VTS+: A VISUAL THINKING STRATEGIES VARIANT FOR LOW-INTERACTIVITY DISTANCE LEARNING

Raymund Sison
De La Salle University, Philippines

ABSTRACT

The COVID-19 pandemic has forced governments and educational institutions around the world to look for viable alternatives to campus-based education. However, pedagogical methods such as Visual Thinking Strategies (VTS) might need to be adapted to low-interactivity distance learning environments, such as datacasting. This paper describes VTS+, a version of VTS that, in addition to asking the three VTS foundation questions, involves getting the student to iteratively write down his or her answers to the three foundation questions of VTS until no further details could be observed, and finally writing down what the visual text is communicating to the student. These innovations were designed to increase the degree of learner-self conversation and, through prolonged engagement with the teacher-selected visual text, also the degree of learner-teacher conversation. Quasi-experimental results indicate the effectiveness of VTS+ and a surprising outcome: the conciseness of final interpretations.

KEYWORDS

Visual Thinking Strategies, Distance Learning, Datacasting, English Language Learning.

1. INTRODUCTION

The COVID-19 pandemic has forced government and educational institutions around the world to shift to distance or remote teaching and learning. In developed countries, where most students have computers and Internet access at home, remote learning has largely taken place over the Internet. However, in developing countries, such as the Philippines, much of the remote teaching and learning is implemented using a paper-based approach, in which printed modules are picked up at schools by parents at the start of each quarter, and answer sheets are brought by parents to the schools at the end. Unfortunately, paper-based distance learning has several disadvantages, including unsustainability, especially when used in mass education.

Though less than one-fifth of the households in the Philippines have Internet access, more than four-fifths (83%) of the households have television (TV) sets (DICT, 2019). Through datacasting, which is the broadcasting of data over television signals, learning materials could therefore be delivered inexpensively to students in these households. Compared to the Internet, communication via datacasting might be more limited in that it is primarily one-way, but this is still better in terms of transmission speed and economies of scale than paper-based communication in traditional distance education. The use of datacasting to transmit learning materials is being examined in several United States pilots in South Carolina, Indiana, Pennsylvania (Modan, 2020) and New Mexico (Griswold, 2021).

In the Philippines, while waiting for datacasting infrastructure to be put in place, we have begun developing a framework and set of materials for distance learning via datacasting (DOST-PCIEERD, 2022). This paper focuses on the English learning materials for Grade 6, particularly the design of learning materials for visual comprehension, which is an important English competency taught from Grade 5 onwards. Specifically, the author has developed a version of Visual Thinking Strategies (VTS), called VTS+, for low-interactivity distance learning environments, such as datacasting. The rest of the paper discusses VTS, VTS+, and the pilot test results.

2. VISUAL THINKING STRATEGIES (VTS)

Visual Thinking Strategies (VTS) is a facilitation method for building visual literacy (Yenawine, 2013, viii). Created by Abigail Housen, a cognitive psychologist, and Philip Yenawine, a former education director of the Museum of Modern Art, VTS has become one of the most popular educational methods for viewing art in recent years, whether in museums or in schools (Ishiguro, et al., 2020).

The protocol of a VTS session involves presenting a carefully selected image, posing three specific questions, facilitating discussion, and concluding the session (Hailey, Miller, and Yenawine, 2015). The three "foundation" (Housen, 2001) questions that the VTS facilitator asks are: 'What is going on here (in this picture)?', 'What do you see that makes you say that?', and 'What more can you find?' VTS is designed to be carried out in an environment of group discovery (Housen, 2001).

The length of VTS interventions has been shown to correlate not only with aesthetic development, for which it was designed, but also with the development of elementary students' critical thinking skills, which transferred from art images to science artifacts (Housen, 2001). It has also been shown to correlate with improvements in medical image interpretation skills of medical and nursing students (see Hailey, Miller, and Yenawine, 2015). More recently, the use of VTS is being explored in fields other than the humanities and healthcare, such as engineering (Campbell, et al., 2021) and leadership (Kakim and Priest, 2020).

