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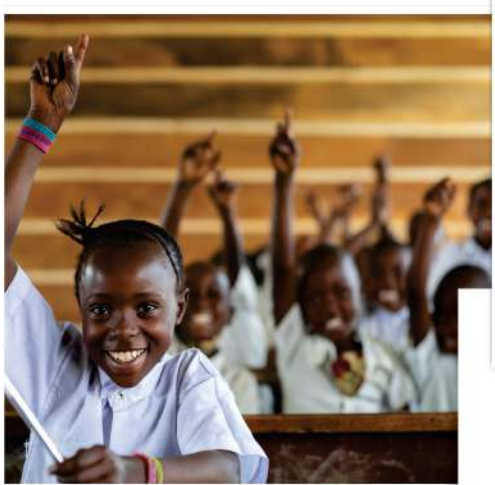
INNOVATIVE STRATEGIES FOR TEACHING VOCATIONAL, SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION: CLASSROOM PRACTICES



PROF. JOSEPHINE N. OKOLI

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PREFACE

The electronic book (e-book) acknowledges that traditional methods in Vocational, Science, Technology and Mathematics Education: Classroom Practices may not be sufficient to equip students with the necessary skills for a rapidly evolving technological landscape.

Therefore, it advocates for the adoption of Innovative teaching approaches that promote a more dynamic and effective learning experience.

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FOREWORD

This book entitled "**Innovative Strategies for Teaching Vocational, Science, Technology and Mathematics Education: Classroom Practices",** is a book of readings on various innovative classroom pedagogies. It is a welcome literature for Education System and a very important resource book for teachers who are functioning in the disciplines of Vocational Education, Science, Mathematics and Technology education and training. It is a compendium of most of the **active learning strategies** aimed at producing graduates who have been prepared for adaptation to the conditions of the 21st century world of fluidity. The 21st century world accommodates soft skills which the individual can edit from time to time as the conditions of socio-cultural, economic and technological environments change constantly and uncontrollably. A century in which cross-border job openings are important means of employment, a century where attitude is more important than subject-based excellence, a century where collaboration, innovation and creativity are irreducible demands by employers of labour, a century where adaptive skills are critical for entrepreneurship, creation of jobs and wealth.

All categories of teachers at all levels of education would find this resource book interesting and professionally helpful for their teaching practice. Because conditions of the modern world are in perpetual flux, teachers have to re-skill in order to produce adaptive graduates and the era of lecture method is literally over. It is these modern innovative instructional strategies that would enable teachers to produce such graduates who would survive and then succeed in the 21st century global economy.

This book would also be very useful to researchers and innovators in the envisioned pedagogic paradigm shift of this era. I therefore, proudly recommend this book, a compendium on innovative pedagogies to all classes of teachers and researchers on pedagogies and curriculum reforms in the modern era.

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DEDICATION

This book is dedicated to educators in the world

CHAPTER 18

THINK-PAIR-SHARE COMPARATIVE TEACHING AND LEARNING STRATEGY

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Abstract
Think-Pair-Share (TPS) is a widely used collaborative learning strategy that aims to promote student engagement, critical thinking, and communication skills. In response to the prevailing poor performance of students in their external examinations, national and international competitions, scholars are in search of instructional strategies that will enhance students understanding, comprehension and academic achievement. This is the reason why the authors have decided to give a close look on how teachers can act as facilitators in implementing Think-Pair -Share instructional strategy to boost learning outcomes. This is a cooperative learning strategy provide students with opportunity to engage with course content in a manner that demonstrates both self-learning and collaborative learning. The requirements for implementing Think – Pair – Share and the different adaptations of the strategy in different discipline were explained. The merits and demerits of the study as well as suggestions for improvement of the strategy were highlighted.

Keywords: Think-Pair-Share Strategy

Introduction
Think-Pair-Share is one of the 21st century teaching strategy which is a paradigm shift from teacher-centered method of teaching to learner-centered method of learning'. The emphasis of Think-Pair-Share instructional strategy places the learner to perform dominant role in the teaching-learning process. Think-Pair-Share is a strategy designed to provide students with idea as "food for thought" on a given topics enabling them to formulate individual ideas and share these ideas with other students in the class (Tenenbaum, Winstone, Leman, & Avery, 2019). It is a learning strategy developed by Lyman and associates to encourage student classroom participation. Rather than using a basic recitation method in which a teacher poses a question and one student offers a response (Amelia, 2016). Think-Pair-Share encourages a high degree of pupil response and can help keep students on task. Learners construct their own understanding and knowledge of the world through experience and reflection on those experiences.

