MINDSKETCHING AS A VISUAL LEARNING STRATEGY TO BUILD ACADEMIC LITERACY OF CHILDREN RAISED IN POVERTY: A NATURALISTIC INQUIRY APPROACH

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Abstract: Despite persistent efforts, teachers struggle to teach children from poverty, particularly in the area of academic literacy. This study examines seven elementary school teachers' observations, insights, and perceptions of a visual learning strategy called mindsketching, to build academic literacy of their students raised in poverty. Through naturalistic inquiry, data were obtained from face-to-face interviews and classroom observations. Three themes emerged from the study: first, teachers observed that an in-depth understanding of mindsketching was necessary for purposeful implementation—from introductory activities to a teaching tool used for various instructional practices. Second, mindsketching encouraged metacognition in their students. Thus, teachers' communication with students, such as instructions, explanations, and affirmations, took on a metacognitive bent. Third, mindsketching provided the initial step towards engaging students in effective learning. In conclusion, mindsketching supported students in visually bridging images to words, thereby enhancing learning.

Keywords: Mindsketching; Visual Learning Strategy; Qualitative Research; Academic Literacy; Poverty.

INTRODUCTION

Imagine an elementary school where the majority of the students are raised in poverty. These students experience consistently failing grades and, ultimately, many drop out of school. Very few would argue that this is not an ideal situation. Most school leaders would work with fervor to reverse this phenomenon if it were present in their schools.

This study looks at how teachers helped their students achieve academic success in their elementary school classrooms using a visualization strategy called mindsketching (Juntune, 1987; Juntune, 2012; Juntune, Kaya, & Ramos, 2011) Using a naturalistic approach distilled from the teachers' experiences, the study focused on how they used this strategy to build academic literacy of their students—the majority of whom were raised in poverty.

ACADEMIC LITERACY

Academic literacy typically refers to formalized language used in school settings, including achievement on school-related tasks and standardized assessments (Bowers, Fitts, Quirk, & Jung, 2010; Li, 2022). In discussing issues of academic literacy, the term academic language appears frequently in the literature, as academic language requires linguistic registers that students are expected to use within the context of their schooling (Ehlers-Zavala, 2008).

Academic literacy is one of the key factors affecting the achievement gap between high- and low-performing students (Hayes, Hattam, Comber, Kerkham, Lupton, & Thomson, 2017; Wong-Fillmore, 2004). Underperforming students often come from poverty environments which lack exposure to the types of language used in school. They have less academic support and fewer school-like conversations in their home environments (Zwiers, 2008).

Academic language is markedly different from the social language students use in everyday conversations (Corella, 2022). In ordinary spoken language, the speakers involved can be imprecise, with either short responses or lengthy sentences. Context and nonverbal cues help facilitate meanings and expressions (Wong-Fillmore, 2004). However, academic literacy, as a part of various school literacy tasks, often involves decontextualized language or language that is devoid of interpersonal cues. The language used

tends to be concise with complex ideas compressed into fewer words and long sentences consisting of sequenced of information (Snow, 2010; Snow & Uccelli, 2009).

Children from poverty exhibit academic deficits such as a weaker grasp of language skills when they begin school, as compared to children from higher SES (socio-economic status) backgrounds (Lurie, Hagen, McLaughlin, Sheridan, Meltzoff, & Rosen, 2021). Numerous studies have concluded that a lack of academic readiness of children from poverty leads directly to academic underachievement (see Coleman et al., 1966, Duncan & Brooks-Gunn, 1997; Hanushek, Peterson, Talpey, & Woessmann, 2019; Hopson & Lee, 2011; White, 1982).

Children from poverty: Vocabulary acquisition. Lower SES children with limited vocabulary used it less frequently for tasks requiring analysis and reason, justification and reflection, and when predicting and considering different alternatives; all of these are higher-order skills necessary for academic literacy (Sperry, Sperry, & Miller, 2019; Tough, 1982). Further, Hart and Risley's (1995) landmark study pointed out a significant effect of poverty on vocabulary growth; the gap between the number of words produced by children from higher and lower SES levels increased over time. These researchers found that by the age of three, children from high-SES backgrounds had an average vocabulary of 1,116 words while children from working class families averaged 749 words. However, children from low-SES backgrounds had vocabulary that averaged 525 words.

Specifically, Hart and Risley (1995) predicted that by the age of three years, children from the high-SES homes in their sample had heard nearly 40 million words while children from the low-SES families had heard only 10 million words. They also found that the higher SES children not only had heard more total words from their families than did lower SES children, but higher SES children had also heard more different words as a result of the diverse vocabulary employed by speakers in their homes. Follow-up studies by Hoff (2013) reported similar findings, where lower SES children possessed less advanced language skills in the area of vocabulary size.

Children from poverty: Reading acquisition. Research suggests that children from poverty perform below average on pre-literacy skills, including phonological awareness (the ability to isolate and manipulate sounds) (Barone, 2006) and print and letter knowledge (the knowledge of forms and functions of print) (Dodd & Carr, 2003; Justice & Ezell, 2004). These pre-literacy skills play an essential role in children's early reading success (Watts, 2022).