3. VTS+

As mentioned earlier, datacasting provides a way to deliver distance education in areas with low Internet penetration but high TV penetration. However, the technology-mediated communication in datacasting is primarily *one-way*, from the teacher to the learner. Pedagogical methods such as VTS, which require a great deal of learner-teacher and learner-peer interaction, will therefore need to be adapted for use in low-interactivity distance learning environments, such as those that rely on datacasting.

In the learning materials that the author has designed, VTS is used as the framework for teaching visual comprehension in Grade 6 English, in which images are considered as texts to be "read" or interpreted. Therefore, in their English lessons, students not only "read" paintings, but also diagrams, editorial cartoons, infographics, visual narratives, traffic signs, maps, and other visual images.

In the author's adaptation of VTS, called VTS+, students are shown a picture on their TV or similar device and then asked to fill out a VTS+ Table, shown in Table 1. The first three questions in the VTS+ Table are the same three foundation questions in (Housen, 2001). To compensate for the low degree of learner-teacher conversation inherent in datacasting, the author added a fourth question, which involves the student's *iteratively* asking himself or herself the first three questions until he or she could no longer find anything new in the visual text.

Table 1. VTS+ Table

Question	Your Answer
1. What is going on in this picture?	
2. What do you see that made you say that?	
3. What more can you find?	
4. Repeat steps 1-3 until you could not find anything else. How many times did you repeat steps 1-3?	
5. What is the picture saying to you?	

The addition of this fourth question has two benefits. First, it increases the degree of learner-self (L-S) conversation in distance learning (Sison, 2003). L-S conversation involves implicitly or explicitly developing, executing, and/or monitoring a learning plan, no matter how small, partial, or tentative it is, and reflecting on

one's learning. L-S conversation is related to self-regulated learning (SRL) (Zimmerman, 2005), which has been associated with improvements in students' academic performance as well as strategic behavior and motivation at the primary (e.g., Dignath et al., 2008), secondary (Dignath and Buettner, 2009), and tertiary education levels (Theobald, 2021). L-S conversations are arguably as important to the learning process as learner-teacher (L-T) and learner-peer (L-P) conversations, especially in distance learning. Second, it lengthens the student's engagement with the visual text. If we view the visual text that the teacher has selected or created as a complex message (Sison, 2003) from the teacher to the learner, then increasing engagement with that text can be viewed as also strengthening the L-T conversation.

The author also added a fifth question, 'What is the picture saying to you?' which is similar to the first question, but framed in a more personal way. This not only enables the student to provide an overall interpretation of the visual text after performing an iterative analysis of it, but also enables the student to compare her final interpretation of the visual text against her initial impression of it, possibly triggering self-satisfaction reactions (Zimmerman, 2005) as she realizes how her efforts resulted in new discoveries about the text leading to a final interpretation that is better than the first. The fifth question's being framed in a personal way also paves the way for further analysis of persuasive visual texts, such as editorial cartoons.

4. RESEARCH METHOD, RESULTS, AND DISCUSSION

The learning materials were piloted with a group of volunteer students from the De La Salle University - Integrated School (DLSU-IS). Specifically, these were Grade 5 students who were taking Grade 6 lessons in science and mathematics (on top of their Grade 5 lessons in these subjects). Prior to their participation, we obtained the students' assent and their parents' consent using assent and consent forms. We also obtained permission from the school principal. A pretest and a posttest were then administered before and after the students took four lessons on interpreting visual texts (Lesson 1: Formal Elements of Visual Texts; Lesson 2: Symbols in Visual Texts; Lesson 3: Visual Texts as Narratives; and Lesson 4: Making Connections with Visual Texts). Each lesson is essentially a sequence of lesson presentation-worksheet activity pairs; that is, a lesson is composed of mini-lessons, at the end of each of which is a worksheet activity. Each worksheet activity includes writing down answers to questions (such as the VTS+ questions in Table 1) on an answer sheet. The VTS+ Table was explicitly taught in Lessons 3 and 4, but VTS+ questions 1 and 2 in Table 1 were introduced in Lessons 1 and 2.

Because the datacasting facilities are not yet in place, datacasting was simulated by uploading the learning materials to a shared Google Drive every Monday morning, which students would then download to their devices via the Internet. Nevertheless, the learning materials have been tested and found transmissible via the prototype datacasting setup of the project's partner agency (DOST-ASTI). No other lesson-related communications with the students were performed, in keeping with the limitations of datacasting technology. The students would then email photos of their answer sheets every Friday. The pre- and posttests were administered via Google Forms.

