; therefore, they should be clear, concise, and well-structured. Visual aids should supplement, not replace, traditional teaching. Educators must also consider accessibility, ensuring alternatives for learners with limited access to technology. New tools may present a learning curve, requiring support for varying skill levels. Furthermore, visual aids may not suit all learners, particularly auditory or kinaesthetic ones, and developing these tools can be time-consuming, especially in resource-constrained environments. Thoughtful implementation is key to maximising their effectiveness and ensuring all learners benefit.

19.9 Case Studies in Imagery and Visualised Learning

There are many possible avenues to explore, but we will focus on Mind Mapping and Think Boards. Mind Mapping helps students visually organise information by branching out from a central idea, fostering connections and deeper understanding. Think Boards encourage learners to break down problems or concepts into visual components, promoting active engagement and critical thinking.

Case Study 1: Introducing Concepts through Prior Knowledge, Imagery, and Infographics
In today's lesson, a lecturer working with Year 1 pre-service student teachers introduce the concepts of lesson

planning and classroom observation. The objective is for student teachers to identify different elements when observing a taught lesson.

The lecturer begins by prompting the students: "What image comes to mind when I say 'classroom'? Draw on your background knowledge from years of being in a classroom to form a mental image."
Next, the lecturer instructs: "Now, imagine you're zooming in on that image. Take a moment to focus on the detailsdraw that image in your notebook."
Once students have completed their drawings, the lecturer continues: "Below your image, write a description of what you see in words. Focus on the key elements that stand out to you."
Finally, the lecturer asks the students: "Using both your drawing and description, make a list of all the details you've included in your image."

The class then collaborates to create a mind map, combining the individual observations and details each student has noted to form a comprehensive visual representation of a classroom.

Case Study 2: Introducing Concepts Using a Visual Hook and Guided Observation – Think Board

In today's lesson, a lecturer is working with Year 1 pre-service student teachers, introducing the concepts of lesson planning and classroom observation. The objective is for the student teachers to identify the various elements involved when observing a lesson being taught.

Figure 19.7: Think Board Example (Sources: https://flic.kr/p/2qeGgyP & https://flic.kr/p/2qeNrjA)

LESSON OBSERVATION AND REFLECTION REPORT

TEACHING
Introduction

Lesson development (building on Prior knowledge)

Presentation of new knowledge

Learning activities (appropriate)

Instructions: clear

Questions (closed/open – Bloom's taxonomy)

Resources

Assessment

Conclusion

Attainment of Lesson aims (Do you think the lesson was successful)

Creating | Evaluating | Analysing

Applying

Understanding

Remembering

NOTES

The lecturer starts the session by saying: "I am going to show you a short video. As you watch, use page 2 of the think board I handed out to you to list everything you observe. Pay attention and comment on the following aspects:"

1. What is the topic of the lesson?
2. How does the teacher introduce the lesson?
3. How does the teacher use the students' prior knowledge to introduce the content?
4. What activities do the children engage in to master today's content?
5. What teaching aids or resources does the teacher use to make the content more accessible to understand?
6. What types of questions does the teacher ask during the lesson?
7. How does the teacher check whether the children understand the lesson?
8. How does the teacher conclude the lesson?
9. After the video, the lecturer facilitates a discussion, guiding the students in comparing their observations and identifying key elements in the lesson structure.

19.10 Conclusion

In conclusion, visualised learning and imagery significantly benefit education by enhancing comprehension, retention, and engagement. By incorporating visual tools such as mind maps, infographics, and think boards, educators can cater to diverse learning preferences and promote active learning and critical thinking. However, the effective implementation of these strategies requires careful consideration of potential challenges, including cognitive overload, accessibility issues, and the varied learning preferences of students. Technology also plays a crucial role in expanding the potential of visual learning, providing access to dynamic tools like interactive diagrams, 3D models, and simulations, which further enhance engagement and understanding. When thoughtfully integrated, visual learning techniques can markedly improve educational outcomes, making them invaluable in modern teaching practices.

