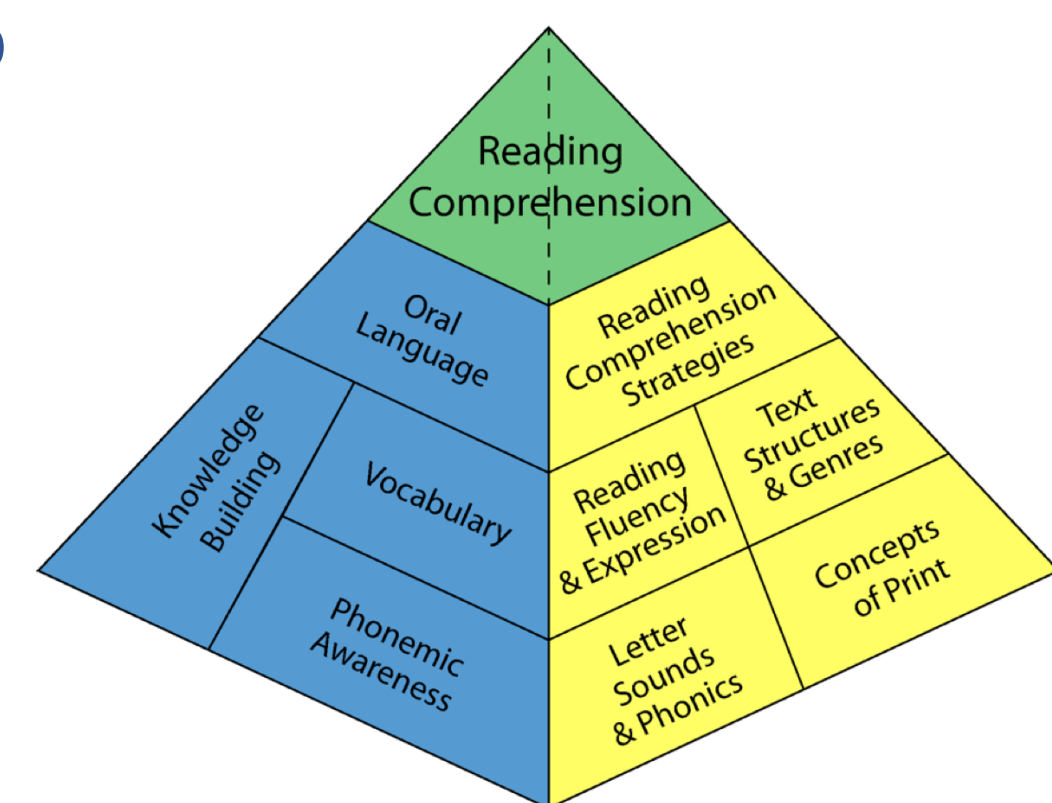


Examining How Teachers Study a Multimedia Model of Reading Development: Do eye movement patterns affect what teachers learn?

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STUDY PURPOSE

The purpose of this exploratory study was to use eye-tracking methodology to examine how elementary teachers study a visual model of reading development (called the reading pyramid) and accompanying text, and whether particular eye movement patterns affect what they learn.



Research Questions:

1. What are pre-service and experienced teachers' eye movement patterns as they study the reading pyramid and accompanying text?
2. To what extent do elementary teachers' eye movement patterns differ according to teaching experience and knowledge of reading development?
3. Do particular eye movement patterns affect what elementary teachers learn?

METHODS & PARTICIPANTS

Study Design: Both quantitative and qualitative components were used, with the eye-tracking metrics as the main data source.

Participants: Seven experienced teachers and 11 education students from Ontario Canada participated in the study.

Data Sources & Material:

1. **Demographic questionnaire:** The questionnaire consisted of five closed-ended questions about participants' experience.
2. **Pre-test of literacy knowledge:** Adapted from 3 existing tests.
3. **Cognitive task:** Participants were asked to study the model and text while thinking about how different literacy components work together to support children's reading development. A **Tobii Pro X3-120 Eye Tracker** was used to record eye movements.
4. **Eye-tracking metrics:** Areas of interest (AOIs) on the pyramid and keywords in the text were predetermined.
5. **Heat maps:** Visual representations of fixation durations were used to support the statistical results.
6. **Transfer task:** Participants were asked to verbalize how they would explain the basics of teaching reading to someone new to teaching at the elementary level. Participants verbalized their explanation without access to the stimulus.
7. **Retention task:** The retention test included 2 questions: 1. Please describe the reading pyramid. 2. While you studied the reading pyramid, what stood out to you?

