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Cover Page Footnote

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RESEARCH ARTICLE

Promoting Comprehension Strategies of Intermediate Grade Students Through Datacasting Materials for Distance Learning

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Abstract

Many online learners, especially in resource-challenged schools, struggled with learning gaps during the pandemic. This study focuses on using cost-effective datacasting learning materials for distance education that promote intermediate grade students' self-regulation, reading, and writing skills. Datacasting is the process of delivering computer (IP) data over a traditional television broadcast signal. Locally, where only 17.7% of households have Internet access, but 82.7% have television sets (Department of Informations and Communications Technology, 2019), datacasting affords greater learning opportunities than the Internet. Guided by structure, interactivity, and the functional language teaching theory, this study used sequential explanatory design to explore the role of datacasting in a public elementary school in Cavite in the academic year 2021–2022. Analyses of students' artifacts reveal that their levels of autonomy are non-autonomous, semi-autonomous, and autonomous. Moreover, the data also show that when they navigated the materials, they used these comprehension strategies: preparational, organizational, elaboration, and monitoring. Correlations between culminating writing activities and final writing scores were found but are not statistically significant, which may be attributed to the pandemic-induced sample attrition. The results suggest a need to refine the learning materials following the multimedia principles of personalization and embodiment through judicious text choice and adaptation and task design. Pedagogical recommendations for the use of datacasting materials are also offered.

Keywords: comprehension strategies, datacasting, distance learning, reading proficiency, MELCs

The Philippines has taken significant steps in responding to the United Nations Organization's call for action on equitable and inclusive education for all citizens of the world (Chambers et al., 2016; Musset, 2012). However, these efforts are not seen as fully implemented in accessible and low-cost ICT-enabled curricula across all levels of education. Accessibility to digital resources is a lingering issue confronting most Filipino students and teachers who contend with challenges brought by the digital divide. To date, some governmental actions have been implemented, which included the adoption of the Last Mile Schools Program and the Basic Education Learning Continuity Plan (BE-LCP) by the DepED in School Year 2020-2021 (Department of Education [DepEd], 2020). The programs aim to provide schools with stimulating classroom and virtual environments that address students' and teachers' needs. However, the current consensus is that many students still lack the resources and skills to engage in online learning, and less than ¼ of households have computers (Barrot et al., 2021; Cleofe et al., 2021; De Villa & Manalo, 2020; DICT, 2019; Madrona, 2020; Tabiliran & Blanco, 2023).

The COVID-19 pandemic foregrounded the issues of inclusivity and digital inequities in Philippine education when over 28 million students from pre-primary to college level shifted to distance learning in 2020 (Bustillo & Aguilos, 2022; Rotas & Cahapay, 2020; UNESCO, 2020). Among these students, the majority in public elementary schools had no full access to ICTs because of two factors: delayed and lack of implementation of the government agenda for educational technologies (Nuncio et al., 2020). Indeed, the "new normal" education is replete with hindrances that Filipino students and teachers need to hurdle. Addressing digital inequity and the lack of skills in navigating learning management systems effectively for distance learning requires swift action from the Philippine government and other stakeholders who champion education. Innovative efforts to improve pedagogy in basic education in the country have been launched, but such innovations seemed ineffective as Filipino students continue to underachieve in math, science, and reading. This outcome was reported by the 2018 PISA results (Organisation for Economic Co-operation and Development, 2019) and a World Bank post-pandemic report in August 2022 that disclosed that nine out of 10 Filipino children struggle to read simple texts by age 10 (The World Bank, 2023). This means that they lack the ability to read on grade level, putting the Philippines on the list of lower-middle income economies with the highest rates of learning poverty and increasing number of school drop-outs. Learning poverty is defined as the inability to read and understand short, age-appropriate texts by the age of 10 (Chi, 2023).

In light of the aforementioned deficit, DepED has re-calibrated its K to 10 curriculum (now known as the MATATAG Curriculum) with the development of digital literacy as one of its major objectives. Although a majority of Filipino households have no Internet access, fortunately, most Filipino households have televisions. However, unlike the Internet, but like television broadcasting, datacasting technology is essentially unidirectional, proceeding from the transmitter of a television station to a television receiver with an antenna. It is an innovative, low-cost educational technology because the learning materials are delivered to the students through a television broadcast signal. Moreover, datacasting technology is an important topic because it has not been exploited pedagogically and investigated locally. This paper assumes that through datacasting learning materials, students will improve their use of comprehension strategies, boost their writing competencies, and develop self-regulation in language learning.

This research is significant because it may address the issues surrounding digital inequity and inclusivity in education. Datacasting technology may be useful as a tool to help advance the aims of DepEd's Digital Rise Program as the department continues to embrace educational technologies. The findings of this study might also be useful to all teachers who develop lesson plans incorporating technology. Specifically, this investigation may pedagogically help language teachers design highly stimulating and engaging learning tasks for self-regulated virtual learners equipped with higher-order thinking skills. Moreover, the findings of this study may inspire parents to be more involved in their children's education, specifically in family literacy with their children. Finally, students will directly benefit from this study as its findings may motivate them to consider datacasting materials as a supplementary resource.

Review of Related Literature

This research is inspired by studies on the integration of digital and mobile technologies for language learning and teaching. The demand for educational technologies for online teaching and learning has surged worldwide (Botero et al., 2018; Cervino & Vera, 2020; Haleem et al., 2022; Jung, 2015;). Undoubtedly, many educators, especially language educators, found themselves in the middle of the pandemic unprepared (Bailey & Lee, 2020) and struggled with the challenges of emergency distance education or emergency remote teaching (ERT; Moorhouse & Kohnke, 2021). For schools that offer hybrid distance learning, digital teaching brings many affordances that can nurture students' comprehension and other language skills (Muñoz, 2022; Tuncer & Karatas, 2022).

There is a body of research on the educational uses of ICTs that promote self-regulated learning of students and the teaching competence of teachers across different levels in diverse settings. According to Carrier (2017), educational technologies may be categorized as input technologies, interactive technologies, and portable technologies. He added that interactive tools are devices and software for interaction with materials and the production of written or spoken artifacts. Smartphone apps proved to be effective interactive tools when used by students for academic purposes and not just a distraction to high school students (Clayton & Murphy, 2016). Like smartphone applications, datacasting materials are inherently interactive technologies.

Several studies proved that regarding practicality and convenience, mobile technology was highly favored by students and teachers. During the pandemic years, students benefited from using learning management systems (LMS) such as Google Classroom and open educational resources (OERs) such as video-recorded lectures, web-based textual materials, and YouTube clips during online asynchronous classes in low-resource schools. Researchers (Alqahtani, 2021; Oraif & Elyas, 2021) reported that student engagement with learning materials peaked because the students felt that they were learning at their own pace. However, teachers of asynchronous classes should address gaps created by a lack of real-time guidance and support by creating ways to monitor and regularly evaluate their students' progress (Lian et al., 2021). The researchers recommended that teachers still need to provide students with assistance and guidance so that they could focus on the objectives of their lessons without depriving them of opportunities to grow as self-regulated students. These studies on asynchronous teaching suggest that teachers should ensure that learning materials have comprehensible input, interesting topics and texts, and tasks that develop learning outcomes.