Think-Pair-Share is one of the simplest and active/cooperative learning strategies that provide students with opportunity to engage with course content in a manner that demonstrates both self-learning and collaborative learning (Shih, & Reynolds, 2015). Think-Pair-Share is a useful pedagogical technique that instructors can implement at numerous times throughout a class by giving students an opportunity to reflect on a particular topic/idea discussed in a lecture (THINK), pair up with a partner or small group (PAIR), and then share their understanding of that topic/idea (SHARE). Depending on the number of students, students can be paired off in groups of 2-4. After the initial activity, the instructor can extend the activity into a whole-class discussion and debrief (Slaving, 2014). The instructor presents a task, student think about the task, later the possible solution is shared in groups. Students are given ample time to discuss a complex topic after being allowed to think through it.

Statement of the Problem
There are ongoing efforts to improve students' engagement and academic achievement after exposing them to the curriculum content. In spite of these efforts, many classrooms still struggle with passive learning, limited students' interaction, and uneven participation. Traditional teacher-centered approaches used by many teachers often fail to create inclusive environments where all students feel confident and encouraged to contribute to the learning process.

Think – Pair – Share (TPS) cooperative learning strategy was designed to address these challenges by promoting active participation, collaboration and reflective thinking. TPS aims to deepen understanding, build confidence and foster deep learning through a structured process; where students think individually about a question, discuss their ideas with a partner, and then share with a larger group.

This study therefore seeks to unfold the importance and technique of using Think – Pair – Share to enhance participation, comprehension and collaborative skills. It aims to expose how TPS influences learning outcomes and reshape the teaching and learning experience for both students and educators.

Purpose of the Study

The purpose of this study is to;

1. examine the importance of Think-Pair-Share (TPS) in enhancing student engagement, motivation, and participation in the learning process.
2. explain how to use Think – Pair – Share in classroom instruction.
3. suggest the requirements for arrangement and timing in using Think – Pair – Share in classroom instruction.
4. provide hints and Management ideas on execution of Think-Pair-Share.
5. identify the various ways Think – Pair – Share can be adapted in classroom instruction.

Importance of Think, Pair, Share

Shih and Reynolds (2015) and Sampsel, (2013) highlighted some importance of adopting Think-Pair-Share instruction in teaching. These include but not limited to;

a. Providing "think time" to increase quality of student responses. Deeper thinking and providing students with sufficient think time allows them to engage in deeper thinking reflection and analysis. When students have time to think, they feel more confident in their responses, which can lead to more participation and engagement. Example in a topic digestion of food, ask the students about what happen to the food in the mouth.
b. Students become actively involved in thinking about the concepts presented in the lesson. Students now reason differently on what happen to the food in the mouth.
c. Time to digest and think over ideas. Research tells us that we need time to mentally "chew over" new ideas in order to store them in memory. When teachers present too much information all at once, much of that information is lost. If we give students' time to "Think-Pair-Share" throughout the lesson, more of the critical information is retained. The students are given up to 3 minutes to think about the condition of food in the mouth.
d. When students talk over new ideas, they are forced to make sense of those new ideas in terms of their prior knowledge. Their misunderstandings about the topic are often revealed (and resolved) during this discussion stage.
e. Students are more willing to participate since they don't feel the peer pressure involved in responding in front of the whole class.
f. Think-Pair-Share is easy to use on the spur of the moment i.e making a decision or taking action at the exact moment, without prior consideration. Example: I decided to go on a road trip on the spur of the moment and ended up having an amazing adventure.
g. Easy to use in large classes. This refers to the flexibility and practicality of the Think, Pair, Share (TPS) strategy in managing and engaging large group of student's i.e simple to implement, encourages participation and manages class room dynamics.
h. Understandings of concepts are greatly improved as they are discussed.
i. Discussion with peers increases learning both for the student being helped and those giving the help.

How to use Think-Pair-Share in instruction

Queens University (2014) mapped out the technique for using Think – Pair – Share as follows:

a. Students may be seated in teams of 4, have them number them from 1 to 4.

b. The teacher as a facilitator announce a discussion topic or problem to solve. Example: Which room in our School is larger, the cafeteria or the gymnasium? How could we find out the answer?
c. The facilitator give students at least 10 seconds of think time to THINK of their own answer. Research shows that the quality of student responses goes up significantly when you allow "think time.
d. Using student numbers, announce discussion partners. Example: For this discussion, Student 1 and 2 will be partners. At the same time, Student 3 and 4 will talk over their ideas.
e. Ask students to PAIR with their partner to discuss the topic and proffer solution.
f. Finally, randomly call on a few students to SHARE their ideas with the whole class. Teachers may also ask students to write or depict the diagram of their responses while doing the Think-Pair-Share activity.