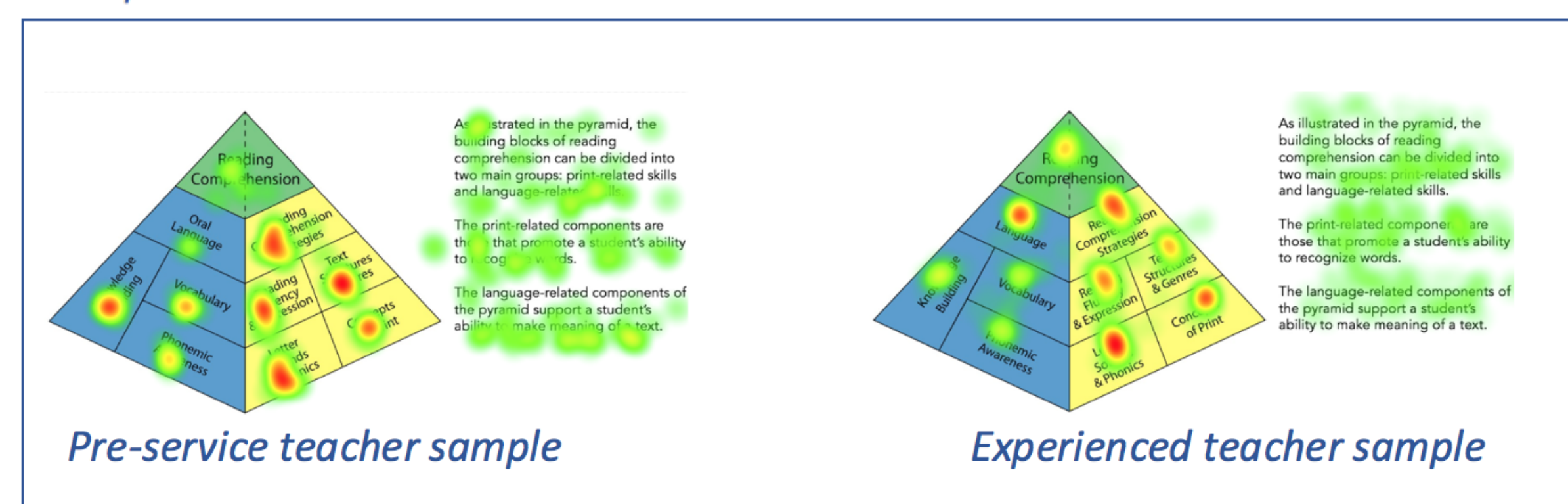
RESULTS

What are teachers' eye movement patterns as they study the reading pyramid and text?

Summary of Group Differences (N = 18)

	Experienced Teachers (n = 7)		Pre-Service Teachers (n = 11)				
	M	SD	M	SD	t-value	p	d
Total Recording (secs)	127.29	57.49	94.09	31.39	1.59	.131	0.72
Total Fixation Duration of Keyword AOIs (secs)	14.95	8.80	10.17	7.27	1.26	.227	0.59
Total Fixation Duration on Pyramid AOIs (secs)	64.29	35.10	33.77	22.70	2.26	.039*	1.03
Total Fixation Count on Keyword AOIs	75.86	34.00	56.09	32.22	1.24	.232	0.60
Total Fixation Count on Pyramid AOIs	254.29	138.10	144.72	75.80	2.19	.044*	0.98
Transfer Score	6.86	3.13	4.55	1.97	1.94	.071	0.88
Retention Score	9.71	3.82	6.09	2.47	2.46	.026*	1.13
Test of Literacy Knowledge Score	7.86	2.12	3.45	1.37	5.40	<.001*	2.47