Regarding synchronous teaching, some studies investigated the use of synchronous online language lessons (SOLLS) via video conferencing software (VCS). According to Cheung (2021), the break-out rooms of VCS proved to be useful in developing the communicative competence of elementary students in group work that encouraged multimodal responses. During the pandemic, many schools depended greatly on such platforms as Zoom, Microsoft Teams, and Blackboard Collaborate in that language lessons impacted students because of the regular real-time interaction and communication between them and their teachers. The study of Kamal et al. (2021) showed that if lessons are well-organized and interesting, "shyer students may be more willing to contribute during SOLLs than in-person lessons" (p. 7317). Studies of self-regulated learning for specific language skills such as speaking, writing, and reading exist. Most of these studies investigated and recommended strategy training for university students engaged with print reading (Hemmati et al., 2019; Kavani & Amjadiparvar, 2018; Ozturk, 2019), while a few paid attention to university students' self-regulated learning through digital technologies (Alqahtani, 2021; Ismailov & Ono, 2021; Lian et al., 2021).

In the Philippine context, although DL during the pandemic was met with challenges, the DepED launched the BE-LCP as its flagship project for "upholding the right of Filipino learners to quality, accessible, and inclusive education towards lifelong learning" (Manalo et al., 2022, p. 90). Technology-assisted learning for Filipino public school students with weak digital literacy and bereft of stable Internet connection and gadgets still mar a large part of their learning landscape according to a meta-synthesis of Filipino students' online learning experiences (Aying et al., 2023). These issues have received the attention of policymakers and education officials in the BE-LCP and, most recently, the MATATAG Curriculum. Although the delivery of lessons through DL did not translate into equal learning gains for all students at all

levels, in general, the greatest takeaway for them was a realization that our government could help provide Filipino students with open educational resources and ICTs.

Local studies on digital learning using interactive technologies for primary and secondary students are scanty (Budianto & Yudhi, 2021; Cheung, 2021; Chew & Ng, 2021; Oraif & Elyas, 2021). This is a gap that this study aims to fill. In addition, unlike many studies involving interactive technologies, this research does not aim to investigate strategy training for reading literacy but rather to test how the use of datacasting materials might help basic education students achieve better learning outcomes. The novelty of datacasting and datacasting learning materials for Filipino students is also a motivation for the researchers of this study to undertake this research.

Theoretical Frameworks

Moore's (1993) transactional distance theory underpins this study in that the writers of the lessons and the technical team that created the video lessons were guided by the two constructs of the theory: structure and interactivity or dialogue. *Structure* refers to how content and teaching are organized in courses and programs. On the other hand, *interactivity* or *dialogue* refers to student-content interaction or how the students interact with the reading and writing content of the materials. Concretely, it refers to observable activities that students perform in response to a learning material (e.g., answering a worksheet or pausing a video or animation to do what it says). Traditional, paper-based DL compensates for the lack of teacher-student dialogue by having a high degree of structure: lessons, learning activities, and learning materials are designed carefully and systematically and then tested thoroughly. DL via datacasting will need to have a higher degree of structure than fully online DL but can have a higher degree of interactivity than paper-based DL, especially when one considers not only social interactions (i.e., teacher-student and student-student interactions) but also student-content interaction. Datacasting technology is limited by smaller bandwidth and minimal teacher-student interaction. As such, DL via datacasting can be situated between traditional (e.g., paper-based) DL and fully online DL.

The self-regulation theory (Zimmerman, 2000) also underlies this study. It posits that the outcomes of students' engagement with academic goals are influenced by their outlook on their capability to succeed, mindset, and feelings. The theory is actualized by self-monitoring and reflection while pursuing academic goals. The materials are conceptually supported by the functional language teaching theory that is actualized by communicative language teaching tasks in delivering instruction by means of datacasting. The theory highlights integration, learner-centeredness, contextualization, and construction (Derewianka, 2014). The framework capitalizes on multimedia and age-appropriate texts (expository and literary). Students critically process various types of texts and apply effective language learning strategies that promote both conceptual knowledge and linguistic development (Sari et al., 2015). Top-down communicative techniques are expected to generate high student engagement because learners are provided with scaffolded activities and tasks. Lastly, the schema theory also underpins this study. In practice, students also relate their schema or prior knowledge to the reading texts and tasks that prepare them for the writing activities of the lessons. The teaching strategies that mirror most, if not all, of these stages are scaffolds found within the lessons, such as student-friendly intro- and outro-videos, easy-to-follow lectures with attention-getting visuals, graphic organizers such as VTS+ (Sison, 2022), and tree diagrams, outlines among others that help lessen the cognitive load of writing in the students.

Statement of the Problem

The study endeavored to explore the effects of datacasting materials on intermediate grade students from a public school. It aims to answer the following questions:

1. What are the comprehension strategies of the students?
2. What effects do the datacasting learning materials have on the students in terms of self-regulation and writing skills?

Research Design and Methods of Data Analysis

This mixed-method investigation introduces datacasting materials and aims to examine the materials' impact on the language learning of the students. Specifically, the explanatory sequential

design was utilized as this study's methodology. In this design, we first gathered the quantitative data followed by qualitative information (that is, QUAN + QUAL; Creswell & Plano-Clark, 2011). The data were gathered, analyzed separately, and compared. Complementarity serves as the main purpose of this method in that the qualitative data clarify and illustrate the quantitative data. Figure 1 schematically shows the process. For the quantitative aspect, Pearson correlation was used on the scores of the students in the culminating activities of all Quarter 4 lessons and in the final writing test to find out if the materials impacted their learning (writing). Statistica was the software used to calculate the correlation. Concerning the use of different types of comprehension strategies by the students across the lessons, we did a frequency count manually using a frequency chart. Frequency count is a statistical measure that stands for the number of times a data value occurs in a data set. The percentages were calculated using the formula % = (f / n) x 100 (Glen, 2023). On the other hand, the students' weekly output or artifacts consisting of worksheet activities and tests were coded through Nvivo. The coded data were compared, and the themes extracted were further analyzed and subsequently finalized. According to Revesz (2012), sorting data according to themes can help a researcher identify related content across the data.