A lack of academic literacy also directly affects reading comprehension (Johnson, 2009). Academic literacy, academic comprehension, and academic learning share a mutually supportive tripartite relationship known as the Matthew Effect (Stanovich, 1993). Essentially, the Matthew effect explains that students who possess a large academic vocabulary are able to comprehend more successfully. In turn, the Matthew effect boosts their learning of new academic language. On the other hand, the Matthew effect can also be seen when students from poverty struggle to read. They develop less vocabulary, and that smaller vocabulary makes it arduous to comprehend what they read.

Children from poverty: Oral language and writing acquisition. Oral language reinforces the development of reading and writing (Snow & Beals, 2006). Oral language is particularly related to writing because generated ideas while listening, reading, and speaking in class have to be transcribed in text form using words and sentences (Berninger & Abbott, 2010; Kim, Al Otaiba, & Puranik, 2015; Olinghouse, 2008).

When children display poor oral language skills, their acquisition of more advanced levels of reading and writing is at risk (Neuman, Kaefer, & Pinkham, 2017; Pullen & Justice, 2003). Research indicates that children from low-SES backgrounds exhibit lower levels of oral language skills than do children from higher SES backgrounds on measures of language production and comprehension. These differences can be found in research examining developmental ranges from infancy to high school, with the gap widening as the age increases (Fernald, Marchman, & Weisleder, 2013; Hoff, 2006; Watts, 2022).

The Matthew Effect is based on the parable of Jesus in the book of Matthew: for whoever has, to him more will be given, and he will have abundance; but whoever does not have, even what he has will be taken away from him (Matthew 13:12, New King James Version).

In sum, for children to attain academic literacy, they need to learn to recognize the function, structure, and demands of language used in the classroom. When students encounter gaps in academic language, it leads to an academic literacy gap, that in turn leads to a gap in academic achievement gap (Johnson, 2009). Hirsch (2003) succinctly states: "It is now well accepted that the chief cause of the achievement gap between socioeconomic groups is the language gap" (p. 22).

VISUALIZATION

For decades, researchers have studied the role of visual images in promoting children's literacy (Dyson, 1983; 1986; Kendrick & McKay, 2004; Levunlieva, 2023). Dyson (1986) proposed that visualizing through drawing, coupled with talking, are active components of the literacy process. In addition, Levin and Bus (2003) showed how children who were unable to communicate spontaneously through writing instead resorted to drawing, suggesting the prevalence of the urge to draw images as a means to communicate. As Graves (1983) found in his ethnographic study, children's drawings are likely to possess more information than their written texts.

One of the most well-known works on visualization is Paivio's (1969; 1978) dual coding theory of cognition (DCT). Paivio opined that verbal and nonverbal information are processed in functionally autonomous but interconnected systems. The verbal system or logogens deals directly with language while the nonverbal system or imagens deals with nonlinguistic objects and events. In an educational setting, DCT aids the information processing needed in academic literacy by assisting the learner in making connections between mental representations created in the visual and verbal systems (Paivio, 2008).

In addition, Purnell and Solman (1991) discovered that combining mental imagery and verbal elaboration in technical material (such as geography texts) was effective in promoting understanding and learning in students from grade school through the university level. Another intervention program for mathematics involved teaching students how to use visualization to represent numbers and operations. Again, anecdotal evidence supported the effectiveness of visualization-verbalization techniques (Tuley & Bell, 1997).

Visual learning techniques, a central element of DCT, can address poor academic achievement in any child. These techniques appear to be particularly useful in helping children from low-SES backgrounds who are often at risk for oral and literate language difficulty; they serve to build the complex language skills needed for academic literacy (Burt, Holm & Dodd, 1999; Pruitt & Oetting, 2009). To overcome challenges in this area, children from low-SES backgrounds can be assisted in building complex language through a visualization strategy called mindsketching (Juntune, 1987; Juntune, 2012).

Mindsketching is different from other drawing strategies: the intent is to capture an image of a concrete or abstract idea by sketching it in very few lines (Juntune, 1987; Juntune, 2012). The dual coding theory (Paivio, 1969; 1978) suggests that images, even with little detail, leave a distinctive trace in the memory, facilitating the retention of verbal and written information. Students from poverty have been shown to better retain information when they use visual learning techniques to help them build academic literacy (Juntune, 2012).

METHOD

QUALITATIVE RESEARCH

Qualitative research, particularly naturalistic inquiry (Lincoln & Guba, 1985) was best suited for the study as it allowed construction of a holistic picture of the phenomenon being studied from those who had shared an experience, namely using mindsketching in their classrooms. A naturalistic approach afforded the best fit for the study as it legitimized an emergent research design for flexibility in data collection, thus allowing the researcher to make value judgments about the quantity and quality of data being collected.

Cresswell and Poth (2018) assert that any qualitative approach may have a narrative form of representation, as narrative is the common thread that runs through all qualitative approaches. It is through the vehicle of narratives that individuals make sense of the world and themselves. Narrative researchers believe that human experience is a lived experience that needs to be narrated in order for human knowledge to be understood and interpreted. Thus, this study elicited teachers' narratives about the use of mindsketching with students from poverty.