Think-Pair-Share helps students to develop conceptual understanding of a topic, develop the ability to filter information and draw conclusions, and develop the ability to consider other students points of view.

Time Requirements for Think-Pair-Share. Rearrange

Kaddoura, (2024) and Mahmoud, (2013) suggested that the arrangement and timing of Think-Pair-Share should be arranged as follows:

Activity	Time Allocated Per activity for students
Engage student with Content	05-10 min
Form Pairs/Groups of student.	03 min
Form Initial Stance	03 min
Discussion in small Groups/pairs	05 min
Whole Class Discussion	05-10 min
Additional Debrief	05-9 min
Total Class Time / Period	35 to 40 min

Note: Time requirements are approximate and may vary broadly from one exercise to another. Depending on the complexity of the material and the number of students and their prior learning experiences with cooperative learning strategies, a Think-Pair-Share activity may be accomplished in as little as 15 minutes.

Example: Learning Task: The teacher will provide a worded problem involving spelling or diagram in set theory or differentiate between sexual and asexual reproduction.

Thinking section: The teacher will allow the students to individually think and solve the problem first.

Pairing section: After 5 minutes, the teacher will ask the students to find a partner or the teacher will personally pair the students. The students discuss their solutions with each other. They should come up with a single solution for the given problem (differences between sexual and asexual reproduction). While partners are discussing their solutions, the teacher will go around to see which partnered students were able to make it correctly and those that are not.

Share section: The teacher will randomly select a partner to share their solutions to the class by explaining the differences between sexual and asexual reproduction in front of the classroom and solving it using the chalkboard or whiteboard as may be available.

Hints and Management ideas on execution of Think-Pair-Share.

According to Onoja and Uwuoti, (2021), Prahl, (2017), Radhakrishna, Ewing and Chikthimmah, (2012), the following hints can be applied on the execution of Think-Pair-Share:

a. Assign Partners: The facilitator should be sure to assign discussion partners rather than just saying turn to a partner and talk it over. When you don't assign partners, students frequently

turn to the most popular student and leave the other person out. Students should be refrained from having permanent partner.

b. Change Partners: The facilitator should switch the discussion partners frequently. With students seated in teams, they can pair with the person beside them for one discussion and the person across them for the next discussion.
c. Give Think Time: The facilitator should be sure to provide adequate "think time. It is necessary that students give thumbs-up sign when they have something they are ready to share.
d. Monitor Discussions: The facilitator walk around and monitor the discussion stage. You will frequently hear misunderstandings that you can address during the whole-group discussion that follows.
e. Timed-Pair-Share: If the facilitator noticed that one person in each pair is monopolizing the conversation, the discussion can be switched to "Timed-Pair-Share." In this modification, each partner is given a certain amount of time to talk. For example, say that Students 1 and 3 will begin the discussion. After 60 seconds, call time and ask the others to share their ideas.
f. Rally Robin Style: If students have to list ideas in their discussion, ask them to take turns. For example, if they are to name all the geometric shapes they see in the room, have them take turns naming the shapes. This allows for more equal participation. The structure variation name is Rally Robin similar to Rally table, but kids are talking instead of taking turns writing.
g. Randomly Select Students: During the sharing stage at the end, call on students randomly. You can do this by having a jar of Popsicle sticks that have student names or numbers on them. One number for each student in the class, according to their number on your roster. Draw out a Popsicle stick and ask that person to tell what their PARTNER said. The first time you do this; expect them to be quite shocked! Most kids don't listen well, and all they know is what they said! If you keep using this strategy, they will learn to listen to their partner.
h. Questioning: Think-Pair-Share can be used for a single question or a series of questions. You might use it one time at the beginning of class to say "What do you know about Living things?" or at the end of class to say "What have you learned today?"