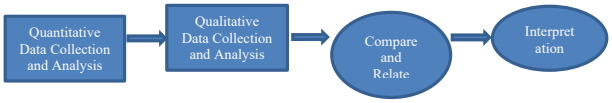


Figure 1
Explanatory Sequential Design

Participants

Convenience sampling was employed in this study. A group of Grade 6 students in a resource-challenged DepED school in the province of Cavite participated in the study that covered Quarter 3 and Quarter 4 in School Year 2021–2022. Grade 6 students were involved because the competencies in Grade 6 are crucial prerequisites of the Philippine secondary school spiral curriculum. The spiral approach to curriculum refers to a learning approach that expands and deepens a student's basic knowledge with increasing complexity every time a student encounters the same topics throughout their academic life. Located in the municipality of Silang, the school has been a recipient of many community engagement projects of our home institution. The community where almost all the student participants came from was a partner of the project team throughout the development and piloting of the learning materials in the school. We were members of the project team who worked with research assistants, educational technologists, teachers from the school, student participants, and parents of the student participants. Table 1 shows the number of participants in the school per quarter. The COVID-19 pandemic exacerbated the difficulties in the school; thus, Quarters 1 and 2 served as the period for familiarization of the student participants with the following: (a) effective use of technologies, including the phablet and applications, such as productivity tools, email clients, cloud storage, and videoconferencing software; (b) the learning framework on which our learning materials are based, which tended to focus on thinking skills that are higher order compared to what they are used to; and (c) the datacasting procedure. However, the number of student participants at the school dropped by 50% from Quarter 2 to Quarter 4. This was due to various factors, including the pandemic, the students' workload at school, and the students' difficulties in adjusting to the project's technologies, framework, and the like.

Table 1
Number of Student Participants in the School Per Quarter (Q)

	Number of Participants			
	Q1	Q2	Q3	Q4
DepED School	26	26	20	13

Materials Development Procedure

The learning materials address the 10 most essential learning competencies (MELCS) for Grade 6 English identified by the DepED. The MELCS refers to the

knowledge, understanding, skills, and attitudes that students need to demonstrate in every learning activity. They are important to be developed as students need them to continue to succeeding grades and for lifelong learning. Figure 2 shows a screenshot of an introductory video of Lesson 11.

Figure 2
A Frame of the Intro Video of Lesson 11

Following a learning framework for Grade 6 English, the development of the materials followed an iterative procedure, consisting of these steps: (a) selection of a learning competency; (b) analysis of the learning competency vis-à-vis the learner and the delivery method; (c) designing a lesson, and the learning materials for the lesson, for the competency, using the framework for distance and remote learning via datacasting; (d) evaluation of the design; (e) development of the lesson and learning materials; and (f) evaluation of the lesson and learning materials. The IT (Instructional Technologists) team in charge of the production of the datacasting materials used Adobe Premier and Blender Video Sequence Editor (VSE), which are free and open-source animation software applications. The deployment of the materials in Quarter 3 included training of the students, orientation for teachers and parents of the children, and provision of tablets. The students took photos of their worksheets and sent them back through their tablets. Figure 3 depicts a typical workflow that the students followed. They accessed the lessons weekly through phablets that served as datacasting technology, studied the materials that included answering all worksheets and SRL activities, and submitted their worksheets and tests using the phablets at the end of the lessons.

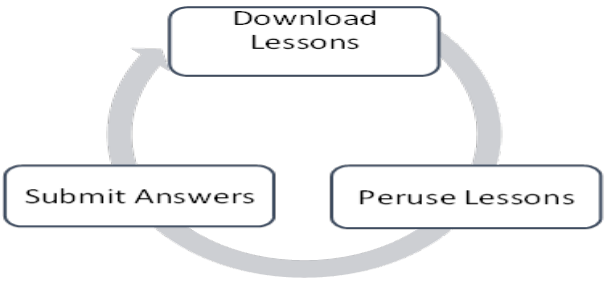


Figure 3
Typical Workflow of Distance Learning via Datacasting

Figure 4 and Figure 5 are examples of worksheet activities in the lessons. Figure 4 shows an obligatory QuERST activity requiring a student to replicate a template of an answer sheet on paper. QuERST activity scores have a bearing on their grade in the subject. It is also notable that an example of translanguaging, a Filipino translation of the activity's directions, is given. Following students' feedback on the worksheet activities' readability, the Filipino translation is a form of scaffolding for comprehension present in obligatory activities of the lessons. The QuERST activity is described further in the results section (Datacasting Materials' Innovations) of this paper.

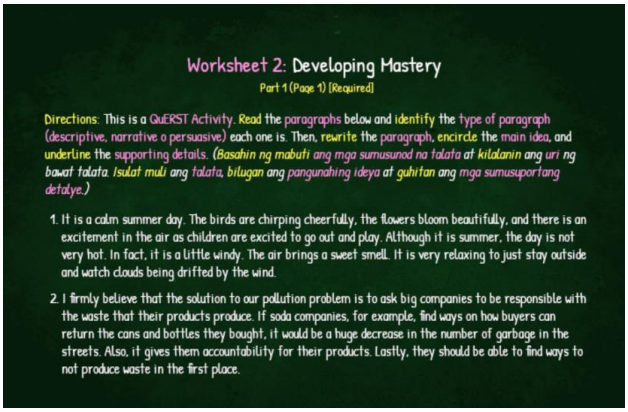
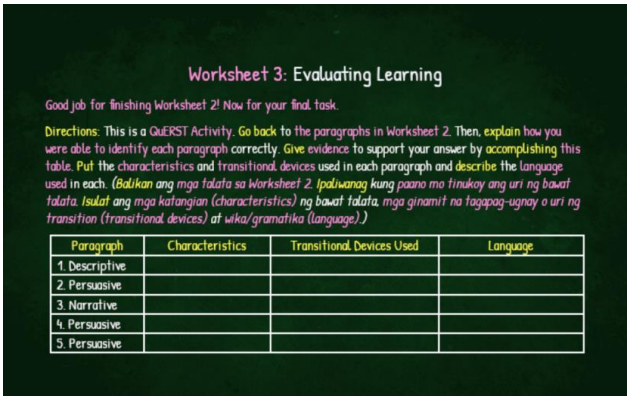


Figure 4
Sample QuERST Worksheet Activity

On the other hand, Figure 5 is an assessment that instructs the students to make a table to be filled with information from their analyses of different texts. Figure 6 shows a student's response to the assessment in Figure 5.



