Concept Maps, Cloze Tests, and Multiple-choice Tests: A Think-aloud Approach to the Comparison of the Strategies Utilized in Different Test Formats

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Abstract: The aim of the present case study was to investigate different strategies utilized by test takers while performing on three different reading test formats, including: Concept Maps (CM), Cloze Tests (CT), and Multiple-choice Tests (MC) using a think-aloud approach to understand the mental processes of the participants and to elicit their strategy use while completing the tests. To this end, five advanced EFL learners studying at Avesta Language Institute in Mashhad, Iran were given reading tests containing the three aforementioned formats. The obtained results were identified according to Pishghadam and Ghanizadeh's (2011) framework. However, some strategies were added to account for all test formats. The results indicated that different strategies were used when test takers perform on different test formats and the test format affects learners' strategy selection and strategy use.
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1. Introduction

1.1. Reading Strategies and Think-aloud Approach

Undoubtedly, some learners are more successful than others. This difference has inspired researchers to look for its reasons. Some researchers have identified different strategy use as a reason for the difference between language learners (Naiman, Frohlich, Stern, & Todesco, 1976; Rubin, 1975; Stern, 1975).

Administrating questionnaires is the commonest method of identifying learner strategies; however, it suffers memory loss as learners may forget the strategies they have used in the past (Chamot, 2004). To tackle this problem, learners' verbalizations of their strategy use while performing a task can be taken into account (O'Malley & Chamot, 1990; Wenden, 1991). Protocol analysis seems to be the most reliable and direct method of eliciting strategies (Grenfell & Harris, 1999).

Think-aloud is a research method that allows exploring individuals' cognitive processes which cannot be observed. Many scholars have employed think-aloud approach as a powerful research method (e.g., Ericsson & Simon, 1980; Ericsson & Simon, 1993; Olson, Duffy, & Mack, 1984; Sainsbury, 2003; Stevenson, Schoonen, & Glopper, 2007). Think-aloud focuses on immediate learning experience and enables participants to focus on what they are doing. This method yields very detailed data in real-time use (Cotton & Gretsy, 2006). This method helps expression of thoughts without any attempt on the readers' part to control, direct, or observe them (Ghonsooly, 1997). In addition to the mentioned advantages, think aloud is a promising method for activating metacognition as a result of its open-ended nature; it helps the development of the monitoring ability of second language learners and using the strategies that help understanding of the text (McKeowon & Gentilucci, 2007).

Reading strategies are defined as mental operations relating to how readers perceive a task, what textual cues they pay attention to, how they make sense of what they read, and what they do when they do not understand. Therefore, strategies are resources used by readers for understanding and learning (Langer, 1982, cited in Rao, Gu, Zhang, & Hu, 2007). Many scholars believe that learners who use different learning strategies are more successful language learners (Bruen, 2001; Green & Oxford, 1995; O'Malley & Chamot, 1990; Wharton, 2000). Pressley (2000) and Wade (1990) state that good readers apply a variety of appropriate strategies to the text they are reading. The strategies can be improved by direct instruction (Lau, 2006). As Lau (2006) claims, good readers are those who use better strategies while poor readers either give up easily when they face problems or use inefficient strategies.

Think-aloud can be employed as a powerful method in the elicitation of learners' reading strategy use. Think-aloud method is also stated to be a useful measure for the assessment of readers' comprehension during reading (Cakir, 2008). If the strategies that readers use are discovered, general elements that help more successful readers can also be discovered and can lead to reading improvement through teachers' focus on those strategies (Alderson & Urquhart, 1984).

Using the think-aloud method involves choosing a reading task and asking the participants to say aloud everything they think while performing the task. This method directly assesses participants' strategy use; it also provides product information and process report, avoids problem of memory failure, and allows for analysis of affective and cognitive processes (Lau, 2006).

1.2. Different Test Formats

One of these many factors that affect test performance along with language ability, which is the main concern of the tester, is test format. Bachman (1990) proposes a framework for test methods and revises it in Bachman and Palmer (1996). Bachman (1990) believes that test performance is affected by test method. Baker (1989) also believes that test method effect is important because we do not know whether test performance is due to the test takers' knowledge or their ability to answer certain formats. These test methods represent the how of language testing.

