Application-Based Crossword Puzzles: 
Players’ Perception and Vocabulary Retention

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Abstract
This study investigates the perceptions of students towards Application-Based Crossword Puzzles and how playing this game can affect the development of vocabulary amongst students. Drawing on Vygostky’s Socio-Cultural Theory which states that the human mind is mediated by cultural artifacts, the nature of this game poses challenges and builds curiosity, allowing players to pay more attention to the words to fill in the boxes which subsequently enhances their retention of vocabulary. This game has very good potential to build positive perceptions and to develop cognition in the linguistic domain of players, i.e. the amount of their vocabulary. In this study, the researcher conducted interviews with eligible or selected student players to find out their perceptions toward this game and administered a vocabulary test to find out how this game had added to the retention in memory of new words acquired by the players from the game. The study findings showed that the participants perceive this game positively and it affects the players’ vocabulary retention positively as indicated by their test results. It is recommended that English teachers consider using Application-Based Crossword Puzzles to help students build their vocabularies especially as part of extracurricular activities.

Keywords: Application-Based Crossword Puzzles, vocabulary development, socio-cultural theory.

1. INTRODUCTION

In this digital era, many aspects such as learning, information and entertainment grow rapidly. In learning, for example, students can easily access online materials, tutorials or lectures freely through their personal computer or their smart phone. Thus, learning is no longer constrained by time and place. Similarly, games have also progressed in such a way that the players can access them or download them either from their computer or their gadget. Thus, the modes or models of games are very...
different from in the past when they were time and place-dependent. These portable games can make the players engrossed in game-based activities.

In general, we can classify games into educational and non-educational. One educational game is the Application-Based Crossword Puzzles (see Appendix 1). This is partly because this game can be used for educational purposes particularly for learning vocabulary (e.g. Huyen & Nga, 2003; Klepper, 2003) or as a review tool to prepare for examinations (e.g Weisskireh, 2006; Davies, Shepherd & Zwiefelhofer, 2009). Thus such crossword puzzles can have some benefits for students.

Furthermore, Vygotskian’s school of beliefs contends that cultural artifacts such as pens, dictionaries and/or games have important roles in cognitive development (Lantolf, 2001). This school of belief argues that the human mind is mediated by cultural artifacts, suggesting that human cognition needs stimuli allowing the cognition to work. Thus a seven-year-old boy could play a game on a gadget after he interacts with it. Similarly, students could possibly remember a lot of vocabulary after they interact with crossword puzzles which could thus have an impact on their development of a bigger vocabulary.

Considering the vital role of vocabulary in language learning (Schmitt, 2000; Nation 2001; Maximo, 2000; Read, 2000; Gu, 2003) and the results from studies on the effects of crossword puzzles on vocabulary development (Njoroge, Ndung’u & Gathigia, 2013; Widyasari, 2010; Rosnelly, 2010; Sandy, 2011), this study was worth doing for two primary reasons. Firstly, other studies on the effect of crossword puzzles on vocabulary development did not investigate the perceptions of the students toward crossword puzzles in depth such as through interviews and how the game is able to enhance the vocabulary development of students. Secondly, other studies in this domain are mainly quantitative studies; as a result the voices of the participants are unheard. These two reasons encouraged the researcher to conduct this study seeking answers to the following research questions:

1. How did the participants perceive the Application-Based Crossword Puzzles?
2. How well did the participants retain the new words they acquired through this word game?

2. LITERATURE REVIEW

A number of studies have been carried out to find out the benefits of crossword puzzles in several domains including both linguistic and non-linguistic domains. In a non-linguistic domain, for example, the crossword puzzle is found to be beneficial as a tool for examination review as indicated by favorable responses from students (Weisskireh, 2006; Davies, Shepherd & Zwiefelhofer, 2009) and this model of exam review also further affects the success of the students’ learning (Davies, Shepherd & Zwiefelhofer, 2009). His study demonstrated that students given a crossword puzzle as a tool for exam review showed improvement in their scores. This is partly because this kind of game is considered motivating (William, 2007) and challenging at the same time (Ersoz, 2000), allowing students to engage in a game-based activity. Specifically, in the affective domain, Langeling and Malarcher (1997) state those games such as crossword puzzles can lower affective filters, encourage creative and spontaneous use of language and give students fun. Moreover, a game like the Application-Based
Crossword Puzzles potentially arouses the curiosity of the players, allowing their motivation to develop (Arnone, et al., 2011; Deci, 1975).