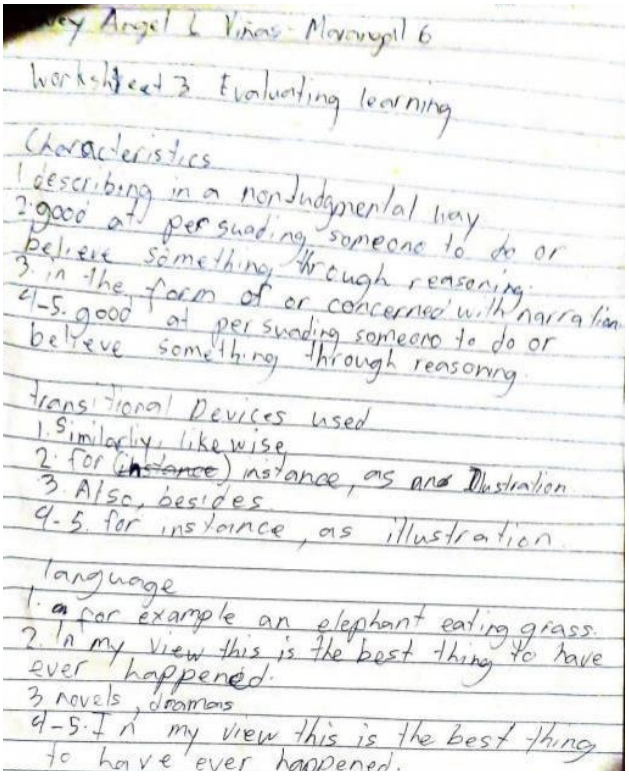
Worksheet 3: Evaluating Learning

Good job for finishing Worksheet 2! Now for your final task.

Directions: This is a QuERST Activity. Go back to the paragraphs in Worksheet 2. Then, explain how you were able to identify each paragraph correctly. Give evidence to support your answer by accomplishing this table. Put the characteristics and transitional devices used in each paragraph and describe the language used in each. *(Balikan ang mga talata sa Worksheet 2. Ipaliwanag kung paano mo tinukoy ang uri ng bawat talata. Isulat ang mga katangian (characteristics) ng bawat talata, mga ginamit na tagapag-ugnay o uri ng transition (transitional devices) at wika/gramatika (language).)*

Paragraph	Characteristics	Transitional Devices Used	Language
1. Descriptive			
2. Persuasive			
3. Narrative			
4. Persuasive			
5. Persuasive			

Figure 5
Assessment Activity



Worksheet 3 Evaluating learning

Characteristics
1 describing in a non judgmental way
2 good at persuading someone to do or believe something through reasoning
3 in the form of or concerned with narration
4-5 good at persuading someone to do or believe something through reasoning

Transitional Devices used
1 Similarly, likewise
2 for instance, as and illustration
3 Also, besides
4-5 for instance, as illustration

Language
1 for example an elephant eating grass.
2 In my view this is the best thing to have ever happened.
3 novels, dramas
4-5 In my view this is the best thing to have ever happened.

Figure 6
Screenshot of an Answer Sheet

Results

This section presents the quantitative data and key findings from the data analyses.

Quantitative Data

For research question number 1, Table 2 presents the number and frequency of use of the various types of strategies in worksheets across the three lessons of Quarter 3, wherein a total of 50 strategies were used. The students used SRL most frequently (31 times or 62%) across the three lessons. It is followed by the information-gathering grid (10 or 20%), outlining is third (6 or 12%), and fourth is diagramming (3 or 6%). Data in Table 3 also show the SRL activity (25 or 26.88%) occupying the top spot among the eight strategies used by the students in Q4. Answering a crossword puzzle is second (17 or 18.27%), third is end-of-lesson survey (ELS), fourth is determining word meanings through context clues (13 or 13.97%). In 93 instances of strategy use, more strategies were used in Lesson 11 and Lesson 12 than in Lesson 13 and Lesson 14. The preponderance of strategies used in Lesson 11 and Lesson 12 may be ascribed to the quantity and cognitively demanding reading activities the students processed in the lessons.

Table 2
Participants' Use of Strategies in Worksheet Activities of Q3

Student Number	L8	L9	L10	Total	**% of strategies** in the data set
17	SRL			1	2%
25	Info-grid; Diagram		SRL (3)	5	10%
27	Info-grid (2)			2	4%
28		SRL; Outline		2	4%
34	Info-grid; Diagram			2	4%
35	SRL			1	2%
37	SRL	SRL (3); Outlines (2)	Info-grid; SRL (3)	10	20%
39	Info-grid	Outline; SRL	Info-grid; SRL (3)	7	14%
47	Info-grid; SRL		SRL (2)	4	8%
48	SRL	Outline; SRL	SRL (3)	6	12%
49	Info-grid	SRL		2	4%
51	SRL; Info-grid; Diagram	SRL; Outline	SRL (3)	8	16%
TOTAL	17	14	17	50	100%

Table 3
Students' Use of Strategies in All Q4 Lessons

Student Number	**L11**	**L12**	**L13**	**L14**	**Total**	**% in the Data Set**
17	Answering a puzzle; SRL				2	2.15%
25	Answering a puzzle; SRL	Context clues; Outline		Crossword puzzle; Inferring; SRL	7	7.53%
27	Answering a puzzle				1	1.08%
28	Answering a puzzle; SRL	Context clues; Outline			4	4.3%
34		Context clues; Outline		Crossword puzzle; Inferring; ELS	5	5.38%
35	Answering a puzzle; SRL End of lesson survey (ELS)				3	3.20%

37	Answering a puzzle: SRL	Context clues; Outline;	Context clues;	Crossword puzzle;	15	16.12%
	ELS	SRL; ELS	Comprehending M.I; Important Details; SRL; ELS	Inferring; SRL		
39	Answering a puzzle; SRL;	Context clues; Outline	Context clues; SRL	Crossword puzzle;	16	17.2%
	ELS	RL; ELS	Comprehending M.I; Important Details; SRL; ELS	Inferring; SRL		
47	Answering a puzzle; SRL	Context clues; Outline			6	6.45%
	ELS	ELS				
48	Answering a puzzle; SRL	Context clues; Outline			7	7.53%
	ELS	SRL; ELS				
49	Answering a puzzle; SRL	Context clues; Outline	Context clues; SRL	Crossword puzzle;	12	12.9%
		SRL	Comprehending M.I.; Important Details	Inferring; SRL		
51	Answering a puzzle; SRL	Context clues; Outline;	Context clues; Compre-	Crossword puzzle;	15	16.12%
	ELS	SRL; ELS	hending M.I.; Important Details; SRL;ELS	Inferring; SRL		
TOTAL	27	28	20	18	93	100%

Students' Use of Comprehension Strategies

Table 4 names, defines, and gives examples of comprehension strategies the students employed in making sense of texts in the Q4 lessons. *Comprehension strategies* are conscious plans or sets of steps that good readers use to understand the meanings of texts. These strategies are also described as techniques that enable the students to complete tasks. *Reading comprehension* refers to the ability to process texts (print or electronic form) to understand the meanings conveyed. In the lessons, different questions address different comprehension levels: literal, inferential, and critical. The literature names various types of strategies, but the ones used by the students in this study resemble those that Gunning (2006) has identified. Table 4 outlines the types of comprehension strategies: preparational, organizational, elaboration, and monitoring. These comprehension strategies comprise sets of strategies the students used in the three stages of a reading lesson: pre-reading, while-reading, and post-reading. In the pre-reading phase, a student tackles a reading activity by listening to take a cue from the video lesson, which may be any of these strategies: setting a purpose for reading or making a prediction about the content of a text. In the while-reading phase, monitoring understanding of a text occupies his consciousness of a text's main ideas. Important details, purpose, and tone and may do any of these other strategies: (a) rereading hard-to-comprehend sections of a text in order to grasp the meanings of the sections; (b) looking up the meaning

of unfamiliar words; or (c) paraphrasing sentences or taking down notes to help retain the meaning in complex sections of the text. In the post-reading phase, comprehension strategies that a student may deploy include (a) reflecting on the message and summarizing what is read, (b) considering the text's relevance to self, others, and society, or (c) determining how the text is related to other texts previously read.