Brown and Hudson (1998), in their classification, classify language assessment into three broad categories: Selected-response assessment, Constructed-response assessment, and Personal-response assessment. Scholars have proposed different formats for testing reading comprehension: Multiple-Choice Questions, Short Answer Questions, Cloze, Selective Deletion Gap Filling, C-Tests, Cloze Elide, Information Transfer (e.g. Weir, 1990; Hughes, 2003). Pishghadam and Ghanizadeh (2011) also introduce CM as a valid and reliable reading test format. The three test formats utilized in this study are representative of selected-response (CM and MC) and constructed response assessment (CT).

Ausuble's meaningful learning theory gave rise to concept maps (Novak, 1997). This theory states that learning occurs through the incorporation of new concepts into the learners' existing cognitive structures. Therefore, new information must be related to old information. Concept mapping requires higher levels of learning. It requires connected understanding, i.e. understanding both concepts and the connections between them (Schau, et al., 1997. pp. 136-158, cited in Schua, et al., 2001). However, they have not been used much in either testing or teaching.

Different test formats are tackled differently by different test takers and it has been reported that personal characteristics affect test taking. Therefore, some researchers have commented that different test formats must be utilized in tests (e.g. Pishghadam & Tabataba'ian, 2011a & 2011b).

To see whether different strategies are used with different test formats, the present case study investigates the frequency of different reading strategies English language learners use while taking three different test formats in the Iranian EFL context. It also compares different strategy use on different test formats.

Introspection has been employed by many studies, some of which have compared the strategies of successful and unsuccessful readers (e.g., Hosenfeld, 1977). Differences between readers' strategy use have been revealed in these studies. Padron, Knight, and Waxman (1986) conducted a research to find out whether any difference existed between strategies of bilingual and monolingual students while reading. Also, Sarig (1987) examined the differences between reading processes of L1 and L2 to see if any relationship existed between the two. Ghonsooly (1997) also used introspection to describe competence in reading skills. Tabataba'ian and Zabihi (2011) have also utilized introspection to investigate and compare the strategies used by learners while reading ESP (English for Specific Purposes) and GPE (General Purpose English) texts. Pishghadam and Ghanizadeh (2011) also employed protocol analysis to validate their CM test.

However, to the researchers' knowledge, different strategies used when doing different test formats have not been taken into account. Therefore, the present study aims at investigating different strategies used in different test formats and examining the differences between reading strategies utilized by readers while taking different reading test formats by applying the think-aloud method. The study was conducted to answer the following questions:

- What strategies are used when readers take different reading test formats (CM, CT, and MC)?
- Are there any differences between readers' strategy use while taking different test formats (CM, CT, and MC)?

2. Methods

2.1. Participants

Five language learners participated in the present study, 3 females and 2 males. Their age ranged from 23 to 27. They were all studying English at Avesta Language Institute (ALI) in Mashhad, a city in north-eastern Iran. They were all advanced students preparing for taking CAE examination. They were chosen based on their performance on a CAE sample test. Their proficiencies were nearly the same and they were more proficient than their classmates. They had studied different majors at university.

2.2. Instrumentation

The think-aloud technique was chosen to elicit their reading strategy use. Three reading tests each including one test format were given to the

participants to do. The three test formats included SAFI Concept Map format (Pishghadam & Ghanizadeh, 2011), a Cloze Test (Pishghadam & Tabataba'ian, 2011a & 2011b), and Michigan ECPE reading test (1997). SAFI CM test includes three passages which have been extracted from IELTS academic reading (2003). It included 31 items. The utilized cloze test included 50 items and was prepared based on guidelines provided in Farhady, Ja'farpur, and Birjandi (1994); every seventh word in the text was deleted. Michigan ECPE reading module also includes 4 readings each containing 5 questions. Therefore, it includes 20 items.

2.3. Procedure

2.3.1. Data Collection

The participants were asked to attend ALI individually in three different sessions as the tests were rather long and tiredness could affect their performance. The distracters were eliminated as much as possible. On average, the tests took about 2 hours 15 minutes for each individual to complete. They were asked to report whatever went on in their minds as they were doing the tests. The researchers tried to interfere as little as possible in a way that their presence could not be felt by the test taker.