PARTICIPANTS

The participants consisted of a purposive sampling of seven elementary school teachers from three schools within a single school district in west Texas. Purposive sampling involves selecting "information-rich" cases that best help to answer the research questions that correspond to the purpose of the study (Crowley, 2019). Participants were identified by the school district as "high implementers" of mindsketching strategies. All were females, ranging in ages from late 20s to early 50s. Five participants listed themselves as "Hispanic" when asked for their self-reported ethnicities, while two participants self-identified as "White." Table 1 provides more detailed information about the seven participants.

Table 1: Demographics of Participants

Pseudonym (Gender)	Self-reported ethnicity	Number of years taught	Number of years using mindsketching	Age range (years)
Beverly (F)	Hispanic	12	5	41-50
Cheryl (F)	Hispanic	19	5	41-50
Deborah (F)	Hispanic	8	5	21-30
Helen (F)	Hispanic	17	5	41-50
Rosalind (F)	White	5	5	41-50
Tina (F)	White	18	4	51-60
Winnie (F)	Hispanic	21	4	41-50

Five participants came from two elementary schools considered "high poverty" schools as more than 85% of the students were eligible for free or reduced-price lunch (FRPL), a proxy measure for the percentage of students who live in poverty (National Center of Education Statistics, 2015). Two participants came from a mid-poverty school in which 48.4.% of the student population was eligible for FPRL programs (National Center of Education Statistics, 2015), but reported that over 75% of the students in their specific classes were on FPRL programs.

Each of the participants completed 12 hours of professional development training (two six-hour sessions within two years) conducted by an experienced educational consultant on building academic literacy in children from poverty. A key instructional strategy taught at the training was mindsketching.

THE HUMAN INSTRUMENT

The researcher is the primary instrument to gather, analyze, and interpret data (Denzin & Lincoln, 2000). Patton (2002) notes that it is imperative to disclose the researcher's positionality in the study as the researcher brings with her personal biases, beliefs, and values that can affect the research process. The primary researcher (first author) in this study acknowledges her own lenses of reality and beliefs which may have shaped the way she examined a phenomenon and processes in this study. The researcher was a high school teacher who also had administrative experience as head of department and assistant principal. While the researcher understood the complexities involved in teaching and learning, her interest in the current inquiry was piqued by her own experiences with students who came from low SES families.

The researcher used a reflexive journal, akin to a daily journal, to capture thoughts and insights on the research process that shaped the way issues were viewed (Lincoln & Guba, 1985). The researcher made it a point to capture these thoughts and insights immediately after an interview or classroom observation. Although the veil of objectivity is not presumed to be achieved in a qualitative study, the researcher's sense of reality was bracketed through the use of this reflexive journal each time after data was collected.

DATA COLLECTION PROCEDURES

Semi-structured interviews. The primary focus of interviews is to educe first-order narratives wherein participants share stories of themselves and their own experiences (Magaldi & Berler, 2020). To that end, face-to-face interviews provided a means of collecting information that the researcher could not observe directly (Crowley, 2019). Although the researcher was guided by a set of pre-determined questions, the semi-structured process allowed participants to share relevant information that was not covered by the interview protocol. The interviews were digitally recorded and centered on how the participants used mindsketching in their classrooms.

Following each interview, the researcher transcribed all the digital recordings. After transcribing the data, the researcher reviewed the transcripts for accuracy and edited them for errors. Member checks were conducted to ensure the accuracy of the transcripts. This was done by sending each participant an electronic copy of the transcript to review for contextual or content errors.

Classroom Observations. Corbin and Strauss (2014) stress that utilizing a spectrum of potential data sources is one of the "virtues" (p. 28) of qualitative research. To that end, interview data was supplemented by observational evidence from the classroom. Classrooms are ecosystems in which teachers, students, practices, beliefs, and skills all interact with each other.

Observations of teachers using mindsketching strategies in the classroom assisted the researcher to gain a comprehensive understanding of the context and to record a first-hand account of participant behavior and activity (Merriam & Tisdell, 2016). In addition, Spradley (1980) noted five types of participant observations on a continuum, ranging from non-participation to full participation of the researcher. In this study, the researcher assumed the role of a passive participant, where the researcher was present in the classroom but did not participate or interact with the teacher or the students.

DATA ANALYSIS PROCEDURES

Constant comparative method. Data units, comprising independent segments of meanings and ideas from the transcripts, were categorized using the constant comparative method (Glaser & Strauss, 1967; 2017). This process involved segmenting the units of information into categories by using inclusive or exclusive descriptive phrases to account for all the units of data. The primary researcher also consulted with the secondary researcher as part of the peer debriefing process to help flesh out the categories so that descriptions were more robust.

Thematic analysis. After the units were sorted into categories using the constant comparative method, the researchers looked for similarities amongst the categories to develop emergent themes using thematic analysis (Boyatzis, 1998). Unlike categories, where the descriptions were worded in phrases, the emergent themes were worded in statements of exclusion that differentiated each theme.

FINDINGS

EMERGENT THEMES

Three major themes emerged: 1) an in-depth understanding of mindsketching is necessary for purposeful implementation; 2) mindsketching encourages metacognition; and 3) visual thinking is an integral part of learning.