Datacasting Materials and Students' Self-Regulated Learning

A qualitative analysis of (a) the participants' submission behaviors and (b) interviews with them and their parents yielded the following categories: completeness of submissions, timeliness of submissions, need for reminders from the project team, and need for parental assistance (including direct instruction in the contents of a lesson). These attributes are associated with the self-regulated learning construct anchored on Zimmerman's self-regulation theory, one of the theoretical frameworks of this study. We labeled the overall concept that encompassed the above categories as "autonomy." Operationally, autonomy in this research is the ability to submit complete and timely artifacts (answer sheets) with minimal reminders from the project team and minimal assistance from parents or older relatives. A rubric was then developed so that (a) each participant could be scored with respect to the above dimensions and (b) an overall score for each participant could be computed. We then placed each learner in one of three groups, which we labeled "autonomous" (score > 2.8), "semi-autonomous" (2.0 ≤ score ≤ 2.8), and "non-autonomous" (score < 2.0). As can be seen in Figure 7, most of the participants belonged to the non-autonomous group, which means that they accomplished very few (0-35%) of the required worksheets, very rarely (0-35%) submitted their worksheet answers on time, very rarely (0-35%) submitted their answer sheets with minimal reminders, and could hardly accomplish their worksheets without the help of parents or other relatives.

Table 4

Comprehension Strategies in the Lessons Strategies Definition and Examples

Strategies	Definition and Examples
Preparational	Activates prior knowledge about a particular topic, such as setting purpose and goals, predicting/previewing parts of the text
Organizational	Select important details and build relationships among them. Examples are identifying the main idea and topic sentences, classifying information, deciding which information is relevant, sequencing, summarizing, and following directions.
Elaboration	Additional processing of the text that creates links between the text and a reader's background knowledge of the topic, examples are making inferences, visualizing images, and asking questions.
Monitoring	Being aware of one's own mental process (self-regulation while reading and knowing when to use the three other types of strategies.

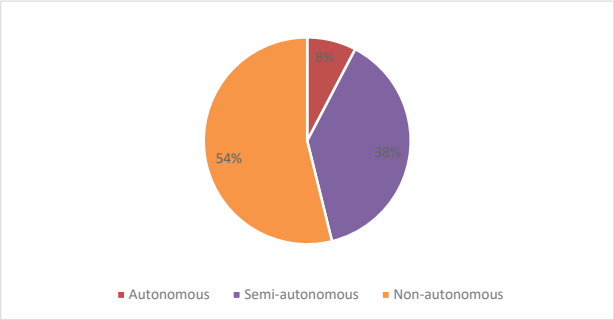


Figure 7
Participants Grouped According to Degree of Autonomy

Table 5 shows the number of artifacts submitted, worksheet submission rate, and level of autonomy of the students. The word artifact means a page or an image. Although the number of artifacts submitted by each student has some value, it should not be used as the main indicator of the student's worksheet submission rate, given that some students submitted several images just for one worksheet. In contrast, others only submitted one image per worksheet or combined several worksheets or items in one image submitted. Looking closely, it is interesting to note that the more autonomous or independent students generally had an overall higher rate of submission when compared to the students who were non-autonomous or were monitored and aided by their parents or guardians. Student number 37, the only student who worked on the modules independently, had a submission rate of 70% of all the worksheets used in this analysis. Activities in the worksheet and that every single prompt was answered.

Table 5
Worksheet Submission Rate and Level of Autonomy

Student No.	No. of Artifacts Submitted	No. of Worksheets Submitted	Worksheet Submission Rate	Level of Autonomy
S17	7	5	16.67%	Non-autonomous
S25	11 (1 video)	8	43.33%	Semi-autonomous
S27	14	6	20%	Non-autonomous
S28	9 (1 video)	10	33.33%	Non-autonomous
S34	8	5	16.67%	Non-autonomous
S35	2	4	13.33%	Non-autonomous
S37	28 (1 video)	21	70%	Autonomous
S39	17 (1 video)	13	43.33%	Semi-autonomous
S46	4	2	6.67%	N/A
S47	27	19	63.33%	Semi-autonomous
S48	28 (3 videos)	17	56.67%	Semi-autonomous
S49	27 (1 video)	26	86.67%	Non-autonomous
S51	39 (2 videos)	25	83.33%	Semi-autonomous
	TOTAL:221	MAX: 30		

Table 6 presents the number of artifacts and test types in the lessons. Of all the artifacts gathered for the analysis, "Answering Questions" was by far the most numerous test type utilized across all worksheets in the learning materials. This test type comprised approximately 58.82% of all artifacts that were gathered for this analysis. Under the code category for "Content," artifacts were coded by both completeness and accuracy.

Table 6
Number of Artifacts Per Lesson and Worksheet Test Types

Lesson No.	No. of Artifacts	Test Type/s
E608	37	W01: Answering questions W03: Completing the information gathering grid; writing a report
E609	31 (10 videos)	W01:Answering Questions W02: Writing an outline W03: Answering questions + making video presentation
E610	29	W01:Answering Questions W02:Answering Questions W03:Answering Questions W04:Answering Questions
E611	7	W03: Completing a table
E612	10	W03: Writing a persuasive essay
E613	11	W02:Answering questions W03: Writing a persuasive essay
E614	5	W05: Writing a persuasive essay
TOTAL	130	

Correlation Between Q4 Culminating Activities and Q4 Learning (Writing)

Table 7 conveys that there is a correlation (r = .832) between the Q4 culminating-worksheet activity (CWA) scores and final writing scores in Lesson 13, though this is not statistically significant (p=.168), and only for the autonomous and semi-autonomous students. We also found a correlation (r=.741; p=.152) between the L14 CWA scores and writing scores, though this is also insignificant (p=.152). The sample size might be the reason why the correlation is not statistically significant. For Lesson 11 and Lesson 12, Table 7 also shows that there is no correlation (r = .139; r = .05) between the students' scores in CWAs and their writing scores (p =.823; p =.937), therefore not statistically significant.