The Application-Based Crossword Puzzles is a word game which can be downloaded from Playstore. As the name suggests, the Application-Based Crossword Puzzles is a game based on wordplay in which a word answer from a numbered clue has to be written in a corresponding numbered space either vertically or horizontally within a square or oblong (Hornby, 1995). The Application-Based Crossword Puzzles has several advantages, for example, it is very portable as it can be saved in smart-phones, tablets, laptops or other gadgets. Also, this game offers some features that can be manipulated for learning purposes.

Moreover, this model of a game has several advantages in the linguistic domain. Bressan (1970) stated that this kind of game is believed to improve the vocabulary of students as they deal with words in the game. In addition, students’ knowledge of orthography can also be enhanced through this game since the solutions to the puzzles are usually based on correct spelling. Another advantage of this game is that this game can improve students’ knowledge of morphology through the use of items dealing with verb endings, prefixes, suffixes and the like.

Specifically, this game can also empirically improve the mastery of vocabulary amongst students (Njoroge, Ndung’u & Gathigia, 2013; Orawiwatnakul, 2013; Widyasari, 2010; Rosnelly, 2010; Sandy, 2011). Widyasari (2010) used the classroom action research design with crossword puzzles as the ‘treatment’ to improve students’ vocabulary. Her study also indicated that crossword puzzles were able to improve students’ vocabulary. Meanwhile Rosnelly (2010), Sandy (2011), Njoroge, Ndung’u and Gathigia, (2013) and Orawiwatnakul (2013) employed the experimental design using crossword puzzles as the treatment for the experimental group. Their post-tests demonstrated that the experimental groups in their studies outperformed the control groups and resulted in statistically significant improvements in the experimental group’s vocabulary results when compared with the results from the control groups. These studies further showed that crossword puzzles as a treatment can be effective in developing vocabulary amongst students. These findings are relevant to the proposition of Huyen and Nga (2003) that games have shown to have advantages and to be effective for learning vocabulary in at least two ways. Firstly, games bring relaxation and fun for students, thus helping them learn and retain new words more easily. Secondly, games usually involve friendly competition and keep learners interested. In such competitions, a certain amount of attention is needed which eventually results in better retention (Klepper, 2003; Harmer, 2001; Brown, 2001). Ebbinghaus (1964), the German psychologist, in his memory experiments, predicted that after less than 2 weeks, the participants could retain up to 30% of the new words. Furthermore, Nagy (1997) stated that when a person is exposed to a new word once in reading, he will retain about 5% -14%. Thus multiple or repeated repetitions are needed for better retention (Nation, 1990). This implies that similar words encountered by the players in this game might strengthen their memory for better word retention.

Moreover, experts in the domain of vocabulary claim that building vocabulary plays a crucial role in learning and using a foreign language (Schmitt, 2000; Nation 2001). Furthermore, researchers such as Maximo (2000), Read (2000), Gu (2003) and Nation (2001) contend that the acquisition of vocabulary is essential for successful second language use and plays an important role in paving the way to develop all four language skills (i.e. listening, speaking, reading and writing) in EFL/ESL contexts.
Nunan (1991) further argues that without a large vocabulary, someone will be unable to use the structures and functions of a language one has learned for comprehensible communication. Vocabulary also plays a very important role in reading comprehension in which L2 readers need a vocabulary of between 2000 and 7000 words (Nation, 1990; Swaffar, 1988). Meanwhile, to survive in academic coursework, L2 learners need around 5000 to 7000 words according to Grabe (1991).

3. METHOD

3.1 Research Design

This mixed method study used both qualitative and quantitative data; the researcher recruited 4 participants, i.e. those who frequently play Application-Based Crossword Puzzles. They are some of the researcher’s students at the English department of UNISMA (Universitas Islam Malang); thus the researcher already knew them, allowing him to obtain in depth information concerning their perceptions of playing the Application-Based Crossword Puzzles and how this game had enhanced their vocabulary development.