Though there were 13 students who took the pretest, only five were able to take the posttest and all the four lessons on visual comprehension. Part 1 of the pretest/posttest involved interpreting five images. Part 2 involved making connections between five images and one's background knowledge. Neither the pretest nor the posttest required the students to use VTS+ to interpret the images. The students' Part 1 pretest and posttest scores for completeness and accuracy are shown in Table 2. Completeness is measured as the number of salient details in a student's answer; accuracy is measured as the number of details in a student's answer that are correct.

Table 2. Pretest and posttest scores of student participants

Student ID	Pretest Score	Posttest Score
S01	11	12
S05	9	11
S08	9	14
S12	7	7
S13	6	6
Average	8.4	10

As Table 2 shows, there was a 19% increase in the average student score after the participants took our lessons, where they used VTS+. This increase is significant at alpha=0.1, test statistic=0, using the Wilcoxon Rank Test.

Surprisingly, the author also noticed while doing qualitative analysis that the students' posttest answers were more concise. For example, here is S05's pretest interpretation of a diagram of the life cycle of a butterfly:

> *What I see in this picture is how a butterfly is made. Its like its life circle. Because it is indeed the life cycle of a butterfly.*

Here is the same student's posttest answer:

> *This is a life cycle of a butterfly. It represents how a caterpillar transforms to a butterfly.*

It will be noted that not only is the posttest answer less verbose; it also contains an additional detail (caterpillar). Table 3 shows the number of words used by the participants in their pretest and posttest answers.

Table 3. Number of words used in pretest and posttest answers

Student ID	Pretest Answer Length	Posttest Answer Length
S01	85	74
S05	105	55
S08	54	45
S12	28	17
S13	13	9
Average	57	40

As Table 3 shows, there was 30% decrease in the average answer length after the participants took our lessons, where they used VTS+. This decrease is significant at alpha=0.1, test statistic=0, using the Wilcoxon Rank Test.

Conciseness is, of course, not just a matter of using less words. However, if a decrease in answer length is accompanied by an increase in the completeness and accuracy of these same answers, then the answers might indeed be more concise. The author was surprised by this result because nowhere in any of the four lessons were the students told to use less words or to be more concise in their interpretations. In fact, the VTS+ protocol, which asks the students to iteratively do steps 1-3, i.e., iteratively observe and interpret an image, would cause students to generate more words as they observe more details in an image. However, it could be that step 5 of VTS+, coming at the end of a potentially exhausting series of iterations of steps 1-3, taught the students to produce a final interpretation of an image that not only synthesizes all their observations and intermediate interpretations, but also one that does so efficiently.

5. CONCLUSION AND FURTHER WORK

The COVID-19 pandemic has forced governments and educational institutions to look for viable alternatives to campus-based or in-person education, such as distance learning via datacasting. This paper described VTS+, a version of VTS adapted to a low-interactivity distance learning environment, particularly datacasting. The adaptation involves getting the student to iteratively write down his or her answers to the three VTS foundation questions until no further details could be observed, and writing down what the visual text is communicating to the student. These were designed to increase the degree of learner-self conversation and, through prolonged engagement with the teacher-selected visual text, also the degree of learner-teacher conversation.

Pilot-test results showed that posttest interpretations of images were more complete, accurate, and concise than pretest interpretations, indicating that VTS+ might be effective. However, further studies are needed because the sample size of the pilot is small and the students in the pilot test might have above-average intelligence or SRL skills. There are plans underway to do a second pilot run of the lessons at a public

elementary school in the new academic year, during which the author also plans to revise the first two lessons on visual comprehension to explicit teach VTS+, thereby increasing exposure of the students to VTS+. As noted earlier, the length of VTS interventions has been shown to correlate with image interpretation skills. It will also be interesting to unpack the VTS+ innovations to determine whether improvements in performance indicators are due to the increased degree of learner-self conversation or the student's increased engagement with the teacher's selected visual text, which in turn can be viewed as an increased degree of learner-teacher conversation.

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