Table 7
Correlation between Q4 Culminating Worksheet Activity Scores and Q4 Learning (Writing) Scores

	L11 CWA	Post		L12 CWA	Post		L13 CWA	Post		L14 CWA	Post	
25	3	4	r=.139	6	4	r=.05				6	4	r=.741 p=.152
37	3	7	p=.823	6	7	p=.937	7	7	r=.832 p=.168	7.5	7	
39	3	3		5	3		6	3		5.5	3	
47	2	5		4	5		5	5		5	5	
51	3	9		5	9		9	9		7	9	

Discussion

This section discusses qualitatively the answers to the research questions.

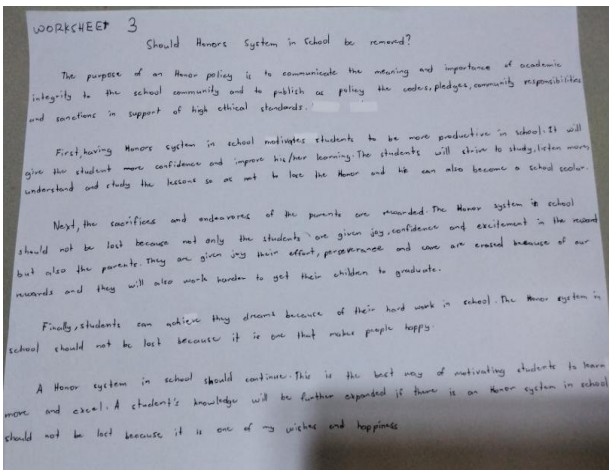
Students' Reading Proficiency Levels and Their Application of Various Types of Comprehension Strategies

The DepED requires all language teachers to administer the Philippine Informal Reading Inventory (PHIL-IRI) with their students to determine their reading proficiency levels. The test outcomes are used as a guide for materials development and lesson planning by the teachers. The said test was given to the students of this study at the start of the school year. Students' reading levels play an important role in their use of comprehension strategies. As mentioned earlier, the reading levels are independent, instructional, and frustration. The four students (numbers 27, 35, 48, and 49) with frustration levels garnered an average of 5.5% (see Table 2 and Table 3), which means they completed 13 strategies across the lessons even though they were categorized in the frustration level. This level indicates that a student manifests withdrawal from reading activities by refusing to read. Surprisingly, the data show that the students in this study coped well with the reading activities of their lessons. It is notable in Table 2 that student number 48 is ranked 4th among the top 5 in terms of the quantity of strategies used. The other levels of reading proficiency are instructional (the level at which a student profits from instruction), and independent (the highest level at which a student can read independently with ease without the assistance of the teacher). Occupying the highest spot in the top 5 is student number 37 (independent), second is number 51 (instructional), third is number 39 (independent), and fifth is number 25 (independent). Both Table 2 and Table 3 also show that the students used metacognitive strategies (such as the SRL activity and the End-of-the-Lesson (ELS) worksheets), organizational strategies (examples are writing outlines, comprehending the main idea of text/s, determining important details in texts, following directions, sequencing, and summarizing), and elaboration strategies (such as cloze test, making inferences connected with meanings of unfamiliar words using context clues and answering crossword puzzle, types of characterization in narratives based on author's descriptions of setting and characters and dialogue of characters) when they navigated the lessons. Additionally, based on the data in Table 3, it is clear that there are no big changes in the number of strategies used by the students except the increase (from 2 to 12 strategies) attained by student number 49 (frustration level), which accounts for 12.9% of the total number of strategies used by all students. These results tie well with previous studies (Manoli & Papadopoulou, 2012; Park & Kim, 2011) on graphic organizers as visual scaffolds in reading and writing lessons and second language learners' application of reading strategies such as setting up reading purposes and planning, previewing and determining what to read, connecting prior knowledge and experiences with texts and tasks, and inferring when processing online L2 texts.

Datacasting Materials' Innovations and Their Effects on the Students' Writing Skills and Autonomy

Although the students' CWA scores and final writing scores on Lesson 13 are not significantly correlated (r = .832; p = .168), there are framework-based innovations used in the lesson that might have contributed to their learning. Qualitatively, Lesson 13 (Deepening Persuasive Writing Skills) walks the students further through the characteristics and elements of persuasive writing. The lesson refreshes the students' minds via a short lecture on the relevance of factors such as topic selection before drafting an essay. The lesson transitions to attention-getting techniques and the role of the thesis statement in the introduction of the essay. The students are reminded about the characteristics of an effective thesis statement and the relevance of the writer's awareness of the purpose and audience of the essay. Examples of good thesis statements are given. From a discussion of the thesis statement, the lecture transitions to writing the body with emphasis on three important elements: ethos, pathos, and logos. Capping the segment of the lesson is a discussion about how to conclude the essay. Techniques such as writing a summary statement, a call to action, and a restatement of the thesis are explored.

The QuERST answer sheet (for Developing Mastery of the lesson plan) has three important columns. In this enabling activity, the students were expected to read analytically an essay using a three-column QuERST answer sheet. The first column contains the students' answers to questions that require varying cognitive levels of thinking. Question numbers 2, 4, 5, 8, 9, and 10 require critical thinking. Students 37 and 51 nearly got all answers right, whereas students 39 and 47 are not far behind, with just 1 point separating them from the two leaders. Student number 25 did not submit a worksheet. Consistency of correctness of answers is also seen in the score (5/5) of student number 37 on the activity of column 3. Furthermore, the students demonstrated their critical thinking skills by creating a table and explaining their answers in the table. Students 39 and 51 almost got perfect scores (4.5/5). Student number 47 did not submit a worksheet. The CWA of Lesson 13 challenges the students to write freely about a topic that interests them (as shown in Figure 8). This option might have spurred them on. Technically, this writing activity requires an extended response that allows a student "maximum flexibility and free-thinking in the generation of his/her response" (Witte, 2012, p. 209). Student 51 almost got a perfect score (9/10) by writing a well-supported claim, whereas Student 37 got a lower score (7/10) than the leading Student 51 this time for providing little factual support or opinion. Students 39 and 47 wrote their essays with topic sentences but with few elaborating sentences.


WORKSHEET 3

Should Honors System in School be removed?

The purpose of an Honor policy is to communicate the meaning and importance of academic integrity to the school community and to publish as policy the codes, pledges, community responsibilities and sanctions in support of high ethical standards.

First, having Honors system in school motivates students to be more productive in school. It will give the student more confidence and improve his/her learning. The students will strive to study, listen more, understand and study the lessons so as not to lose the Honor and he can also become a school scolar.

Next, the sacrifices and endeavorss of the parents are rewarded. The Honor system in school should not be lost because not only the students are given joy, confidence and excitement in the reward but also the parents. They are given joy their effort, perseverance and care are erased because of our rewards and they will also work harder to get their children to graduate.

Finally, students can achieve they dreams because of their hard work in school. The Honor system in school should not be lost because it is one that makes people happy.