19.11 Reflective Questions

1. What elements of the chapter could contribute most to enhancing learner learning and recall, and why?
2. How could visual aids enhance the comprehension of complex topics?

3. What guidelines or tips does the chapter offer for effective analysis of visual information?
4. What advantages, if any, would using technological tools hold for visual learning?
5. How does the chapter define a "visual learning toolkit"?

19.12 References

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Chapter 20: Using Elaborative Interrogation in Classroom Settings

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20.1. Concept Map
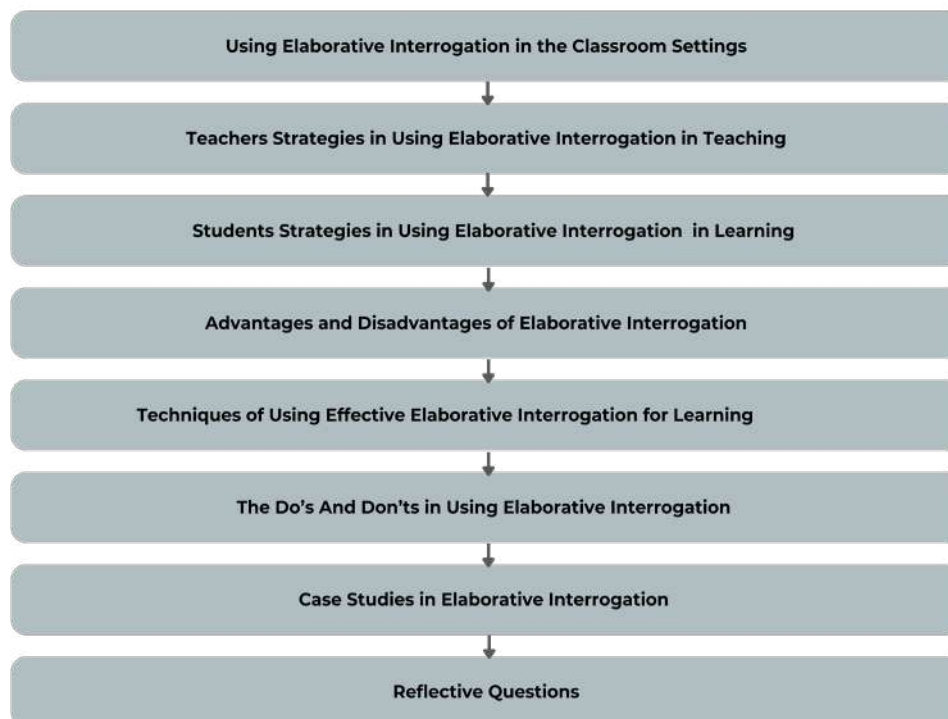
20.2 Learning Outcomes

After studying this chapter, you should be able to:
1. Explain the use of elaborative interrogation in learning.
2. Identify how a teacher, lecturer, or instructor uses elaborative interrogation to promote knowledge acquisition.
3. Categorise a learner's strategies for using elaborative interrogation to advance learning.

4. Apply the techniques of elaborative interrogation in practice.
5. Discuss your creativity in using elaborative interrogation to improve learning.

20.3 Clarification of Key Terms

Elaboration: This is the extent to which a learner is willing to expound, think, process, practice, revise, review, and respond to a concept or topic learned in the classroom. A learner's active interest in interrogating the concept determines the scope to which they can generate their thoughts and ideas, as well as how they can crystallise or conceptualise the acquired knowledge for better understanding. The generation and processing of these thoughts or ideas will vary depending on the mental effort the learner is ready and able to apply, based on their previous knowledge and interests. Many learners, based on personality differences and uniqueness, actively rehearse the topics they have learned from their teachers, lecturers, or instructors during prior educational engagements. This follow-up action promotes active learning in the student. Conversely, some learners hardly give active attention to the concepts or topics they have learned, which leads to a passive approach to learning and limits their ability to expand on the knowledge acquisition process. Therefore, active attention, as opposed to passive or selective attention, impacts a student's ability to elaborate on what has been learned. Consequently, the extent of elaborative interrogation effort by the learner results in varying learning outcomes in the acquisition of knowledge.