Emergent theme 1: An in-depth understanding of mindsketching is necessary for purposeful implementation. The first theme centered on the participants' observations, insights, and perceptions on how their use of mindsketching evolved over the years. Two key ideas were pivotal in this theme. First, the teachers' use of mindsketching evolved because, as they incorporated mindsketching more extensively into their lessons, they discovered the adaptability of the strategy. This discovery led the teachers to find myriad ways to weave it into their teaching practice in a purposeful manner. Second, the teachers began to add their own twist to mindsketching. They added their own personality and flair to the strategies as they responded to how their students experienced success in using mindsketching.

During their early implementation of mindsketching, they used the strategy in rudimentary ways: starter or sponge activities or warm-up games before the lesson proper. However, when students began to exhibit understanding of information through their sketches, the teachers realized that mindsketching, if incorporated purposefully into the lesson, may be an effective aid to help their students academically.

With regards to the first key idea of the various uses of mindsketching, the teachers noted that mindsketching could be used to surface prior knowledge of students. In order to introduce new content and concepts, the teachers believed they needed to activate students' relevant prior knowledge so they could build on that knowledge base productively. For example, Helen used a silhouette of a head for students to sketch "what was in their heads" in her second-grade science and math classes to assess if they understood concepts such as multiplication or division in math, or the different kinds of movement in science. In social studies, Tina had her students sketch what they understood about the concept, freedom, when dealing with stories of World War II. Teachers in this study tested students' prior knowledge by using mindsketching to see if they understood abstractions such as fairy tales, multiplication, division, and freedom.

In addition, the teachers believed that the process of activating prior knowledge built additional linkages to existing prior knowledge, thereby aiding the integration and retention of new information. Such linkages were deemed necessary for students to make sense of abstract concepts across the various disciplines in the academic milieu.

The teachers also used mindsketching to review what their students learned and to help them consolidate new material with prior knowledge. The teachers believed their students from poverty had difficulty remembering information because structured learning demanded verbal processing. Students reviewed what they had learned by taking turns to sketch and talk about their sketches. Together with mindsketching and verbalization, the teachers observed that they were able to tell whether their students understood what they were taught because as Rosalind suggested, "…the kids who really grasp it [the content] are able to create a sketch."

Mindsketching was also used for assessment purposes. The teachers adjusted their assessment procedures to incorporate mindsketching into the actual assessment. One insight the teachers had was that since they used mindsketching to teach academic concepts and content, the form of assessment should also incorporate mindsketching. They found that mindsketching helped students retrieve learned information more effectively.

For some of the teachers, mindsketching in assessment entailed not just writing out answers to questions posed in the assessment, but having students sketch to help them provide those responses in the first place. Tina shared that her assessments for social studies consisted of short essay questions but there was also a section where students sketched their responses and used those sketches "to support their writing."

As mindsketching became more integrated into their own teaching practice, the teachers alluded to the notion that mindsketching was a teaching tool that could be easily adapted to cater to the learning needs of students, not a program per se. Rosalind noted the versatility of the tool:

"What I really like about mindsketching is that it lends itself to adaptation so well. If it had been rigorous and very prescriptive–first this, second this, and this is how it always is, then it would not have appealed to me. And then I probably wouldn't have used it. But because you can take it and adapt it and use it in so many situations, it really works for us."

Because of the adaptable nature of mindsketching, the teachers expanded their uses of mindsketching by concocting their own strategies to work in tandem with mindsketching. They noted that mindsketching integrated very well with whatever pedagogical practice they employed, such as role play, problem-based learning, or the use of learning centers.

Besides incorporating mindsketching into their existing teaching practice, the teachers were also responsive to how students actually used the sketches they produced to aid in information retrieval from their memory. When the teachers initially started using mindsketching, students had to sketch very quickly and with minimal details to capture the images they had in their minds' eye. When students produced the sketches, they were able to explain their sketches, but as time progressed,

they had difficulty trying to recall what their sketches signified. As Tina put it: "A mindsketch loses its power if it doesn't talk to you after two days."

Before, the sketches were thrown away after the lesson, but the teachers and students now discovered the value of keeping the sketches in notebooks so they could use the sketches as triggers to recall what they learned. Using the sketches to aid memory was the teachers' way of engaging students productively for successful information recall.

The use of mindsketching in the classroom expanded as teachers gained more understanding of the tool. When the teachers' comfort level with using mindsketching increased, the students embraced its use for comprehension and memory.

Emergent theme 2: Mindsketching encourages metacognition. Johnson (2009, p. 52) provides a working definition of metacognition—"thinking about our thinking"—which involves students being critically aware of their own thinking and learning and monitoring their own strengths and weaknesses as learners. The teachers observed that as they continually used mindsketching, their students became more aware of their own understanding as their minds made connections across different subjects. The teachers provided opportunities for students to transfer their understanding to a different context in another subject. Rosalind provided an illustration of metacognition at work when one of her students made a connection with science and social studies when he understood the word "neutral":

"I had a student who realized, because we'd talked about Switzerland remaining neutral and the neutron did not have a positive or a negative charge and one of the kids actually made that connection… That's quite interesting, isn't it? The kid sketches a neutron and then comes across this word neutral and how that sketch is similar or different to that one…Before, they were very compartmentalized. They really did think that what they learn in science does not bleed into math, does not bleed into social studies."