A Honor system in school should continue. This is the best way of motivating students to learn more and excel. A student's knowledge will be further expanded if there is an Honor system in school should not be lost because it is one of my wishes and happiness

Figure 8
Screenshot of a Student's Essay

We also found a correlation (r=.741) between the L14 CWA scores and final writing scores, though this is insignificant (p=.152). Notably, like Lesson 13, Lesson 14 has framework-based scaffolds that might have eased the students' learning. Lesson 14 focuses on grammar and ends with a culminating writing activity that suggests two topics as options. As in the other video lessons, a writing assessment concludes this lesson following the framework of the datacasting learning materials. If a student does not choose either of the topics, they may write about a topic that is interesting to them. The writing prompt requires a restricted response, specifically the length of the response (minimum of two paragraphs). The topics are: (a) Does God help those who help themselves? (b) Schools are now ready to hold face-to-face classes; and (c) Own topic. Student 37, tackling a topic of his own choosing, has a thesis statement that is supported by factual evidence. The factual support provided indicates that the writer is well-read about planets, especially Pluto. Student 51 developed a two-paragraph essay on one of the two suggested topics (Schools are now ready to hold face-to-face classes.). Regarding length, the topic sentence of the first paragraph has two well-chosen factual supports. The second paragraph relates the number of schools that are ready for the face-

to-face mode. The use of statistics indicates that the writer seemed well-informed about the topic, possibly because she read about the pandemic and how schools prepared to welcome students. However, it seems that the second paragraph is unfinished and could have been easily expanded with 1–2 more supporting sentences and a concluding sentence. Students 25 and 39 chose the topic "Does God help those who help themselves?" The writers each managed to write a single paragraph about the topic. They provided topic sentences and supported them with 1–2 elaborating sentences. Student 47 chose to tackle the topic extracurricular activities and their impact on students in a short paragraph. He wrote a short paragraph that mentions the ways extracurricular activities benefit students. Three of the five students have problems with syntactic complexity development in composing. Based on these, it seems that L13 and L14 (and the SRL activities) might have contributed to the autonomous and semi-autonomous students' Q4 learning. Figure 9 shows a screenshot of a student's artifact with answers to an SRL activity.

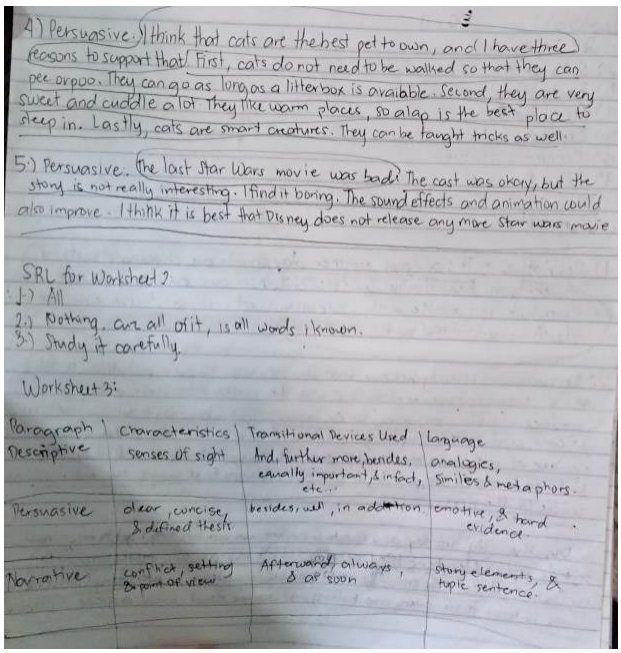


Figure 9
Sample Answer Sheet with SRL

Regarding Lesson 11 and Lesson 12, we think it is not logical to conclude that the affordances of the lessons did not affect the students' writing skills. There are also framework-based innovations in the lessons that might have benefited them. Importantly, critical thinking skills are expected to be developed through questions that require the students to analyze, synthesize, and make judgments about what they read or see. In Lesson 11, the students are directed back to the paragraphs in Worksheet number 2 to explain how they were able to identify the type of the paragraph and to provide evidence to support their answers using a four-column table, which they replicated on a piece of paper. The last three columns were filled in with information about the texts' characteristics, transitional devices, and language. Making a table and writing an elaboration merit 1 and 2 points, respectively. The activity also boosts their skills in categorizing or classifying ideas and topics, which is a basic thinking skill. Classifying is a skill that allows the students to identify groups in which ideas and concepts of a text will be put together. The scores the students gained in Lesson 11's culminating activity indicate that they could express their opinions without writing lengthy elaborations.

Moreover, Lesson 12 relates to Lesson 11 as it also aims to help the students develop their persuasive writing skills. This lesson introduces the process approach to the students and teaches them how to compose a short essay with three equally important parts, namely: introduction, body, and conclusion. Lesson 12 has two worksheet activities. Worksheet number 1 sharpens the students' skills in making inferences using context clues to arrive at the meanings of five keywords from the reading material. Student number 25 got a score of 4 over 5, whereas Students 37, 39, 47, and 51 got 5 points each. On the other hand, Worksheet number 2 is a QuERST worksheet that asks the students to copy the structure of a sample outline provided in Column 1 of their worksheets, and then the teacher's outline in column 2. On page 3 of the same worksheet, three questions are posed. It is noteworthy that SRL question number 3 has to do with a rubric for evaluating a sample essay based on the following criteria: content, development, and language. The rubric is discussed in an earlier lesson and is used for all culminating activities across the lessons and post-test writing tests. In this activity, the students rated the essay numerically and wrote a supporting sentence for the scores they gave. Student 51 received the highest possible score of 7, followed closely by Students 25, 37, and 39, who each got 6 points, whereas Student 47 trails behind them with 2 points. In the culminating writing activity (CWA) of Lesson 12, with 6 as the perfect score, Students 25, 37, 39, and 51 received 6, 6,

5, and 5, respectively. Student 47 got a score of 4, which is an improvement from her score in the QuERST activity. These scores may suggest that the lesson's enabling activities motivated the students to write. Some of the pieces of evidence of learning include the well-supported claim of Students 25, 37, and 51 and the presence of structural errors in the sentences of their short but meaningful essays, particularly the grammatical errors in the essay of Student 39.

Datacasting Materials' Impact on the Non-autonomous Students' Writing Skills

For paragraph and essay writing activities, most autonomous students did well in terms of overall completeness and accuracy. The outputs were also rated highly in terms of the dimensions of paragraph development (sentence fluency, organization, and transition), which shows that they knew how to express themselves well in longer strings of language. However, the non-autonomous students' responses (Students number 17, 27, 28, 34, and 35) tended to be short, mostly one to two sentences or single-paragraph essays in the post-test. Their inability to expound topic sentences is evident. Research explains that the development of writing fluency is a complex process that does not happen overnight. For L2 writers, especially at the elementary level, writing is a much more demanding cognitive skill than reading tasks. We think that for the non-autonomous students, composing was a very challenging task, "placing greater demands on their working memory than reading tasks do" (Wolsey, 2010, p. 195).

