Scaffolded Instructional Strategy (Sis) In A Student-Centered Classroom: A Tool For Enhanced Academic Achievement In Sciences

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Abstract

This paper focuses on the use of scaffolded instructional strategy in a student-centered classroom. Specifically, it examined the various types of scaffolds that can be used to accommodate students' different levels of knowledge, guidelines for implementing scaffolding, benefits of instructional scaffolding and its challenges. It is hoped that this innovative strategy will address students' academic under achievement.

Introduction

Education today is changing from one of factual based to one of inquiry based. This new approach to learning is bringing about new ways in which students are involved in the learning process. Teachers know that students do not learn at their highest potential when they are in a classroom where the teacher stands at the front of the room and gives them knowledge. Students learn best when they are engaged in the learning process and discover for themselves the meaning of knowledge (Gentry, 2000).

A student-centered classroom is defined as a classroom where the students are actively involved in the learning process. This is a classroom where the focus is not on the teacher teaching, but rather the student learning (Comb's 2003) states that three characteristics are needed in creating an effective learning environment;

- The atmosphere should facilitate the exploration of meaning. Learners must feel safe and accepted. They need to understand both the risks and rewards of seeking new knowledge and understanding. The classroom must provide for involvement, interaction, and socialization, along with a business-like approach to getting the job done
- Learners must be given frequent opportunities to confront new information and experiences in the search for meaning. However, these opportunities need to be provided in ways that allow students to do more than just receive information students must be allowed to confront new challenges using their past experiences without the dominance of a teacher/giver of information.
- New meaning should be acquired through a process of personal discovery. The methods used to encourage such personal discovery must be highly individualized and adapted to the learner's own style and pace for learning.

These three characteristics are at the heart of the student-centered classroom. Students need to feel safe in order to take the risk in discovering new knowledge. They must feel secure in facing challenges based on past experiences. They must be given the opportunity to find information on their own in a way that is relevant to them.

A student-centered classroom is about the students. The teacher takes on a role of facilitator or guide, allowing the students to discover for themselves the knowledge, while the teacher helps or facilitates the learning by guiding the students down the path of knowledge. When students start to move away from traditional learning to more active learning the process of learning becomes the focus.

Researchers have identified reasons for poor attitude, low enrolment and underachievement in the sciences to include ill-equppied laboratories, teacher and gender factors and insufficient funding (Meltzer, 2002; Delphonso, 2003; Danmole and Adeoye, (2004) and Alebiosu and Bamiro, (2007). The factor of high mathematical or quantitative demands (Onwu and Opeke, 1985; Egbugara, (1986) and Adeptitan, (2004) has been identified specifically for physics. Iroegbu, (1986) asserted that poor numerical aptitude generates lack of confidence in handling numerical problems in physics. Similarly, Meltzer, (2002) explained that mathematical ability (figural ability) is positively correlated to achievement in physics.

Simpson and Oliver (1990) identified factors of teachers attitude, teaching methods and personality, attitude of parents and peers, nature and perception of the subject among components influencing attitude to school subject. The above explains that teachers are very important determinants of enrolment, achievement and essentially attitude towards school subjects. Teachers constitute the pivot upon which schooling rotates (Alebiosu and Bamiro, 2007). The teacher is consultant, guide, mentor, inspirator and moderator (Krejster, 2004). His/her use of innovative instructional strategy stands a higher chance of positively influencing the attitude of the learner to the subject.

Consequently, Grober and Jodl (2010) syggested the use of self study, and problem oriented learning. Invariably, instructional strategy and teaching method are important determinants to attitude to science (Orji, 1998; Meltzer, 2002 and Alebiosu, 2006). One of such is the scalffolded instructional strategy. Scaffolding instruction as a teaching strategy originated from Lev Vgotsky's socio-cultural theory and his concept of the zone of proximal development (ZPD). "The zone of proximal development is the distance between what children can do by themselves and the next learning that they can be help to achieve with competent assistance."

Instructional scaffolds are temporary structures teachers put in place to assist students in accomplishing new tasks and concepts they could not typically achieve on their own. Once students are able to complete or master the task, the scaffolding is gradually removed or fades away and the responsibility of learning shifts from the teacher to the student.

Why use instructional scaffolding?

One of the main benefits of scaffolded instruction is that it provides for a supportive learning environment. In a scaffolded learning environment, students are free to ask questions, provide feedback and support their peers in learning new material. When you incorporate scaffolding in the classroom, you become more of a mentor and facilitator of knowledge rather than the dominant content expert. This teaching style provides the incentive for students to take a more active role in their own learning. Students share the responsibility of teaching and learning through scaffolds that require them to move beyond their current skill and knowledge levels. Through this interaction, students are able to take ownership of the learning event. The need to implement a scaffold will occur when you realize a student is not progressing on some aspect of a task or unable to understand a particular concept. Although scaffolding is often carried out between the teacher and one student, scaffolds can successfully be used for an entire class.