Apart from making connections within the curriculum, the teachers also observed that their students were engaged in metacognitive processes as they started to notice abstract concepts at work in real-life. This heightened awareness is especially important for students from poverty who often tend to see a disconnect between school and life outside school. Cheryl shared that one of her students learned the concept of addition in second grade when she was adding the number of items her mother was placing on the conveyor belt at a grocery store.

Another instance of metacognition was when students were taught how to keep track of their understanding of an event in a novel. Tina observed when her fifth-grade students experienced difficulty sketching certain portions in the text, she helped them to get back on track by encouraging them to locate obstacles or uncover confusion that hindered their understanding by saying, "Go back and revisit those previous sketches you made…see what you are missing…sketch that new information."

As a result of their students' propensity to be engaged in metacognitive processes, the teachers' language with their students, such as instructions, explanations, and affirmations, encouraged metacognition. Before, when students were engaged in mindsketching, the teachers' instructions were basic; simply telling them to make a sketch. However, their communication with students about mindsketching grew to be more sophisticated and creative. For example, Tina explained how she reminded her students about the sketch being something that was personal only to them, that "the sketch only talks to your brain…you have to put words into it."

Deborah also consistently asked her students, "Whose brain does it talk to?", to remind them that the sketches should only be meaningful to them, and not to others. Further, she explained to her students that the sketches were "From your brain to your sketch, to your mouth", indicating that once students completed their sketches, their next task was to talk about them since no one else understood what the sketches meant. Tina constantly asked her students if they had a "mind movie" to check if they understood a text they were reading. For Tina, if her students did not have a "mind movie," they encountered a gap in their learning process.

Other teachers devised their own metacognitive explanations to encourage their students to produce their sketches. For example, Helen would ask her students, "Where do you have your ideas?" and they would respond, "In my mind. "Then she

would get them to sketch by saying, "Okay, close your eyes to see your ideas. Now open your eyes to sketch your ideas from your mind." Cheryl had her own "mantra" when praising her students when they were able to talk at length about their sketches by saying, "Kiss your brain!" She explained that it was her "…special way to let the students know that they are able to do it…they can think on their own, they are not bad students."

Emergent theme 3: Visual thinking is an integral part of learning. The third emergent theme involved the notion that visual thinking helped and reinforced the learning process. The teachers observed that if their students did not have a picture or image in their minds, there was a high probability they did not understand the lesson content. On the other hand, when the students did have an image in their minds, the teachers observed that their students had indeed grasped the content as they were able to explain what they learned using their own words, instead of regurgitating what the teacher taught. Tina communicated the importance of having a visual while reading a text, as having a "snapshot in their minds."

Cheryl shared her insight about how amazed she was when her students explained their thought processes using their sketches that at first looked meaningless to her:…"sometimes I'll look at their sketches and I'm like, okay, and then they tell me the sketch, and it makes perfect sense. But if you looked at it, you would be like, forget it, they totally missed the mark. But they come up with the most ingenious ways of how they thought of it and how they sketched that image. It's amazing to see how they understand something just from the sketch. To me, it's such a valuable tool to help them see that their thoughts have meaning."

Since the teacher and the other students did not have a clue as to the meanings of the sketches, the students who produced them had to verbalize their thoughts. The teachers noticed that their students from poverty did not have opportunities to verbalize their thoughts in class, either because they did not understand the content, or they were reticent by nature. Mindsketching was a way for them to express themselves and demonstrate their learning in a safe environment. As Tina put it, her students "did not want to speak, but now, they have found their voice and feel empowered…"

As an extension of this visualization-verbalization procedure, the teachers observed that mindsketching must be accompanied by speaking, writing or both—all in complete sentences. To help their students build complex language, a common feature of academic literacy, students were expected to verbalize their sketches. As Winnie explained, "Only the student that produces that sketch will know what the sketch is about, so they have to explain it to someone else…" Therefore, the sketches acted as bridges to verbal communication. According to the teachers, solely engaging in mindsketching without the verbalization part was akin to not fully utilizing the strategy.

All the teachers in the study insisted that their students speak and write in full and complete sentences–a feature of complex language evident in academic literacy. To help their students, the teachers used a variety of sentence prompts to help them speak and write in complete sentences.

Snow (2010) points out that academic language tends to consist of complex ideas compressed into sequenced information. In terms of writing tasks, the teachers observed that much of their curriculum content required students to sequence information. For example, the teachers found that science presented many opportunities for students to sequence information such as life cycles of a plant or animal, the water cycle when discussing how rain was formed, or the cycle of the four seasons. In social studies and language arts, students learned how to sequence information by sketching events in history, in novels, or their own stories. As a result, the teachers noted a remarkable growth in their students in terms of not only the clarity in their writing, but in their desire to write.

In conclusion, the teachers discovered that using visualization in their instruction by way of mindsketching helped their students learn. Tina summed up, "…they're not in the dark anymore. The mindsketching is like the little flashlight in their heads." The teachers found their students to be more engaged in their own learning. Cheryl stated, "…the students are really learning to learn and to be active participants in their own learning...they are no longer passive learners."