The participants' reports on what went on in their minds while taking the tests were tape-recorded. These recordings were later transcribed without any modifications. They were transcribed as they were reported and the researchers did not tidy them up or change them in any way.

2.3.2. Data Analysis

Having been transcribed, the used strategies were identified partly based on Pishghadam and Ghanizadeh's (2011) proposed framework. However, as their framework was developed for CMs only and the present study utilized other test formats as well, some strategies were added to the framework to account for the differences. Table 1 shows Pishghadam and Ghanizadeh's framework.

3. Results

In this section, first, the results of the study will be reported in 3 separate sections. Pishghadam and Ghanizadeh's (2011) proposed framework will be used but to take account of other test formats further strategies will be added and in case of test formats other than CM some strategies will be omitted as they are specifically used when completing a CM.

3.1. Concept Maps

In table 2, the strategies utilized while completing a CM and their observed frequencies are reported.

Table 1. The profile of SAFI concept map test-taking strategies

Coding sche	**Description**
1. skimming	Going through the text quickly to form an overall rough impression
2. concept identification	Identifying the concepts specified in the concept map and enclosed in boxes
3. proposition formation	Linking two concepts in the concept map via the linking phrases to form a proposition
4. proposition synthesizing	Linking the identified propositions in the concept map to form a section of the text and ultimately the whole text
5. text structure identification	Identifying the relationship between ideas expressed in the text via the connecting lines of the concept map, recognizing and conceptualizing the organization of the text (cause-effect, compare-contrast, classification, etc) by referring to the concept map
6. gist locating	Identifying the main idea, distinguishing between salient and subsidiary points by matching the concepts expressed in concept map, as the main points, with the corresponding ideas in the text
7. redundant idea skipping	Disregarding the redundant or irrelevant materials in the text by going through the concept map, on the ground that the concepts and the relations designated in the map are the foci of the text and the questions
8. inference-making	Finding the answer of a question based on meanings not directly stated in the text
9. back tracking	Going back to the earlier portions for the purpose of finding the answer
10. correct response selection via other alternatives	Eliminating improbable distracters to decide upon the correct response
11. correct response selection via clues in other items	Deciding upon the correct answer by discarding the other options through the clues in other items and the options of other items

Adapted from Pishghadam & Ghanizadeh, 2011, pps. 91-92

Table 2. Strategies utilized while taking a Concept Map test format

Category	*Strategy*	*Frequency*	*Total*
Lower-order Strategies	Skimming	0	157
	Concept Identification	65	
	Backtracking	75	
	Rereading	17	
Higher-order Strategies	Proposition Formation	69	309
	Proposition Synthesizing	52	
	Text Structure Identification	10	
	Gist Locating	96	
	Redundant Idea Skipping	6	
	Inference-making	43	
	Keyword Identification	10	
	Guessing Word Meaning	14	
	Paraphrase	8	
	Grammar Knowledge Activation	1	
Testwiseness Strategies	Correct Response Selection via Other Alternatives	25	35
	Correct Response Selection via Clues in Other Alternatives	2	
	Evaluating Answers	8	
Total		501	

An examination of participants' protocols regarding the test taking process indicated that they tended to take the tests and start them differently. Regarding the CM format, one of the participants read the questions first, then read the text and underlined the keywords, and finally read the questions again and answered them using the keywords he had identified in the text. Two participants read the readings and then the questions, in the same order as they were asked in the instructions. One participant read the questions first for the first text but when she saw noticed the CM and she could not infer much from it, she preferred to read the text first and then the questions for the other CMs so that she could get some idea from the text based on which she could identify the structure of the CM. One participant read the text first while doing the 1st and the 3rd readings but for the 2nd text he read parts of the text and the related question simultaneously. He might have been examining a new strategy for filling the concept map and just as his strategy fails or is less efficient than his first strategy, he resorts to the previous one.

No participant skimmed the text to get a general idea. They all started reading it carefully from the very beginning. They identified unknown words and tried to guess their meanings as far as they were part of the questions or part of the relevant part to the questions. Otherwise, the word was ignored.