To answer the first question, the researcher interviewed the participants to find out their perceptions about the Application-Based Crossword Puzzles (see Appendix 2). The researcher conducted multiple interviews to ensure the consistency of their answers; thus reliable data could be obtained. The interviews were conducted in face-to-face mode to find out both verbal and non-verbal expressions for more comprehensive data. To answer the second question, a vocabulary test was administered to test their retention of new vocabulary that they had acquired (see Appendix 3). Their retention of the new vocabulary, to a high degree, reflected their development of vocabulary.

3.2 Data Collection and Data Analysis

To answer the second question, the following procedures were employed:

1. The participants were asked to play Application-Based Crossword Puzzles on their smart-phones in their leisure time.
2. The participants reported all the new vocabulary that they had acquired to the researcher after they had played a game.
3. Individualized vocabulary tests were developed based on the new vocabulary that a participant reported that he had acquired.
4. The vocabulary tests were administered a week after each participant had played the game and the scores were analyzed.

In addition, an interview was conducted after each test. Soon after the data was obtained, the researcher analyzed it to make it meaningful. The data obtained from the interviews was analyzed qualitatively using thick description. Meanwhile, the data obtained from the tests in the form of scores was analyzed by using descriptive statistics particularly getting the mean scores of the students, which indicated the gains in the vocabulary of each student as a result of playing the game.
4. RESULTS

The following are the results from the interviews and the tests of vocabulary to answer the first and the second research questions.

4.1 Participants’ Perceptions toward the Game

The players’ perception of this game, in general, can be grouped into three different aspects, i.e. affective, cognitive and belief in vocabulary.

4.1.1 Cognitive Aspects

In cognitive aspects, students think that the Application-Based Crossword Puzzles make them curious whether the words they put in the boxes are correct or not. Participant 2 pointed out, “when (I’m) playing this game, I always feel curious with the answers to the questions provided in this puzzle. My curiosity happens when I put my answers in the intended boxes whether the words I put really fit the boxes”. Besides curiosity, another participant also felt challenged; Participant No 1 contended, “this game is very challenging because there are some words (that are) strange to me and always encourage me to consult my dictionary. The questions also make me think hard but above all, I enjoy it”.

In addition to curiosity and challenges, this game also makes the players focus on the questions so that they can get correct answers. Both Participants 3 and 4 agreed that this game made them pay more attention. They asserted, “without a good focus on the game, we might lose the game under the time pressure. Paying more attention to the questions is the key to go to the next level”. In short, this simple game generates cognitively complex responses.

4.1.2 Affective Aspects

In the affective aspects, students perceive that this game is enjoyable although they play the game under time constraints. The game also offers them ease in terms of portability and accessibility as Participant 3 asserted, “I really enjoy the game because I not only get entertainment, but I also learn new vocabulary. It is easy to play because we can play through our smart phone which is very portable. Playing the game is no longer constrained by either time or place”.

Moreover, this game also trains the players to be disciplined and makes them excited which is partly because of the time constraints; thus they have to play against the clock. Accordingly, as Participant 4 added, “being able to complete the puzzle under the time constraint is very exciting especially when I get a good score in it. The good scores make me confident to go on to the next level. This game also gives me experience in solving (word) puzzles. It also trains me to think efficiently”.

4.1.3 Belief in Vocabulary

In addition to the affective and cognitive aspects, their perception toward this Application-Based Crossword Puzzles is shaped by their belief in vocabulary that it is one of the most important language components to master; as Participant 2 stated,
“without having sufficient vocabulary, I will have trouble in reading speaking, writing or listening (to ESL)”. Similarly, Participant 4 contended, “I cannot speak well if I don’t have enough vocabulary”. Their belief in the role of vocabulary might encourage them to play the Application-Based Crossword Puzzles more frequently for their development of vocabulary.

4.2 Vocabulary Development using the Application-Based Crossword Puzzles

The quantitative data were collected from the vocabulary tests a week after each participant played the Application-Based Crossword Puzzles to answer the second research question. The vocabulary tests were developed and administered not to measure the players’ proficiency in vocabulary; rather, to test their retention of the specific words that they had acquired from playing the game; hence this test can be categorized as an in-breadth vocabulary test rather than an in-depth one (see Schmitt, 2000). The results from the tests are shown in Table 1.