Elaborative Interrogation: This is described as the active attention that a teacher, lecturer, or instructor and a learner focus on the topic studied in the classroom. For a teacher, lecturer, or instructor and a learner to successfully perform an elaborative interrogation, they must engage in active mental processes. These processes enable both the teacher and the student(s) to crystallise their knowledge as they further interrogate the topic being taught and learned. These mental processes include, but are not limited to, the elaborative interrogation strategies used by the teacher in the methodology and the teaching of the subject matter, as well as the learner's active interest in further inquiry on the topic learned.

Classroom Settings: This is reflected in physical, virtual, and hybrid classrooms, where many educators, such as teachers, lecturers, instructors, school administrators, and educational psychologists, engage with diverse categories of learners across different levels, including elementary schools, secondary schools, tertiary institutions, and post-tertiary classroom settings (Adu and Zonto, 2024; Ahmad and Mohebi, 2024).

20.4 Introduction

Teachers, lecturers, and instructors use different strategies to present logical concepts or any subject matter in the delivery of knowledge to their learners. These strategies are of great significance, especially in providing support for all categories of learners in the classroom. One effective strategy for enhancing learners' memory to achieve successful learning is the elaborative interrogation strategy. This strategy equips learners with critical thinking abilities, enabling them to gain comprehension of the different topics they are being taught.

It is based on providing additional information or paraphrasing to clarify the meaning of unfamiliar concepts. This chapter is guided by the elaboration theory of Charles M. Reigeluth, which views the delivery and acquisition of instruction at the macro level of organisation in four dimensions, namely: i. Selection, ii. Sequencing, iii. Synthesising, and iv. Summarising of subject matter content.

The present chapter aims to clarify what elaboration is, explain how elaborative interrogation is conducted, and discuss the effective use of elaborative interrogation in classrooms by teachers, lecturers, and instructors, as well as by learners. Deliberate attention is given to the discussion of elaboration in learning and elaborative interrogation in the classroom. The chapter also provides a diagrammatic model for elaborative interrogation in learning, detailing the effective use of elaborative interrogation strategies by teachers, lecturers, and instructors in the classroom. Furthermore, it explores how learners can prepare productive elaborative interrogation strategies. The chapter also explains some of the advantages and disadvantages of elaborative interrogation, as well as techniques for using effective elaborative interrogation strategies for learning. Additionally, it outlines the dos and don'ts of using elaborative interrogation in teaching and presents case studies in elaborative interrogation as templates for teachers, lecturers, and instructors to achieve the desired expectations for their students' academic performance or award-winning learning outcomes from virtually all learners in the mobile world (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

20.5 Elaborative Interrogation Learning Strategies

The use of elaboration in learning is a productive memory exercise that strengthens a learner's ability to acquire knowledge, thereby enhancing memory functioning. Before any information can be encoded, stored, and retained in human memory, numerous active mental processes and consolidations must occur. These processes involve various mental activities performed by the learner, such as concept mapping within both non-declarative and declarative memory, facilitating learning at different levels. (Kahl and Woloshyn, 1994).

There are several strategies to enhance the teaching and learning of elaborative interrogation in the classroom. The two discussed in this chapter are the teacher/lecturer/instructor's elaborative interrogation strategies for teaching and the learner's use of elaborative interrogation for improved learning.

20.5.1 The Teacher/ Lecturer/ Instructor 's Elaborative Interrogation Strategies

a. Mastery of concept to be taught.
b. Who are my learners?
c. What are the objectives for teaching this concept?
d. What are my instructional aids for knowledge delivery?
e. Medium of delivery of concept to sustain learners' interest.
f. How do I get feedback that my learners actually are motivated by this concept?