* $p < .05$



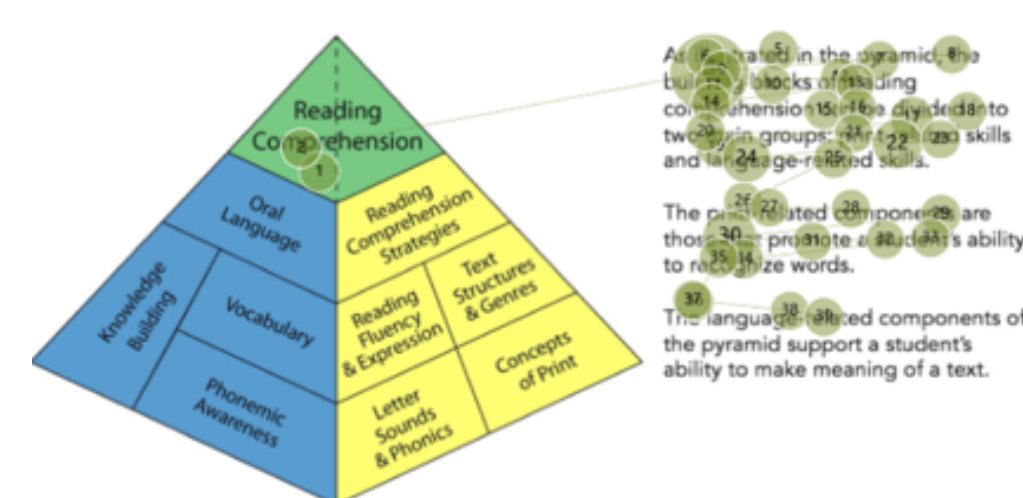
Sample heat maps depicting fixation duration.

*Note: Red shading indicates longer fixation duration.

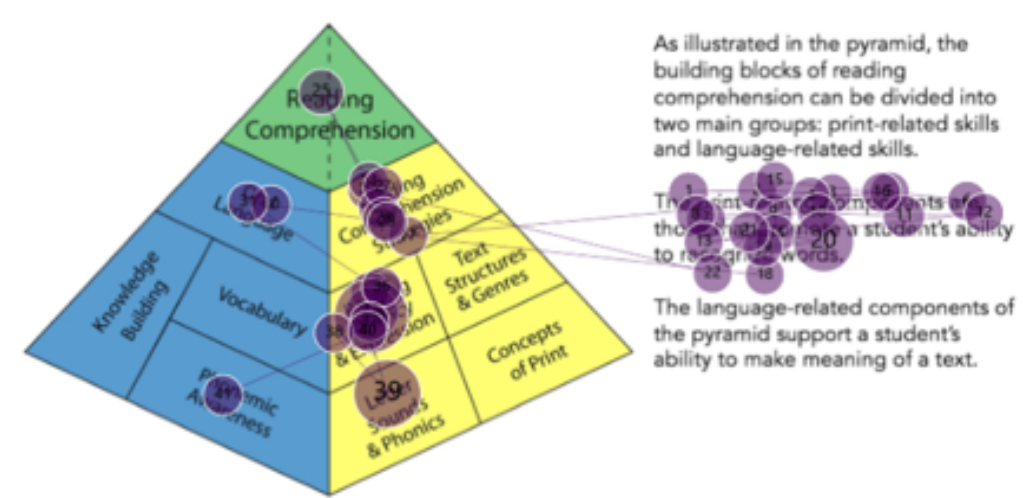
Both groups fixated longer on AOIs on the pyramid than on keywords in the text.

To what extent do teachers' eye movement patterns differ according to experience and knowledge of reading development?