DISCUSSION

UNDERSTANDING MINDSKETCHING

Mindsketching is a tool to promote productive learning in an academic setting, especially one in which the majority of students were raised in poverty. Mindsketching provided a first step towards engaging the students in their learning process, specifically: 1) showing evidence of comprehension by having an image in their minds when they understood something, be it concepts or content needed for academic literacy, 2) capturing that image in the form of a sketch, 3) communicating the meaning of the sketch orally, 4) communicating the meaning of the sketch through writing, and 5) recalling what was learned. The learning process using mindsketching appeared to be cyclical in nature and is encapsulated in Figure 1.

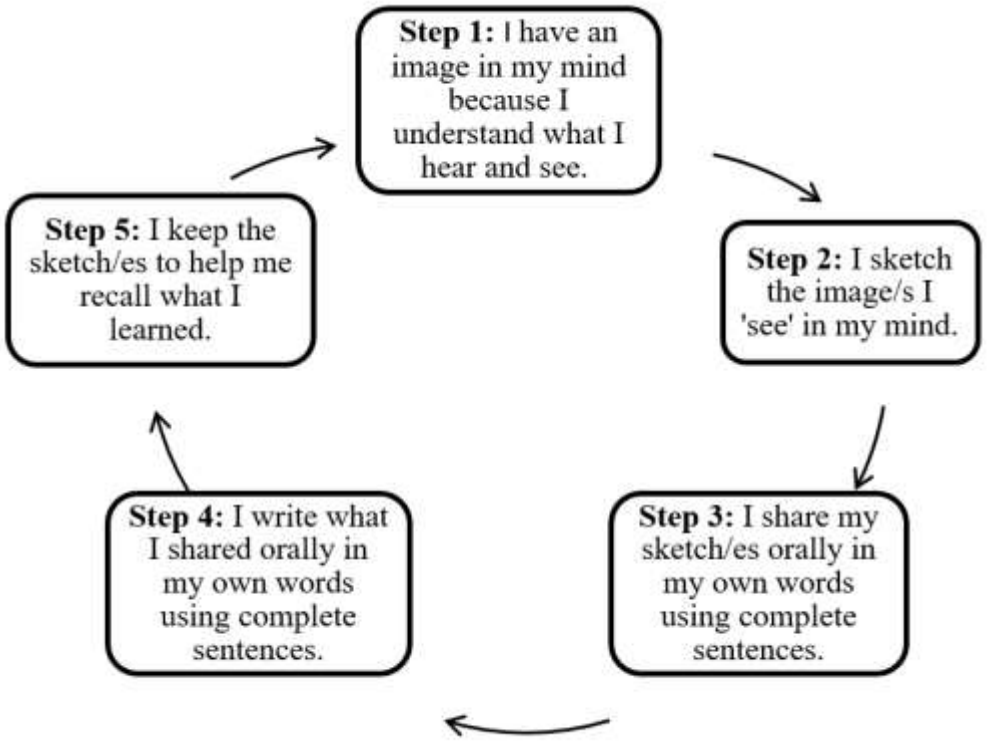

Figure 1: The role of mindsketching during the learning process

Teachers noted that when their students did not fully understand a concept, they had difficulties producing a sketch, or to use Tina's expression, they did not have that "snapshot in their minds." On the other hand, students exhibited their understanding of what they knew or had learned when they were able to produce sketches and then explain those sketches to a peer.

Another aspect of productive learning occurred when students were able to articulate their sketches in their own words using complete sentences. Using complete sentences was necessary as Beverly explained, "Complete thoughts…require complete sentences." For the teachers, mindsketching was a litmus test of checking students' understanding as there was limited latitude for students to simply regurgitate information. During classroom instruction, the teachers shared that they themselves refrained from doing sketching as they were aware that the students might simply copy their sketches.

However, when the students shared their sketches orally to a student partner, they used their own words, not only to describe their sketches but to explain why they had sketched the images in the first place. Therefore, the students had to articulate their own learning. As part of new understanding gained as a result of peer sharing. Thus, students were engaged in structured conversations that were academic in nature and required sharing ideas, thoughts, and understanding pertaining to specific content topics. By serving as a starting point for academic talk, the sketches enabled students to self-direct their oral discussions.

After the oral sharing, students were expected to write down what they had shared. The teachers recounted that the students appeared more comfortable writing as it was similar to oral sharing, albeit in a different medium. Students engaged in mindsketching to enhance their vocabulary and thus, equipped to refine their academic writing. The teachers contended that this process assisted students in making connections between ideas. Rosalind, for example, discovered the power of mindsketching when another teacher friend shared about her woes of student plagiarism in a fifth-grade classroom: Mindsketching mitigates plagiarism.

The teachers recognized that in any learning process information has to be remembered and retrieved. Mindsketching provided a way for the students to recall information more easily as they had to manipulate information through sketching and then explain and write about those sketches. Those behaviors constituted elaborative strategies of learning, wherein visualization and verbal processing aid meaningful processing of information that builds memory (Hodes, 1994; Weinstein & Mayer, 1986). The cognitive ability of retaining and recalling information effectively is not only critical for assessment purposes but assists students in making connections and building their knowledge base as they move up to higher grades.