(See as illustrated in figure 20.1. Model 1 for teacher/ lecturer/ instructor s and explained further in the Chapter)
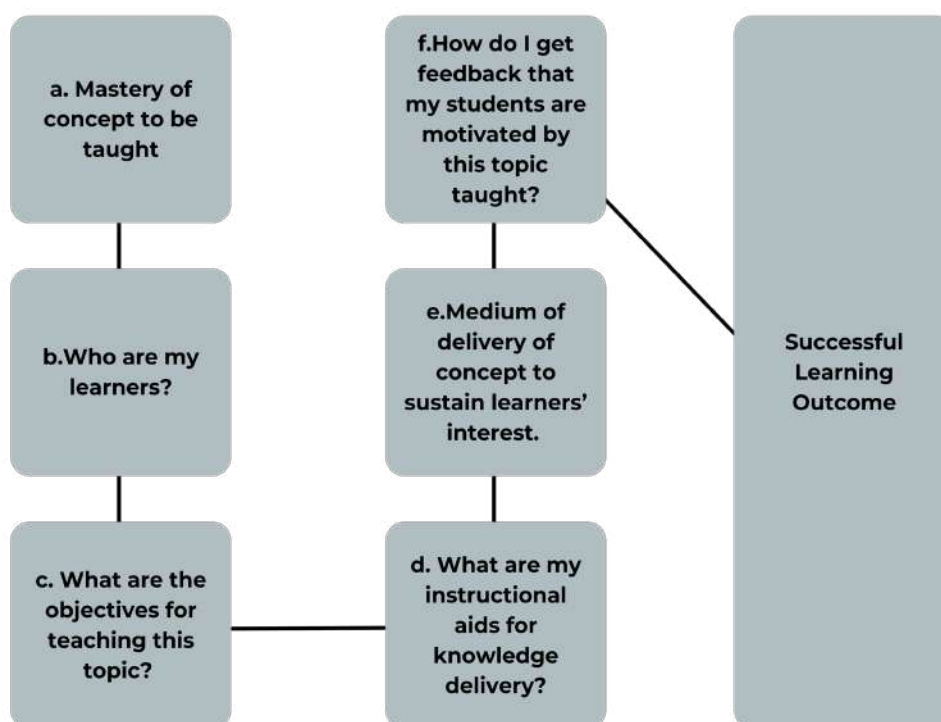
Figure 20.1 Teacher/ lecturer/ instructor's Elaborative Interrogation Strategies. (Source: Authors, 2023)

20.6 Teacher/ Lecturer/ Instructor 's Elaborative Interrogation For Teaching In The Classrooms

a. **Mastery of subject matter to be taught:** The teacher, lecturer, or instructor should already incorporate into their teaching the necessity of effectively disseminating information on the concept to be taught. Adequate preparation for the lesson or lecture plan is essential. It is important to prepare a holistic view of how the

concept is intellectually, socially, psychologically, and cognitively beneficial for the learners. Therefore, the teacher, lecturer, or instructor should build on the learners' previous knowledge.

b. **Medium and delivery of concept to sustain learners' interest:** The classroom environment must be both physically and psychologically conducive to support the day's teaching and learning processes. The educator must pay positive attention to each learner, even during group discussions. The teacher, lecturer, or instructor should begin with known, specific, inductive, and relatable examples of the subject matter before transitioning to more general, deductive concepts. This approach encourages learners to engage in self-discovery methods, self-explanation of the concepts learned, peer dialogue, or peer tutoring. These strategies further enable learners to employ elaborative interrogation in their learning.

c. **What are my instructional aids for knowledge delivery?**
To actively engage learners, the teacher/lecturer/instructor must put necessary instructional aids into perspective based on the concept to be taught. These include the use of visual aids (pictorials), auditory aids (sounds, appropriate verbal stimulation), and tactile aids (real objects that are learner-friendly). Materials for illustration, where necessary, may include colour, paints, drawings, and references to online media, where additional information on the concept can be accessed. The teacher should prepare to stimulate the learners' ability to create concept maps and memory traces for the information to be delivered. The use of technological devices and apps for additional information on the concepts taught is equally important in employing elaborative interrogation for better learning.