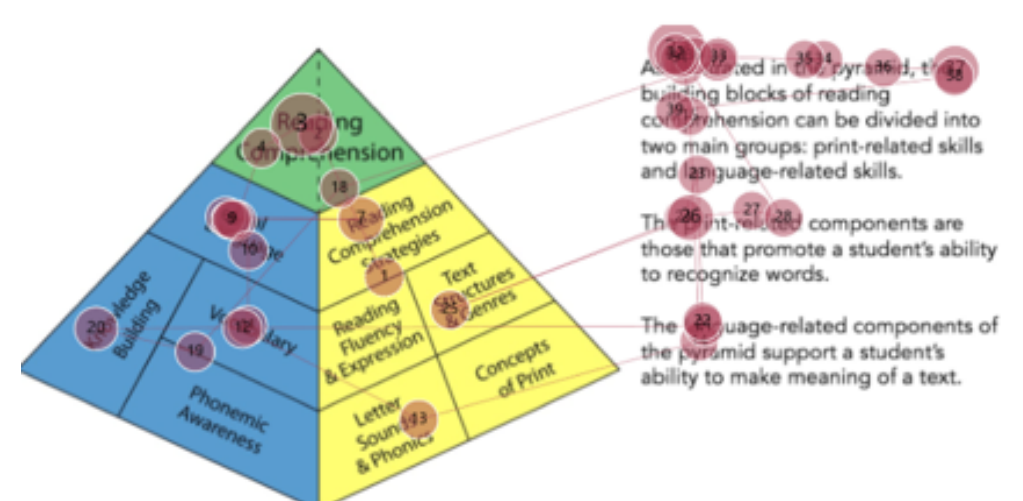
Patterns of Visual Behavior



Sample of global integrative pattern: Eye movements transitioned to pyramid after gazing at most or all of the text.



Sample of local integration pattern: Eye movements transitioned between the pyramid and semantically-related keywords.



Sample of inconsistent skimming pattern: Unrelated transitions between the pyramid and text.

Do eye movement patterns affect what teachers learn?

Pearson Correlations Between Post-Task Scores and Fixation Durations on AOIs of Pyramid and Keywords in the Text (N = 18)

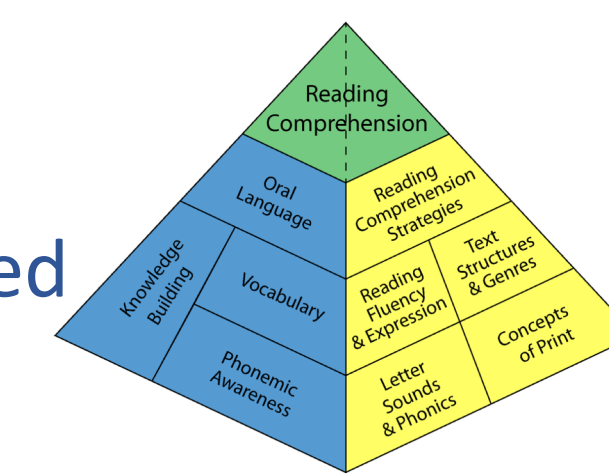
	Transfer Score	Retention Score
1. Transfer Score	-	-
2. Retention Score	.35	-
3. Comprehension AOI	.33	.13
4. Oral Language AOI	.37	.25
5. Comprehension Strategies AOI	.15	.34
6. Knowledge Building AOI	.26	.26
7. Phonemic Awareness AOI	-.02	.33
8. Vocabulary AOI	.15	.55*
9. Fluency AOI	.12	.43
10. Text Structures AOI	.38	.36
11. Phonics AOI	.39	.52*
12. Concepts of Print AOI	.45	.37
13. "Building Blocks"	-.10	.15
14. "Language Components"	.10	.14
15. "Language skills"	.16	.21
16. "Make meaning"	-.24	.29
17. "Print Components"	.05	-.02
18. "Print skills"	.35	.12
19. "Pyramid"	.46	.38
20. "Recognize words"	-.22	.07

* $p < .05$; ** $p < .01$

Note: 1-12 = AOIs on the pyramid; 13-20 = Keywords in the text

AOIs: Each block of the pyramid

Each block of the pyramid was designated as an area of interest (AOI).



AOIs: Keywords in the Text

As illustrated in the pyramid, the building blocks of reading comprehension can be divided into two main groups: print-related skills and language-related skills.

The print-related components are those that promote a student's ability to recognize words.

The language-related components of the pyramid support a student's ability to make meaning of a text.

CONCLUSIONS

- Group differences suggest that teachers study multimedia in different ways, depending on their prior knowledge and experience.
- This information can be used to inform the design of learning support tools and to scaffold and improve novice teachers' understanding of reading development and instruction.
- Multimedia resources that are conducive to teacher learning will lead to teachers being more skilled in reading instruction and ultimately contribute to improvements of reading ability in their students.