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1. BACKGROUND

Motivation for the study

- Integrated tasks which require multiple language skills are employed in a number of international exams (e.g. iBT TOEFL, IELTS, TEAP).
- Integrated writing is a fundamental skill in academic writing but difficult even for L1 learners (e.g. Cumming, Rebuffot & Ledwell, 1989; Shi, 2004; Hyland 2005; Delaney 2008).
- Integrated writing tasks give a better prediction of whether a learner will be a novice or an advanced writer in a real-life academic setting (Plakans, 2008).

Previous research on integrated writing

- The last few decades have seen an increasing number of publications on integrated writing tasks.
- Potential elements in source texts that may influence the quality of written products include:
 - The use of the first language and target language for summarization (e.g. Yu, 2008)
 - Familiarity of the discourse types of a source text (e.g. Delaney, 2008; Yu, 2009)
 - The effects of source text borrowing (e.g. Cumming, et al, 2005; Weigle & Parker, 2012)

Previous research on language assessment by Eye-tracking and keystroke analysis

- Eye-tracking technology is increasingly becoming available to linguistic professionals.
- Bax (2013) investigated the cognitive elements of the IELTS Reading test using the eye-tracker to find readers' higher order and post-lexical processing behaviour" using the eye-tracking technology
- Révész & Lee (2015) studied underlying L2 pausing and revisions behavior using IELTS Writing Task 2.
- Brunfaut & McCray (2015) used Eye-tracker to find text processing according to test-takers' characteristics using Aptis Reading.
- Yu, Rea-Dickens & Kiely (2015) investigated the cognitive processes involved for summative writing with graphic information in the case of IELTS Writing Task 1.

The research gap

- Previous studies suggest complexity of the reading into writing construct, which is quite different from that of reading and writing as separate skills (Delabey, 2008; Bachman, 2002).
- Little research has been conducted on the use of graphic information for integrated writing tasks (e.g. Yu, 2009; Yu, Rea-Dickens, & Kiely, 2012; Yang, 2012, Yu & Lin, 2014)
- Most of the studies for integrated writing use a think-aloud method, but the current study uses eye-tracking technology.
- Empirical research on the cognitive processes of integrated writing in L2 context are still at scarce (Révész, 2014).

2. THE CURRENT STUDY

This study attempts to identify some of the cognitive patterns which are involved in integrated writing when test-takers use information from multiple source texts and graphs as prompts, using the Test of English for Academic Purposes (TEAP)

Task B

Your teacher has asked you to write an essay for class using the information below. Describe the situation concerning schools in Greenhill and summarize the main points about the solutions that have been suggested. In your conclusion, say which of the solutions you think would work the best based on the reasons given. You should write about 200 words.

Students' Problematic Behavior at Schools in Greenhill

Incidents at Greenhill schools in 2012

Education News

LETTERS TO THE EDITOR

Food waste in Greenfield (collected as garbage)

Sources of Food waste

The Effects of Source Texts / Graphic Information
The Effects of Language Proficiency
The Effects of Test-Taking Strategy

WRITING PROCESSES

3. RESEARCH QUESTIONS

RQ: What are the key variables that affect the cognitive processes of integrated writing?

- To what extent do test takers incorporate information from multiple texts?
- To what extent do test takers incorporate information from graphs?
- To what extent do features of the graphs affect the cognitive processes of writing given texts and graphic information as prompts?
- What role does language proficiency play in integrated writing?
- What kinds of test-taking strategies are used for integrated writing?

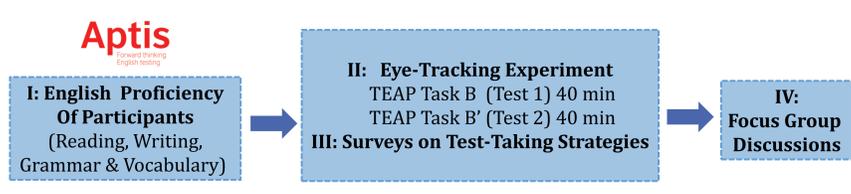
4. METHODS

- A Mixed-Methods Approach (Explanatory Research Method)**
 Quantitative data assess the trends and relationships
 Qualitative data explain the mechanisms or reasons behind the results and trends
- Participants**
 42 Japanese high school students from Kansai Region, Japan. (Male=10, Female=32)