d. **Who are my learners?**
When the teacher, lecturer, or instructor considers the active audience in terms of learners' age, gender, cognitive ability, personality differences, readiness to learn, language, and learning styles, as well as the various types of learners in the classroom—such as fast learners, average learners, slow learners, and gifted learners—they can effectively plan activities for personal idea generation across all levels. This approach enables the educator to encourage all categories of learners to participate in generating their own ideas about the new concept being taught.

e. **What are the objectives for teaching this concept?**
At the end of the lesson, the educator should be willing to engage each learner in a self-explanation of the concept learned. This would enable the teacher/lecturer/instructor to assess how well the learners have acquired the desired or expected learning outcomes.

f. **How do I get feedback that my learners are motivated by this concept?**

Evaluation of concept understanding can be assessed at both the individual and group levels using the following methods:
- Show and tell on the concept learned.
- Report presentation on the subject matter
- Intergroup debate on the subject matter.
- Excursion to places that elaborate on the concept taught/learned.
- Testing the learner's comprehension through oral or written reflective questions
- Quiz and debate (intergroup in the class).

20.7 Preparing A Productive Elaborative Interrogation Learning By The Learners

The learners' actions, having been taught with elaborative interrogation strategies in the classroom, are influenced to do the following:

- Active attention to the topic.
- Encoding (note-taking or writing notes).
- Storage (of encoded information)
- Rehearsal (reviewing, revising, re-writing, repetition)
- Retention (recalling or retrieving information)
- Application (using acquired knowledge)

(See as illustrated in figure 20.2. Model 2 for learners and explained further in the Chapter)

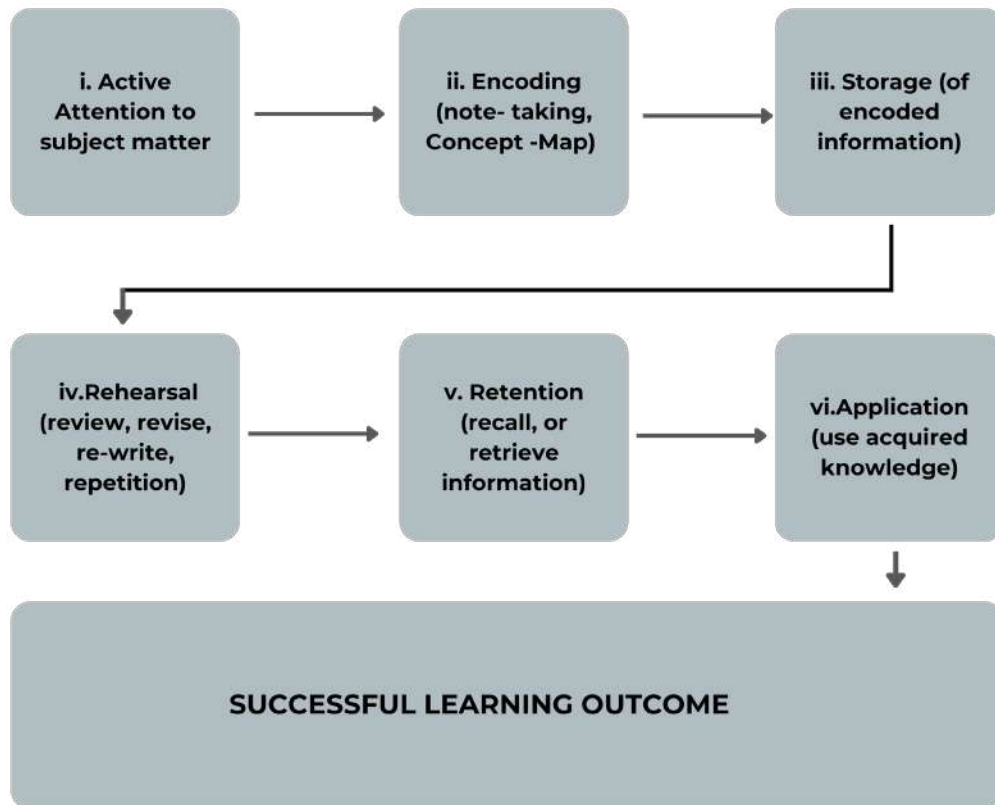*Figure 20.2 Learner's Elaborative Interrogation Strategies. (Source authors, 2023)*

i. **Active attention:** The first major step before a learner can elaborate on any topic learned is to receive the information being taught with focused attention. This requires that all aspects of the learner's mental processes—such as memory, concentration, undivided attention, and interest—are fully engaged to absorb the information being presented in the classroom.