Think-Pair-Share can be adapted in various forms

Onoja and Ugwuoti (2021), Napitulu and Surya (2017) noted the various ways Think-Pair-Share can be adapted in instruction. The instructor can use or combine the following strategies to boost the intellectual capacity of learners.

a. Think-Write-Pair-Share: In order to increase individual accountability, have students jot down their ideas before turning to a partner to discuss them. You can walk around the room and look at what they are writing to see who understands the concept. It also keeps kids from adopting the attitude that they will just sit back and let their partner to do all the thinking.
b. Scientific approach: Learners can make predictions about an experiment, discussing the results of an experiment, talking over charts and graphs, drawing conclusions, developing a concept through discussion, talking about environmental problems.
c. Health – Learners can discuss healthful practices, talking about how to handle stress, discussing proper placement of foods in food groups, analyzing problems in a diet, reviewing body systems.
d. Social Studies: Learners can equally discuss political viewpoints, learning about latitude and longitude, discussing economic trends, analyzing causes and effects of important events, discussing important contributions of historical figures.
e. Mathematics Problem-Solving: The facilitator place a complex problem on the overhead (For example, use one of the Weekly Mathematics Challenges found in the Mathematics File Cabinet.) Ask students to think about the steps they would use to solve the problem, but do not let them figure out the actual answer. Without telling the answer to the problem, have students discuss their strategies for solving the problem. Then let them work out the problem individually and compare answers.
f. Mathematics: Learners practice how to read large numbers, learning how to round numbers to various places, reviewing place value, solving word problems (as described above), recalling

basic geometric terms, discussing the steps of division, discussing how to rename a fraction to lowest terms.

g. Spelling: The facilitator call out a word, have the learners think of the spelling, then designate one person to turn and whisper the spelling to their partner. The partner gives a thumb up to show agreement, or corrects the spelling. You can reveal the correct spelling by uncovering the word from a chart.
h. Reading: Learners are made to discuss character traits and motives, make predictions before a chapter or at the end of a read-aloud session, discuss the theme of a book or story, make guesses about vocabulary words based on context clues in the story, and discuss the meaning of similes and metaphors in a story.
i. Language Arts: Learners discuss Daily Oral Language responses, discuss ways to edit or revise a piece of writing, talk over story ideas, and discuss letter-writing conventions.
j. Art: Leaners discuss elements of artistic compositions, discuss symbolism in artwork, compare and contrast the various works of a particular artist, analyze the use of colour and line in works of art.
k. Music: Learners identify elements of musical compositions, identify instruments in musical selections, compare and contrast types of music.

Students derive the following Benefits from Think-Pair-Share

1. With Think-Pair-Share, students are given time to think through their own answers to the question(s) before the questions are answered by other peers and the discussion moves on.
2. Students also have the opportunity to think aloud with other students about their responses before being asked to share their ideas publicly.
3. This strategy provides an opportunity for all students to share their thinking with at least one other student; this, in turn, increases their sense of involvement in classroom learning.
4. As a Cooperative Learning strategy, Think-Pair-Share also benefits students in the areas of peer acceptance, peer support, academic achievement, self-esteem, and increased interest in other students and school.

Instructor derives the following Benefits from Think, Pair, Share.

a. Students spend more time on task and listen to each other more when engaged in Think -Pair-Share activities.
b. More students are willing to respond in large groups after they have been able to share their responses in pairs. The quality of students' responses also improves.

Demerits of the Think-Pair-Share (TPS) Teaching Strategy,

1. **Limited participation:** In a large class, some students may not have the opportunity to share their thoughts with the entire class.
2. **Dominance by outspoken students**: Outspoken students may dominate the sharing process, while quieter students may struggle to contribute.
3. **Lack of depth**: The time constraints of TPS may not allow for in-depth discussion or exploration of complex topics.
4. **Dependence on partner dynamics**: The effectiveness of TPS can be influenced by the dynamics between partners, which can be challenging to manage.
5. **Difficulty in assessing individual understanding**: It can be challenging for teachers to assess individual students' understanding of the material, as the sharing process may not accurately reflect their knowledge.

Suggestions for Improvement

The study made the following suggestions;

a. **Use more specific language:** Instead of using general terms like "useful to themselves and society", consider using more specific language like "enhancing employability, civic engagement, and social mobility".

b. **Emphasize the lifelong nature of education**: Consider adding words like "lifelong" or "continuing" to emphasize that education is an ongoing process.
c. **Highlight the role of education in personal growth**: In addition to societal benefits, consider highlighting the role of education in personal growth, such as "empowering individuals to reach their full potential".
d. **Use active voice**: Instead of saying "education is a process", consider using active voice like "education enables individuals to acquire knowledge and skills".

Conclusion

Think, Pair, Share is a collaborative learning strategy which enable students to think critically about concepts provided during learning and share ideas with their classmates. Thus, students reasoning capacity is equally enhanced leading to creativity and construction of knowledge. Teachers are instructors or better placed as a facilitator in this instructional strategy.

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