<table>
<thead>
<tr>
<th>Student</th>
<th>SL</th>
<th>AH</th>
<th>AD</th>
<th>AL</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scores</td>
<td>100</td>
<td>90</td>
<td>60</td>
<td>80</td>
<td>82.5</td>
</tr>
</tbody>
</table>

After the test, the participants were also interviewed particularly about their activities after playing the game in relation to the words they acquired from the game. The interviews revealed that the participants used mnemonic activities. Participant 2 said, “after getting new words, I sing them out”, while Participant 4 added, “I used the new words in sentences to memorize them” and Participant 1 stated, “I use the new words in conversation so that I remember them”.

In summary, playing the Application-Based Crossword Puzzles had positive effects on their cognitive and affective domains. Both domains are crucial in learning languages or other skills. Ideally, learning should be fun and enjoyable and cognitively challenging; thus the sustainability of learning can be achieved.

5. DISCUSSION

Several important findings concerning the perceptions of students and the development of vocabulary need to be highlighted by comparing these findings to those from previous studies and existing theories. The findings showed that the participants had a positive perception towards the Application-Based Crossword Puzzles and that playing these puzzles had a subsequent positive effect on the vocabulary development of these students. Their perceptions and their gain in vocabulary can be elaborated in several ways.

First, this game offers challenges which continue to motivate the participants to solve new puzzles. Their motivation not only makes them pay more attention to the game but also allows them to learn new vocabulary in a less intimidating way than standard classroom exercises in vocabulary and to enjoy the game as well (Widyasari, 2010; Bressan, 1970). Further, paying more attention to both questions and answers would lead to better retention (Harmer, 2001; Brown, 2001; Klepper, 2003). The good retention of the new vocabulary that they acquired from the crossword puzzles is shown from the results of the tests of target vocabulary words administered a week after they
did the puzzles. Their mean or average score for the tests was 82.5 or 82.5% (see Table 1). The participants’ memory of the words they acquired from the game is much better than Ebbinghaus’s (1964) predictions in his memory experiments which was about 30% or Nagy’s (1997) statement that when a person is exposed to a new word once in reading, he will retain about 5% to 14%. Their good retention, 82.5% of the new words, might be caused by the fact that they paid more attention during the game and got repeated exposures to the words during playing the game, resulting in better retention recall (see Nation, 1990)

Second, their motivation to play the game is likely driven by their belief in the benefits of vocabulary as from the interviews they think that vocabulary is one of the most important language components. Many scholars, such as Nation (1990) and Schmitt (2000), claim that vocabulary plays a top role in the language proficiency of students. In the context of reading, for example, L2 readers need an English vocabulary of between 2000 and 7000 words (Nation, 1990; Swaffar, 1988). Meanwhile for academic coursework, they need more, around 5000 to 7000 words in order to ‘survive’ (Grabe, 1991). This further shows that vocabulary plays a very significant role in academic life. Furthermore, Schmitt (2000) contends that vocabulary is of the top importance in building competence in EFL communication and in second language acquisition.

Third, the curiosity of the participants develops while playing the game. Curiosity drives people to find interests and desires personally meaningful and thereby is intrinsically motivating (Deci, 1975). Several works state that intrinsic motivation is a very powerful predictor for success in learning (Brown, 2001; Harmer, 2001). Furthermore, Arnone, et al. (2011) assert that curiosity can be a powerful motivator of behavior, initiating actions directed at exploring one’s environment to resolve uncertainty and to make the novel known. Thus in the context of the crossword puzzle, the students are intrinsically motivated to find the correct answer for each question which subsequently enhances the development of their vocabulary.

Lastly, the finding also shows that players get cognitive advantages. Vygotskian’s social-cultural theory asserts that the human mind is mediated through cultural artifacts any human product can inform its users and one of the most important cultural artifacts is language (Lantolf, 2001). The Application-Based Crossword Puzzles as a cultural artifact is able to develop players’ cognition in at least two ways. First, by interacting with this cultural artifact, the players may improve their cognition in digital or technological literacy as indicated by their ability to play this application based game. Second, since this is a friendly word game, they become engrossed in language-related activities in reading instructions and clues, questions, filling in the blank squares with correct words, etc.; thus, their linguistic cognition is also enhanced which enhances their retention of vocabulary as indicated by the good scores they got in their vocabulary tests. This further suggests that cognitive development is sensitive to cultural artifacts. This theory further supports the use of crossword puzzles for vocabulary development (see, Njoroge, Ndung’u & Gathigia, 2013; Orawiwatnakul, 2013; Widyasari, 2010; Rosnelly, 2010; Sandy, 2011).