ii. **Encoding:** In the classroom setting, many factors aid learning, including adequate comprehension of information. When a learner can properly understand the information being presented, they can effectively prepare memory traces and concept maps for that information. This process helps the learner store the information for later use. The encoding of information for future retrieval begins with the learner writing notes for later revision.

iii. **Storage:** The storage of information by the learner is a process of consolidating knowledge acquired in long-term memory. The student stores information by employing mental processes, such as creating mental images or traces for various types of information, including visual, auditory, tactile imagery, and even sensations associated with taste. For improved recall, the learner can review these mental traces or images repeatedly through repetition.

iv. **Rehearsal:** This is the active process whereby the learner can review the concept learned and revise it through critical thinking, self-explanation, questioning, and repetition of the entire process from the beginning using his or her own words.

v. **Retention:** A learner's ability to retain information about a topic includes using repetitive revision methods. Repetition strengthens a learner's memory, enabling them to recall, retain, and reproduce knowledge in diverse and relevant ways with greater creativity and innovation.

vi. **Application:** After a learner has mastered the intellectual processes of giving attention to information and encoding it for memory traces and storage, they can access that information repeatedly and build on the process to enhance the application of knowledge and skills for their own benefit and that of others in their environment.

20.7.1 Advantages Of Elaborative Interrogation Learning

- Elaborative interrogation learning helps promote better comprehension of the topic taught or learned due to the vivid analogies used to create memory traces for the learner. Therefore, it is particularly useful for enhancing the retention of sequences or processes, such as the cognitive processes involved in learning, and empowers the learner's memory functioning.
- Elaborative interrogation learning helps learners achieve mastery over the new knowledge acquired. "The more you can explain about the way your new learning relates to your prior knowledge, the stronger your grasp of the new learning will be, and the more connections you create that will help you remember it later" (Brown, Roediger & McDaniel, 2014).
- Repetition of the concepts learned through the learner's own self-explanation, revision, and rehearsal further enhances the learner's interest in knowing more. Active learning or active processing produces the most powerful and flexible learning.
- Elaborative learning encourages learners to take responsibility for their quest for knowledge acquisition, promoting self-reliance in the learner.

20.7.2 Disadvantages Of Elaborative Interrogation Learning

- Learners may find elaborative interrogation learning most challenging to apply to lengthier or multifaceted concepts.
- Elaborative interrogation learning appears to be durable for sustained learning when the learner has a schema for prior knowledge. However, when there is no prior knowledge, the learner may struggle to use elaborative interrogation unless they develop a schema for the new subject matter.
- Elaborative interrogation learning may be difficult to apply to laboratory-based instructions, thereby limiting its applicability in certain cases.
- Elaborative interrogation requires the learner to dedicate time and active attention to the topic being learned. It can become a disadvantage for the learner to use this strategy if the student cannot cope with the required effort.

20.8 Disadvantages Of Elaborative Interrogation Learning

Every learner can effectively use elaborative interrogation in their learning by applying the following techniques:

20.8.1 **Notes taking:** Regularly writing down ideas is very important for learners, as it helps exercise the hippocampus, which facilitates active responses to retention, recollection, and the activation of imaginative activities. Studies show stronger brain activity after writing on paper compared to using a tablet or smartphone (Umejima, Ibaraki, Yamazaki, Kuniyoshi, & Sakai, 2021). Teachers, lecturers, and instructors should provide activities that motivate learners to practice note-taking for further inquiry on the topics taught in class.