Types of scaffolds

Alibali (2006) suggests that as students progress through a task, teachers can use a variety of scaffolds to accommodate students' different levels of knowledge. More complex content might require a number of scaffolds given at different times to help students master the content.

Table 1: Presents scaffolds and ways they could be used in an instructional setting

Scaffold	Ways to use scaffolds in an instructional setting
Advanced organizers	Tools used to introduce new content and tasks to help students learn about the topic: Venn diagrams to compare and contrast information, flow charts to illustrate processes; organizational charts to illustrate hierarchies; outlines that represent content; mnemonics to assist recall; statement content; rubics that provide task expectations.
Cue cards	Prepared cards given to individual or groups of students to assist in their discussion about a particular topic or content area: vocabulary words to prepare for exams; content-specific stem sentences to complete; formulae to associate with a problem; concepts to define.
Concept and mind maps	Maps that show relationships: partially or completed maps for students to complete; students create their own maps based on their current knowledge of the task or concept. Examples; samples, specimens, illustrations, problems; real object; illustrative problems used to represent something.
Explanations	More detailed information to move students along on a task or in their thinking of a concept: written instructions for a task; verbal explanation of how a process works.
Handouts	Prepared handouts that contain task and content-related information, but with less detail and room for student note taking
Hints	Suggestions and clues to move students along; "place your foot in front of the other", "use the escape key", "find the subject of the verb. "add the water first and then the acid."
Prompts	A physical or verbal, cue to remind; to aid in recall of prior or assumed knowledge; Physical: Body movements such as pointing, nodding the head; eye blinking, foot tapping. Verbal: Words, statements and questions such as "Go", "stop". It's right there" tell me now. What tool bar' menu, item would you press to insert an image?
Question cards	Prepared cards with content and task specific questions given to individuals or groups of students to ask each other pertinent questions about a particular topic or content area.
Question stems	Incomplete sentences which students complete: encourages deep thinking by using higher order. "what if' questions.
Stories	Stories relate complex and abstract material to situations

	more familiar with students; recite stories to inspire and motivate students.
Visual scaffolds	Pointing (call attention to an object); representational gestures (holding curved hands apart to illustrate roundness; moving rigid hands diagonally upward to illustrate steps or process); diagrams such as charts, and graphs; methods of highlighting visual information.