Furthermore, the individual participants in this study, in fact, do things to memorize their new vocabulary such as singing the new words out, repeating them, writing them into sentences to get a mental image of them and using these new words in conversations. Several studies suggest that learners should involve themselves in personal engagement as well as active participation in learning vocabulary (Kramsch,
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1979; Cohen, 1990; Ellis & Sinclair, 1989). Ellis and Sinclair (1989), for example, contend that learners should use their new vocabulary in real-life situations. Meanwhile, Cohen (1990) recommends that learners do various mnemonic procedures for better retention. The various strategies adopted by the participants in this study should certainly reinforce their retention; thus their retention of their new vocabulary acquired through playing the crossword puzzles resulted in excellent results in the tests of their vocabulary.

6. CONCLUSION

In short, the Application-Based Crossword Puzzles is beneficial both cognitively and affectively. Cognitively, this game enables students to develop their vocabulary, and affectively the game is also able to enhance motivation amongst students which is essential in language learning especially in building vocabulary.

The participants’ actions after they got new vocabulary enabled them to have better retention which was indicated by their gains and development in vocabulary. Considering the advantages of this game and the important role of a bigger vocabulary, language teachers can take this game into account for using in their language classes particularly for use as an extracurricular activity. Furthermore, since this study only involved 4 players, there are problems of generalizability and reliability, thus the researcher recommends that other researchers conduct similar studies with more participants to get better and more defensible findings.

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**APPENDIX 1**

_A Sample Application of Based Crossword Puzzle Downloaded from Playstore_

![Crossword Puzzle](image)

**APPENDIX 2**

**Interview Questions**

1. How are you today?
2. How is your class going?
3. Do you often play the Application-Based Crossword Puzzles?
4. What do you feel when you are playing Application-Based Crossword Puzzles?
5. What do you like about playing Application-Based Crossword Puzzles?
6. What do you get from playing Application-Based Crossword Puzzles?
7. How so?
8. What do you do when you do not know the meaning of a word?
9. What do you do with new words you found playing Application-Based Crossword Puzzles?
10. Why do you do that?
11. What is your opinion about the role of vocabulary in language learning?
12. What do you do to memorize vocabulary?
13. Do you think vocabulary helps you enhance your other EFL skills such as writing?
14. Why do you think so?

APPENDIX 3

Vocabulary Test

I. Choose the correct answer.

1. Every school principle has to make … report by the end of the year.
   a. weekly   b. annual   c. monthly   d. daily
2. The police’s dog … to any pedestrian walking in front of police station.
   a. bites   b. barks   c. bends   d. binds
3. She … her aunt’s baby because she doesn’t have child.
   a. adores   b. adopts   c. admires   d. advocates
4. The earth looks like a … when we see it from the moon.
   a. rectangle   b. shadow   c. sphere   d. triangle
5. She … that the lecture is fascinating.
   a. contends   b. gets   c. pretends   d. pays attention
6. It is … that he does not know his neighbor.
   a. good   b. astonishing   c. nice   d. odd
7. He … his dead chicken behind his house.
   a. grabs   b. kicks   c. buries   d. stays away
8. Patience and diligence are the examples of good human’s ….
   a. trait   b. instinct   c. cognition   d. behavior
9. My father changes the lamp using … because it is too high.
   a. stool   b. ladder   c. rubber   d. cable
10. All his friends do not like him because he is ….
    a. humble   b. intelligent   c. cocky   d. friendly

II. Fill in the blanks with an appropriate word from the words in the box.

<table>
<thead>
<tr>
<th>enormous</th>
<th>spade</th>
<th>fog</th>
<th>lift</th>
<th>ranch</th>
</tr>
</thead>
<tbody>
<tr>
<td>budget</td>
<td>bead</td>
<td>brick</td>
<td>abuse</td>
<td>desert</td>
</tr>
</tbody>
</table>

1. This … project spends huge sum of money.
2. My uncle has a horse … in Sumbawa.
3. The flight is delayed because of thick ….
4. Don’t … this table alone because it is heavy.
5. Some people dig the ground using ….
7. Drug … seems to be a serious problem in our country.
8. This wall is made up piles of … .
9. You should make a good … if you do not want to be broke.
10. Sahara is the largest … in the world.

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