In sum, the teachers in the study understood that the purpose of mindsketching was to enable students to take charge of their own learning and become engaged in classroom activities, thus leading to academic literacy. As Cheryl pointed out, "Since using mindsketching, they're really learning to learn and to be active participants in their learning…They are excited about learning."

USE OF MINDSKETCHING

The teachers in the study underwent training in mindsketching but shared that they used mindsketching in a variety of ways, given its flexibility. Mindsketching evolved from a game or starter activity to an indispensable tool that helped students navigate the challenges of attaining academic literacy. It was used purposefully by teachers in their curricula to engage students in higher-order thinking skills. The evolution of how teachers described using mindsketching is shown in Figure 2.

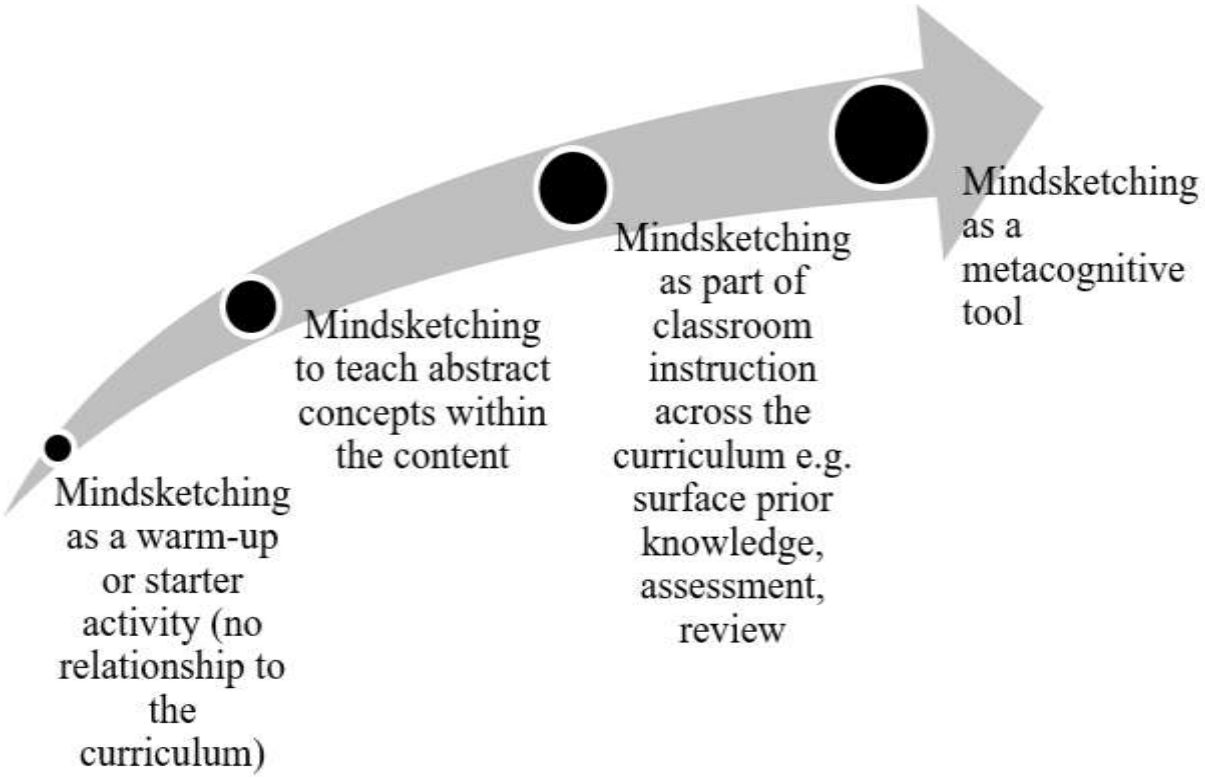

Figure 2: Evolution of the use of mindsketching in the classroom.

To increase fluency in mindsketching, teachers introduced out-of-context games and activities for students to gain more practice in sketching. These mostly came in the form of warm-up or starter activities which had nothing to do with the actual content they were learning. Mindsketching, to a certain extent, was successful because students shared what they sketched with their peers, thereby increasing student engagement.

Academic literacy entails abstract and complex concepts that are cognitively challenging. Therefore, mindsketching was used as a tool to help students understand abstract concepts found in content areas–math, science, language arts, and social studies. These concepts came in the form of domain-specific academic vocabulary (Marzano & Pickering, 2005) present in their respective content areas, such as freedom in social studies and multiplication in math. Teachers found that negotiating abstract concepts within a content area increased the depth of their students' understanding.

As the teachers unearthed the versatility of mindsketching, they infused it purposefully into their pedagogical practices. Mindsketching was not confined to learning abstract concepts, but was helpful in surfacing relevant prior knowledge, reviewing learned material, and assessing understanding of learned material. Teachers used mindsketching consistently to help students build their knowledge base, and through this process, build their academic literacy. In short, the teachers' focal emphasis in using mindsketching was on the process of learning, rather than the product of learning.