We believe that their paragraphs' brevity, incompleteness, and grammatical errors indicate their developmental stage as second language (L2) writers. Their reading proficiency levels (frustration and instructional) might have also caused the lack of content in their essays. Therefore, our findings seem to suggest that error-free writing with a high level of syntactic complexity cannot be expected of L2 elementary grade writers such as the students in this study, conducted for one academic year only. Syntactic complexity, a part of syntactic development, is an intricate construct made up of several sub-constructs and components. It is a writing dimension deemed important as a primary indicator of L2 students' growth in writing by L2 writing researchers (Akak & Saricaoglu, 2021; Crossley & McNamara, 2013; Kyle et al., 2021; Ortega, 2003, as cited in Li et al., 2022). In the written responses of the non-autonomous students in this study, grammatical errors were the most commonly occurring errors, followed by punctuation errors, spelling errors, and capitalization errors, in that order. The breakdown of errors from most to least occurring is as follows: grammatical errors (35.53%), punctuation errors (21.05%), spelling errors (17.11%), and capitalization errors (9.21%). Interestingly, works that were error-free occurred less than those that contained the most commonly occurring type of error (grammatical), and around 13.16% of all submissions under this test type were tagged as "error-free." For both answering questions and writing test types, the grammatical errors committed were primarily comprised of errors in subject-verb agreement. It appears that students commonly made mistakes in terms of ensuring that singular subjects had singular verbs and plural subjects came with plural verbs. The students often misplaced the letter "s" in either the subject or the verb, which caused grammatical errors to occur. However, in terms of the overall meaning of their ideas, their outputs remained relatively unaffected by these errors, and their ideas were still mostly comprehensible. Finally, it is interesting to note that the students tended to revert to writing in Filipino, as was observed in a few instances throughout the analysis. Of all submissions, 3.95% were found to have been written in Filipino. In the context of translanguaging, this phenomenon may mean that some students would still feel more confident in being able to express themselves better in Filipino than in English.

Datacasting Materials as an Intervention

The results emphasize the importance of datacasting as a timely pedagogical tool. One of the issues students face in distance learning is the lack of digital accessibility and confidence in using technical media and other ICTs (UNESCO 2020, April). Today, almost all schools consider DL, hybrid or blended in form, as not just "an emergency teaching and learning delivery mechanism" (Moore, 1993, pp. 3–4) but as a permanent component of their institutional course design and development (CD & D), one of the four interrelated and interacting sub-systems of distance learning (Moore, 1993). Drawing insights from the results of this study, we think that datacasting technology and materials can be considered as a potentially effective step towards planning and maximization of ICTs in online course development (Roddy et al., 2017) for language

teaching and reading literacy of schools. The findings of this study reveal that datacasting materials, as a self-access resource, can support autonomous or self-directed learning. In most resource-limited Philippine public schools, these low-cost datacasting materials could offer students affordances that stimulate their motivation to learn independently with little teacher control. These affordances teach them how to manage their self-learning (Richards, 2015). One of the theories that support the design of datacasting materials is the process of self-regulation (Zimmerman & Schunk, 2001). Self-regulated learners are capable of moving forward toward the completion of a series of activities in the datacasting learning space. Illustratively, the materials in this study enable the students to use comprehension strategies in its scaffolded reading and writing activities and well-sequenced practice exercises with clear objectives and directions. Intro videos and outro videos with student-friendly voice-overs, graphic organizers in short, engaging videos in each lesson, answer keys, easy-to-use rubrics, and SRL worksheets for self-reflection are some of the framework-related innovations in the lessons that might have led to the students' learning. Regarding presentation style, the datacasting materials' audio narrations, on-screen texts, and polite manner of voicing over reflect the principles of personalization and embodiment (Clark & Mayer, 2016). The conversational style and polite language used in the materials give the students a sense of social presence, as if they are interacting with the authors of the materials (Sison et al., 2023). Furthermore, the findings of this study also imply that such affordances could be created by teachers when writing lesson plans that utilize meaningful and authentic language use and highlight reading literacy practices for L2 learners with varying reading and writing proficiency levels.

Conclusion and Recommendations

In this research, we argued that datacasting materials could potentially develop strategic readers and self-regulated language learners. Results of the study revealed that it is certainly possible for competencies at higher levels of Bloom's revised taxonomy to be learned by intermediate-grade students even in a low-interactivity distance learning context, such as via datacasting. This is indicated by the different kinds of comprehension strategies that they utilized during their engagement with the datacasting materials. Results also showed that the English framework for the design of lessons and learning materials is effective in facilitating learning, as indicated by the culminating activity worksheet scores and their final writing scores. Self-regulated learning, activities for which were embedded throughout the lessons and learning materials, has also been shown to have enhanced the students' self-directed learning. The findings of this study align with those of previous studies on the power of digital language lessons to develop self-regulated learners (Oraif & Elyas, 2021; Rivers et al., 2022).

However, some study limitations should be acknowledged. For designers of datacasting materials, the results also suggest that the materials would lead to higher interactivity by using more types of age-appropriate texts with interesting topics for instruction and assessment. Second, this investigation focuses on Grade 6 English MELCs only as such future datacasting lessons and materials could include English competencies for K to 3, junior high school, and senior high school students. Third is the generalizability of the results of this study. The final sample size of this study represented a group of Grade 6 students who qualified to stay in the project until its end. It is logical, therefore, to state that the results are specific to the grade level investigated. The sample attrition could be attributed to the effects of the pandemic, such as some participants' withdrawal from the project because of medical reasons, relocation, and difficulties in school, among others. Thus, a bigger sample for a future study that tackles the same research problems is suggested. Fourth, it is also recommended that affordable datacasting receivers and set-top boxes for the implementation of remote learning via datacasting be produced on a larger scale given the fact that the majority of Filipino households have television sets (DICT, 2019) and the government (through the Department of Science and Technology) has prototype receivers for datacasting. It is also recommended that these gadgets be given freely or subsidized to students with TV sets but without an internet connection. The instructional implication of the results of this study is for language teachers to use ICTs judiciously to develop activities that are anchored on learning outcomes. Another implication is for educational technologists and teachers to use optimally open-source animation software in designing online language lessons so that the digital space in datacasting materials will be conducive to effective learning. To the best of our knowledge, this

is the first local study to introduce datacasting as a viable educational technology for distance learning for basic education students in resource-limited settings. Finally, we think it is reasonable to assume that datacasting materials for distance learning are a way to democratize Philippine education.

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The author/s of this manuscript attest/s that this work is the result of original study, that it is not currently under review in other journals, that it was not published before in any format except in abstract form in conferences/university repositories, and that its similarity index with a similarity detection software is 10% or below.

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