All participants had underlined the keywords in the text while reading the CM except one of them. This can be an indicator of the fact that the visual feature of CM has helped them identify the keywords and the related parts of the reading text better.

As the table shows, higher order strategies are used more than other strategies when doing a CM. It seems that when learners are doing a CM, they have to get the whole message of the part related to the CM and the relations mentioned to be able to complete it. They have to understand the CM well and they have to be able to relate the text to it appropriately. The visual structure of the CM assists them in getting a whole idea. Also, the relationships between concepts seem to be evident in a CM.

3.2. Cloze Tests

Table 3 shows the strategies utilized while completing a CT and their observed frequencies are reported.

While doing the CT, all participants started filling it in as they were reading the texts. Only one of the participants read one of the CTs first before trying to fill in the blanks. All participants had already become familiar with this test format as this is one of the main parts of FCE and CPE tests and they had all passed preparation courses for these tests. However, the CT in such tests mostly measures grammatical knowledge while here it was utilized as a measure of reading knowledge. Although, they had always been advised to skim the CT before attempting it, they preferred to employ their own personal strategy and this test strategy instruction was not taken up by them.

As it is evident from the table, the two strategies which had the highest frequency among

higher-order strategies were grammar and vocabulary knowledge activation. In the learners' protocols, they explicitly activated their previous knowledge and tried to find suitable vocabulary and grammatical points. They looked for propositions of verbs, different phrasal verbs possible and their meanings, etc. They also tried to infer the missing word from the rest of the text or sentences by comparing and contrasting the blank with its cotext. When the answer to the blank was a vocabulary item, they examined all the possible choices and tried to choose the best item.

Rereading was also employed to a great extent as reading the text or parts of it again and again helped the participants in identifying the structure of the sentence and therefore, missing word.

In some cases, the participant would write the missing word without any thinking. The answer to the blank would come up to their mind automatically and their mind did not seem to be involved in any kind of processing.

Table 3. Strategies utilized while taking a Cloze Test format

Category	*Strategy*	*Frequency*	*Total*
Lower-order Strategies	Skimming	1	
	Backtracking	0	21
	Rereading	20	
Higher-order Strategies	Redundant Idea Skipping	0	
	Inference-making	16	
	Keyword Identification	2	
	Guessing Word Meaning	10	
	Paraphrase	6	131
	Grammar Knowledge Activation	60	
	Vocabulary Knowledge Activation	19	
	Choosing the most Suitable Option out of some Choices	12	
	Considering Cohesion	6	
Testwiseness Strategies	Evaluating Answers	9	9
Total		161	

3.3. Multiple-choice

In the following table the strategies utilized while completing a MC and their observed frequencies are reported.

Table 4. Strategies utilized while taking a Multiple-choice test format

Category	*Strategy*	*Frequency*	*Total*
Lower-order Strategies	Skimming	0	
	Scanning	15	48
	Backtracking	27	
	Rereading	6	
Higher-order Strategies	Redundant Idea Skipping	38	
	Inference-making	23	
	Keyword Identification	3	86
	Guessing Word Meaning	14	
	Paraphrase	7	
	Grammar Knowledge Activation	1	
Testwiseness Strategies	Correct Response Selection via Other Alternatives	43	
	Correct Response Selection via Clues in Other Alternatives	0	48
	Evaluating Answers	5	
Total		182	

MC was the format that all the participants were familiar with as they had encountered this test format all through the years of their English education and also at school and in the entrance exam of universities as it is the format used in the entrance examination of universities in Iran.

Different strategies were observed for handling this part of the test. One of the participants

read the questions first and then started answering the questions. One read the questions but did not go through the whole texts and she said that she did not read the texts thoroughly. She had just scanned through the text to find the part relevant to the questions. One had read part of the text and the question related to that part together and the other two had first read the text and then the questions. The instruction the participants had received during their FCE and CAE preparation courses was not employed here. Again, they had been instructed to skim the test first, then look at the questions and then read the text carefully or scan the text. It seems that they were more eager on their individual strategies and the instruction they had received could not change the strategy they had started to employ before the reception of the instruction.