20.8.2 **Self-explanation in the learners' own words:** Using one's own words to elaborate on a subject matter helps a learner develop a better comprehension of that topic (Kim, 2003). Teachers, lecturers, and instructors in the classroom setting should motivate learners to express the concepts or topics they have learned using their own words. This can be achieved through methods such as concept report writing, show and tell, book reviews, discussions, discovery learning, seminars, and presentations of case studies.

20.8.3 **Regular use of mnemonics to shorten long lists of concepts:** Regular use of word chunking or mnemonics strengthens the retention of information for learners. For example, in the English language, the parts of speech (Noun, Adjectives, Pronouns, Verbs, Adverbs, Prepositions, Interjections, and Conjunctions) can be easily recalled using the mnemonic NAPVAPIC, where N stands for Noun, A for Adjectives, P for Pronouns, V for Verbs, A for Adverbs, P for Prepositions, I for Interjections, and C for Conjunctions. Another variant is NAPVAPAC, which includes Article instead of Interjections. Using mnemonics also helps learners acquire a large amount of information, thereby building their knowledge (Kim, 2003).

20.8.4 Weekly test and feedback: Classroom teachers, lecturers, and instructors could use the technique of conducting regular tests and providing feedback on scores, allowing learners to assess their knowledge. This approach would intrinsically motivate learners to prepare in advance for the tests, thereby promoting their interest in sustaining discovery learning regarding previously taught topics.

20.8.5 Quiz and Class Debates: Most learners are positively motivated to learn when their lecturers and instructors use creative, stimulating challenges, such as quizzes and debates, as inter- or intra-class activities. This assists learners in studying ahead, which invariably broadens their level of comprehension of topics covered in a term or semester.

20.8.6 Elaborative method (5W's & How): The elaborative method (5W's & How) can be used by teachers, lecturers, and instructors to clarify the connection between the subject matter and the objectives of the concept being taught to learners. Teachers, lecturers, and instructors should use guided questions that are relatable to the learners in the class. Every focused attempt to answer these questions, based on further interrogation and reading, will help students learn more about the importance of the 'topic' or 'concept' taught in the classroom.

20.9.1 Dos In Elaborative Interrogation Learning

- Every learner must believe that "I can acquire more knowledge in any subject matter if I put my mind to it."
- As a learner, you must be mindful of following up on a review of what has been learned in a subject matter every day. This enables you to create active memory traces and a concept map to interrogate further.
- Every learner must understand his or her own learning style (whether you are a visual, auditory, kinaesthetic, or verbal learner). Your preferred learning style will help you to engage in elaborative interrogation in the best way that works for you.
- Give full attention to the learning activities in the classroom, including obtaining complete information from the teacher, lecturer, instructor, or the medium of knowledge delivery.

20.9.2 Don'ts In Elaborative Interrogation Learning

- Be a proactive learner: Don't procrastinate! Use your time effectively to follow up on any subject matter learned previously.
- Don't give up on your 5 W's and HOW of any subject matter (What is the concept saying? Why is this concept so? Where to apply the concept? When to apply it? Who is the concept useful for? How to monetise the concept?
- No idea is foolish. Don't look down on your ideas. Be bold enough to share your thoughts in class; this will create opportunities for further elaboration on the subject matter.
- Don't be a passive learner: Avoid behaviours that can hinder your learning activities, including missing out on full information from the teacher/lecturer/instructor or the knowledge delivery medium due to noise, distraction, divided attention, or selective attention.

20.10 Case Studies In Elaborative Interrogation Learning

20.10.1 Case Study One

Bimpe, a 200-level agricultural science undergraduate, has never been to a farm in her life. Today, her class has been introduced to "AGR 203: Farm Practice 1" by one of her lecturers. The title of the class discussion is "Importance of Yam Production." This topic caught Bimpe's attention, and she listened with rapt focus in class. Although she has never been to a farm in her life, neither has she attempted planting yam tubers before.