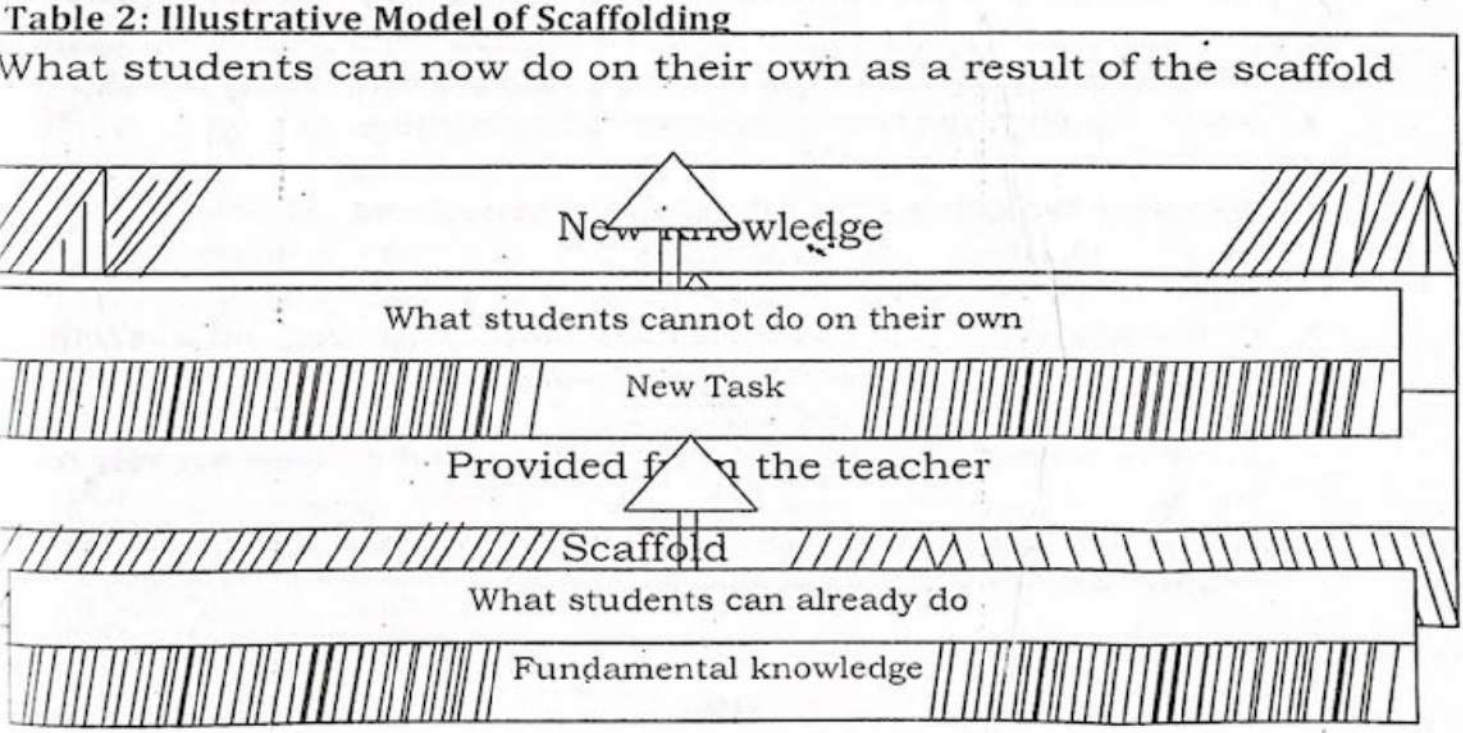
Preparing to use scaffolding

As with any teaching techniques, scaffolds should complement instructional objectives. While we expect all of our students to grasp course content, each of them will not have the necessary knowledge or capability to initially perform as we have intended. Scaffolds can be used to support students when they begin to work on objectives that are more complex or difficult to complete. For example, the instructional objective may be for students to complete a major paper. Instead of assuming all students know how to begin the process, break the task into smaller, more manageable parts.

1. First, the teacher provides an outline of the components of the paper.
2. Then students would prepare their outline
3. The teacher then provides a rubic of how each paper criteria will be assessed.
4. Students would then work on those criteria and at the same time and self-evaluate their progress.
5. The pattern would continue until the task is completed (although scaffolds might not be necessary in all parts of the task).

Knowing your subject well will also help you identify the need for scaffolding. Plan to use scaffolds on topics that former students had difficulty with or with material that is especially difficult or abstract. Hogan and Pressley, (1997) suggest that you practice scaffold topics and strategies they know well. In other words; begin by providing scaffolded instruction in small steps with content you are most comfortable teaching.

Table 2: Illustrative Model of Scaffolding



Guidelines for implementing scaffolding

The following points can be used as guidelines when implementing instructional scaffolding (adapted from Hogan and Pressley, 1997).

- Select suitable tasks that match curriculum goals, course learning objectives and students' needs.
- Allow students to help create instructional goals (this can increase students' motivation and their commitment to learning)
- Consider students' backgrounds and prior knowledge to assess their progress – material that is too easy will quickly bore students and reduce motivation. On the other hand material that is too difficult can turn of students interest levels.
- Use a variety of supports as students progress through a task (e.g, prompts, questions, hints, stories, models visual scaffolding "including pointing, representational gestures, diagrams and other methods of highlighting visual information" (Alibali, M, 2006).
- Provide encouragement and praise as well as ask questions and have students explain their progress to help them stay focused on the goal.
- Monitor student progress through feedback, have students summarize what they have accomplished so they are aware of their progress and what they have yet to complete).
- Create a welcoming, safe, and supportive learning environment that encourages students to take risks and try alternatives (everyone should, feel comfortable expressing their thoughts without fear of negative responses).
- Help students become less dependent on instructional supports as they work on tasks and encourage them to practice the task in different contents.

Benefits of instructional scaffolding

- Challenges students through deep learning and discovery.
- Engages students in meaningful and dynamic discussions in small and large classes
- Motivates learners to become better students (learning how to learn).
- Increases the likelihood for students to meet instructional objectives.
- Provides individualized instruction (especially in smaller classrooms).
- Affords the opportunity for peer-teaching and learning.
- Scaffolds can be "recycled" for other learning situations
- Provides a welcoming and caring learning environment

Challenges of instructional scaffolding

- Planning for and implementing scaffolds is time consuming and demanding
- Selecting appropriate scaffolds that match the diverse learning and communication styles of students.
- Knowing when to remove the scaffold so the student does not rely on the support.
- Not knowing the students well enough (their cognitive and affective abilities) to provide appropriate scaffolds.

Conclusion

At any educational level, teachers can implement a variety of processes to meet the learning attributes and characteristics of the diverse students population in their classrooms.

Instructional scaffolds promote learning through dialogue, feedback and shared responsibility. Through the supportive and challenging learning experiences gained from carefully planned scaffolded learning, teachers can help students became lifelong, independent learners.

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