One of the testwiseness strategies were used with a significantly high frequency. The participants tried to answer many questions by omitting the unreasonable distracters. This might also be because of their familiarity with this test format and the result of the strategy they had developed over years.

4. Discussions

As it was stated before all but one of the participants had underlined keywords while reading the CM while this was not the case with other test formats. Only one participant underlined the some of the parts in the CT and two did so for the MC. It indicates that the fact that CM is represented visually equips readers with better ability to identify the keywords. The keywords are to some extent self evident and this fact facilitates the comprehension of the important, relevant parts.

Although CM and MC had similar formats, i.e. they can be both classified under selected-response assessment, CM assesses the relationships between concepts and it does not only consider one part of the text while some questions on MC can be done based on only one specific line, or few lines of the passage and the readers do not need to form a whole idea of the related part.

Moreover, MC choices were mostly answered by abandoning the distracter although CM had also utilized selected-response strategy. This might be due to the fact that while doing CM, they had to pay attention to the missing concept while in MC they tried to see which choice is not mentioned or is mistaken based on the information they gained from the reading text.

CT was the test format that activated learners' linguistic knowledge explicitly and they directly reported that they were considering the grammatical points related or that they were choosing among several choices. It was the one test format which also drew test takers' attention to cohesion and coherence. They reread the lines and paragraphs to ensure that their choice was a proper one which fit the blank as they had to construct the text themselves.

As it is evident from the obtained results, strategy use was significantly more while test takers were taking the CM. it seems that they were more involved in cognitive processes than when they were taking other tests. This finding might be due to several factors. Firstly, it might be on account of the newness of this format. Secondly, when taking the CM, learners are involved with the whole text. They need to make sense of the text and all the relationships, therefore, they use more strategies. Another reason might be the fact that while doing CM, the answers affect each other but MC is different in nature and the answers do not have any influence on the rest commonly. All in all, as Pishghadam and Ghanizadeh (2011) have also mentioned, CM assesses connected understanding and has a visual representation. These qualities distinguish it from other test formats.

To the interest of the researchers, some learners tested several strategies when they encountered the new test format (CM) to see which ones fit for purpose. They used a variety of strategies to discover the most suitable one.

Specifically, this study provided a comparison of strategy use in three different test formats. Although the limited sample size warrants caution in generalizing the results, the findings can give teachers an awareness of more frequent strategies utilized more frequently.

However, as Lau (2006) mentions it would be best to identify the more efficient strategies as using more strategies does not guarantee success. The present study also indicated some changes in strategy use as some strategies failed and were not suitable for the purpose.

Although some of the strategies differed individually rather than across the texts, several patterns were observed. As reported earlier, some strategies were used more often when test takers were taking certain test formats. If teachers identify relevant strategies to the specific test format, they can instruct their learners in using them.

The results of the present study confirmed Alderson's ideas, (2000) who pointed to the fact that employing only one method for measuring the understanding of the text is not adequate. According to him, good reading tests are the ones that use different techniques for assessing reading comprehension skills (cited in Weir, 2005). As tests with one format disadvantage a group, it will be best to use a mixture of different test types. Employing different test types will result in a more complete

picture of the students' ability (Brown & Hudson, 1998; Pishghadam & Tabataba'ian, 2011a & 2011b).

Although the results of this study and the one done by Pishghadam and Ghanizadeh (2011) have a few disagreements regarding the frequency of CM strategies, both confirm the fact that CMs must become part of education and assessment and must be utilized in classroom settings. The observed differences seem to be due to individual choice of strategy. Usefulness of CMs has been reported in different settings (e.g. Pishghadam & Ghanizadeh, 2011; Fahim & Rahimi, 2011; Cronin, Sinatra, & Barkley, 1992, etc); therefore, they seem to be valuable sources of teaching and assessing. They have been around for years and it seems that it is time for them to become part of teaching and assessment process.

As Novak and Cañas (2008) stated, "this is a chicken-and-egg problem because concept maps cannot be required on national achievement tests, if most students have not been given opportunities to learn to use this knowledge representation tool. On the other hand, if state, regional, and national exams would begin to include concept maps as a segment of the exam, there would be a great incentive for teachers to teach students how to use this tool".

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