However, she knows that 'pounded yam eaten with vegetable fish soup' is a delicious dish in Osun State, her hometown in Nigeria.

The lecturer explains that "yam production is considered a good source of food security and provides job engagement for many people in areas where it is cultivated. Yam is among the major cash food crops and one of the most consumed foods in West African countries like Nigeria, Côte D'Ivoire, Ghana, Benin, and Togo." The lecturer continued, then she asked further questions. Examples of the questions include:

"What is yam?"
"How many of you have eaten yam before?"
"How do we get yam?"
"Why do we need to cultivate more yam on our farms?"
"How useful is yam to the consumers?"
"Where do we plant yam?"
"When do we plant yam in the year?"
Most of Bimpe's course mates had answers to these questions. However, observations show that some of the learners could not provide desirable answers to the discussion in class, including Bimpe.

Hence, Bimpe's lecturer provided them with questions as a guide for further study.
When Bimpe returned to her room in the hostel, she took out her course notes for the four classes she had attended that day. She decided to start with her AGR 203, following the study guidelines for her assignment:
"What is yam?"

"How do we get yam?"
"Why do we need to cultivate more yam on our farm?"
"How useful is yam to consumers?"
"Where do we plant yam?"
"When do we plant yam during the year?"
"Identify five importance of yam production."

The elaborative method (5W's & How) used here aids in clarifying the connection that exists between the subject matter (yam) and the importance of the concept of food for humans. The guided questions are relatable for the learners in the class, and every focused attempt to answer each question based on further exploration and reading will help them learn more about the significance of yam production.

20.10.2 Case study two

An erudite lecturer decided to check her 300-level learners' comprehension in a developmental psychology faculty course. She notified the learners at the beginning of the semester, after they had been given the courseware and the lecture activities had been explained. The lecturer further explained that the inter-departmental quiz would attract a substantial reward for the five best learners from each of the five departments running the course for that semester.

At the end of week 8, a population of 75 learners in the class participated in the inter-departmental quiz challenge on eight topics that had been covered in the classroom.

Observations showed that most of the learners from each department engaged more in discovery learning based on the topics the lecturer had taught them prior to the quiz, in order to perform well.

Findings from the quiz scores also indicated that 70% of the classroom population reviewed their notes and lecture materials to be able to represent their department effectively. Furthermore, the lecturer reported that consultations between lecturers and learners on topics outside the scheduled lecture days had increased as the learners prepared for the quiz.

These two case studies emphasise that teachers, lecturers, and instructors can utilise active elaborative techniques such as quizzes, debates, seminar presentations, show and tell, the '5 W's and How', and case studies in the teaching and learning processes to enhance effective learning among learners.

20.11 Conclusion

This chapter emphasises that elaborative interrogation strategies have a positive effect on enhancing comprehension and knowledge acquisition for every learner. Likewise, for elaborative interrogation to be more effective, teachers, lecturers, and instructors must use elaborative strategies to promote knowledge acquisition.
In addition, elaborative interrogation in learning promotes active memory exercise, which helps learners expound on previously acquired knowledge and elaborate on new subject matter, leading to better application of successful learning outcomes in the wider world. It is also suggested that these strategies can be safely incorporated and adopted in various teaching and learning areas. Many educators, school administrators, counselling psychologists, lecturers, instructors, parents, and educational stakeholders would find this chapter scholastically enriching, and it can be adopted by teachers and lecturers to enhance basic and tertiary educational practices across all subjects and courses for diverse learners in their classrooms. The regular use of elaborative interrogation strategies promotes best practices in the classroom, improving effective learning and successful outcomes for all learners at every level of education.

20.12 Reflective Questions

1. What is elaborative interrogation in learning?
2. How can elaborative interrogation be used in teaching?
3. How can a teacher, lecturer, or instructor use elaborative interrogation to promote knowledge acquisition among learners?
4. Identify the steps a student can take to utilise elaborative interrogation strategies.
5. Explain how a teacher, lecturer, or instructor can apply the techniques learned during practice.
6. As a learner, discuss your creativity based on elaborative learning.

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