Grade 10	n=21
Grade 11	n=9
Grade 12	n=12

- Instruments**
 - Aptis Tests (Reading, Writing, Grammar & Vocabulary) n=5
 - TEAP Writing (Task B) Integrated Writing Mock Tests by Eye-tracker (Tobii TX300 from Tobii Technology) n=42
 - A survey (Test-taking strategies) n=40
 - Focus Groups Discussions n=24

5. PROCEDURES (DATA COLLECTION)



- Describing participants' language proficiency in reading and writing (the CEFR levels) by Aptis tests.
- Understanding the cognitive processes of integrated writing by measuring eye-movements and keystrokes (TEAP Task B as mock tests).
- Triangulating the findings through the use of surveys about participants' test taking strategies.
- Revealing test-takers' experience of the test by conducting focus group discussions.

	Purpose	Allocated time
Introducing Procedures	Collecting a consent form Explaining the procedure	5 minutes
Getting Started	Calibration	5 minutes
Collecting Data	TEAP Task B (Test 1)	40 minutes
	Break	5 minutes
Collecting Data	TEAP Task B (Test 2)	40 minutes
Conducting surveys	Collecting a survey form after completion	5 minutes

※ Data from an eye-recording and keystroke logging can help gain an understanding of cognitive processes of integrated writing.

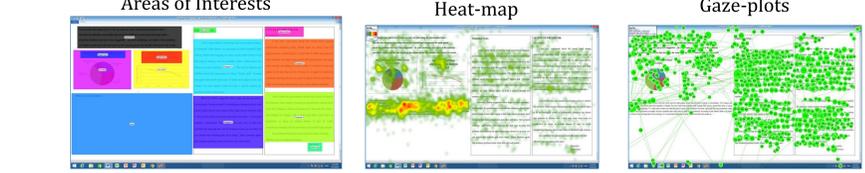
6. MEASURES AND ANALYSIS

Preparing to Write (First Stage of Cognitive Processes of Writing) (Shaw & Weir, 2007)

Task representation Eye-recording Surveys
Did you understand what is required for the task?
 Regression Analysis, Independent-T Test, One-way ANOVA Test (First / Last 10 minutes of recording)
 (Variables) Time to First Fixation, Fixation Before, First Fixation Duration, Total Fixation Duration on Task Prompt, Surveys

Macro-planning Eye-recording Surveys
Did you plan before you started writing the essay?
 AOI switches in Paragraph 1, 2, 3, 4 and elsewhere (First 10 minutes)
 One-way ANOVA (Survey results)

Micro-planning Eye-recording Surveys
How did you decide which information to include?
 Regression Analysis, Independent-T Test, One-way ANOVA Test on AOIs (First 10 minutes of Recording) Survey Results



7. RESULTS PLEASE SEE MY HANDOUT FOR MORE DETAILS

Task representation Gaze-Plots (First 5 minutes)

Gaze-Plots (Last 5 minutes)

Reading CEFR level C
 Writing CEFR level B2

Reading CEFR level B1
 Writing CEFR level C

8. PRELIMINARY FINDINGS

- RQ1 Effects of Source Texts**
- Less successful participant depended on the first paragraph than other paragraphs
 - More successful participant read paragraphs in order (at least once) and scanned the keywords to find the information in text
- RQ2. Effects of Graph Information**
- Most students found it easy to interpret graph information, but difficult to summarize the trends in English. Consequently majority of them did not plan to including information from graphs as much as texts at the planning stage.
- RQ3. Effects of Features of Graph Types**
- Most participants spent more time on the graph which was easier to understand and interpret
 - Most participants found the Pie Chart easier than the Line Graph (Test 1) and Bar Graph (Test 2)
- RQ4. Roles of Language Proficiency in Integrated Writing**
- First 10 minutes were very crucial for task representation and macro-planning based upon evidence from cases studies of students of different language levels (B1vs.B2)
- RQ5. Test-taking Strategies for Integrated Writing**
- Significant differences were found between B1 and B2 in
 - Understanding the task requirement;
 - Identifying the purpose; and
 - Planning which pronouns to use