The use of mindsketching continued to evolve when the teachers provided opportunities for their students to engage metacognitively with the content. For example, Tina engaged her students with metacognitive thinking by having them explain their thought processes behind their sketches while reading a passage of text.

The teachers continued to think about different ways they could use mindsketching in the classroom, such as looking through the curriculum to formulate a list of concepts and academic words that their students should know. Teachers did not change curriculum around the technique but devised mindsketching strategies to help students make meaningful connections between content areas. As Cheryl pointed out, "I don't change what I'm teaching; I just change how I teach."

CHANGES IN STUDENTS

Before the introduction of mindsketching, the teachers revealed that their students faced challenges understanding the content of the lessons and rarely exhibited any excitement towards learning. Words like "quiet" and "reticent" were used to describe the students.

Teachers in this study observed several changes in their students. First, they were astonished at how most of their students readily took to mindsketching, and after a few weeks of practicing the strategy, had a knack for sketching their images instead of taking time to draw details. For example, Winnie shared how her students were engaged in several drawing activities. When she initially introduced mindsketching, the students were given the option to draw or sketch. Over time, she found that her students preferred to sketch instead of draw because they liked to explain their own sketches to their partners.

Second, the teachers observed that their students were now more engaged in oral activities. They seemed to have found "their voice" as Tina expressed and wanted to talk about what they learned and share new ideas. Teachers also found students more eager to express themselves using their sketches, enabling instruction to move away from highly teacher-centered to instruction wherein students actively made sense of their own learning.

Third, all the teachers in the study mentioned that one of the biggest changes in their students was that they spoke in complete sentences. Before, students used one word or short phrases to orally respond to their teachers, but now, they were comfortable speaking in complete sentences. Similarly, for writing, the students often found it an overwhelming task to write, but now, they not only enjoyed writing, but were writing in complete sentences. As a result of speaking and writing complete sentences, the teachers shared that their students showed improvement in their class assignments and tests. They all agreed that there could be other factors that played a part, but they all opined that mindsketching certainly played a "substantial role" (Beverly's words) in their students' improvement.

Fourth, the teachers noted that their students now enjoyed reading. Teachers shared that students often found it difficult to understand concepts in academic books and therefore disliked any reading tasks. After the implementation of mindsketching, students appeared more comfortable in reading tasks.

IMPLICATIONS FOR PRACTICE

Students from poverty face obstacles in building a verbal language base that can help them to succeed academically. Mindsketching brings a visual component to learning and helps students build connections from images to words. It can assist students in improving their language skills—from simple words and short phrases to complete and complex sentences using descriptive language.

Academic literacy encompasses two main types of vocabulary. The first is domain-specific academic vocabulary found in explicit content areas such as dew point and pressure in science or bisect and scalene triangle in math (Marzano & Pickering, 2005). The second is general academic vocabulary consisting of words that cross multiple content areas such as similar, correspond, and represent (Coxhead, 2000, Dutro & Moran, 2003). Together, these comprise examples of academic vocabulary commonly used in classrooms. These words are found across a wide spectrum of academic subjects, and according to Scarcella (2003), are often untaught despite being fundamental to threading complex ideas together.

To build vocabulary, students can be trained to sketch domain-specific and general academic vocabulary across content areas and explain the meanings using their own words. Teachers can also encourage students to sketch things they see around them, such as things they find on their way to and from school, things that are round, or things that make sounds. As they become more comfortable with sketching concrete objects, they can be encouraged to sketch abstract concepts with the purpose of expanding the use of verbal language.

Reading success is highly influenced by vocabulary size, in terms of the number and type of words students know. Schmoker (2001, p. 2) states, "It is worth emphasizing that the most important single activity to promote reading is reading…and if we regularly write about and discuss what we read." It is not enough that students are able to recite the words in a given text. Reading comprehension can be improved by encouraging students to sketch what they have read and to share orally with their peers.

Paivio (2008) emphasized the visualization-verbalization procedure, that is, classroom instruction entails the use of images for text segments such as words, phrases, and sentences. Thus, students are encouraged to describe their images in progressively greater detail. The teachers in the study found that mindsketching in itself did not help students build academic literacy. What helped to make mindsketching effective was that students were expected to verbalize their sketches through oral and written communication.

The teachers leveraged their students' ability to sketch (a visual skill) to promote academic learning across various content areas through development of oral and writing skills—skills necessary for academic literacy. Teachers can provide their students with conversational opportunities for targeted oral and writing practice after every mindsketching activity. Combining sketches with verbal elaboration, in turn, can further enhance students' learning in areas such as vocabulary, reading comprehension, and writing.

Finally, students naturally make connections between what they know and what they are going to learn. These connections form knowledge structures that are meaningfully organized, so that students can retrieve and apply their knowledge effectively. Mindsketching can help students effectively connect new knowledge to previous knowledge to enhance learning. Teachers can engage their students in mindsketching to understand what students know—or think they know—to help them design classroom instruction more appropriately, by identifying and actively filling in the gaps to correct students' misconceptions.

Authors' Notes:

Real names of participants are replaced by pseudonyms. All diagrams (table and figures) are original work and not reproduced from any other source. This study is not funded by any organization or institution. The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policies or position of Texas A&M University.

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