A case study of using the Smart Board as a Chinese learning application by elementary school students

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Abstract: The Smart Board is an effective tool for learning Chinese. The purpose of this study was to investigate elementary students’ perception of using the Smart Board to learn the four fundamental core skills of Chinese: reading, listening, speaking, and writing. Participants (N = 172) were second to fourth graders of an elementary school. Results of the ANOVA analyses indicated that there were no significant gender differences in reading, listening, speaking, and writing for the 2nd graders as well as in reading, listening and speaking for the 3rd graders. However, male 3rd graders had a significantly (F = 7.816, p = .007) higher mean score in writing than female students, while female 4th graders showed a significantly (F = 5.597, p = .022) higher mean score in listening Chinese than their male counterparts. It is suggested that Chinese language learning activities should be tailored based on students’ genders and grade levels.

Keywords: language learning; instructional technology; gender differences; interactive whiteboard; Mandarin.


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1 Introduction

Chinese is one of the most popular languages in the world. It is estimated that 1310 million people speak Chinese worldwide (Lewis et al., 2016). Since there is a growing need to engage in China in the areas of business and culture, more and more people in the USA are learning Chinese. In 2015, President Barack Obama of the USA joined with Jinping Xi, President of China, to launch the “One Million Strong” project. The goal of this project is to have at least one million K-12 students in the USA learned Mandarin Chinese by the year 2020 (Mitchell, 2016). In spite of this, there are some challenges for a native English speaker to learn the Chinese since the two languages are different in many ways. For example, the English language is alphabet-centred (i.e., words are made up of various letters as in alphabetic systems) while the Chinese language uses a logographic system for its writing (i.e., symbols represent the words themselves). Furthermore, Chinese is a tonal language, and the stress and intonation patterns are totally different between English and Chinese. In Chinese, different pitches (highness or lowness) of a phoneme sound indicate different word meaning. On the contrary, changes in pitch in English are used to emphasise or express emotion, not to give a different word meaning (Swan and Smith, 2001). In other words, the major obstacle in learning Chinese is that the learners have to listen and reproduce unfamiliar
tones and sounds (some of the them do not exist in English) through writing skills that involved in generating Chinese characters (Beijing Expat Guide, 2016; Moser, 2010).

With the advance in technology, digital devices are available to almost all the teachers and students nowadays. A study conducted a few years ago indicated that 54% of the 5146 surveyed public school districts in the USA used tablet computers and e-readers or both with an additional 10% expressing planned to purchase the devices in the next year or two. Furthermore, 47% of the school districts used distance learning in some capacity, while 50% of them use Cloud computing and Student Response Systems clickers. Most importantly, 90% of all school districts use interactive white boards and around 88% of them use white boards in all schools in the district (Webster, 2012). Meanwhile, the current trend is that vocabulary building software is supplanting traditional paper flashcards in various learning contexts. For example, animation apps for portable devices could develop “visual-orthographic representations” and concluded that a variety of portable technologies should be used for language learning within and beyond the classroom (Xu et al., 2013), whereas mobile phone apps could be more effective in vocabulary learning than traditional paper flash cards ( Başoğlu and Akdemir, 2010). Moreover, Grillo (2011) demonstrated that some degrees of success when using digital flashcards with high school biology students diagnosed with learning disabilities.

2 Purpose of the study

This current study has selected to examine the Smart Board because it is commonly used in K-12 schools and is relatively easy to use for both teachers and students. The Smart Board is an interactive white board with a touch-screen device, making it well-suited and an effective tool for learning Chinese. It also has the ability to store and present multimedia content via visual and auditory channels simultaneously (Mayer, 2001). Such design facilitates students to “comprehend, use, and control the symbol systems of both print and non-print media, as well as understand the relationship between them” (Cox, 1994; cited in Fortuna, 2007, p.18). The main purpose of the study was to examine the perceptions of elementary school students regarding the usefulness of the Smart Board in reading, listening, speaking, and writing Chinese within the context of structured classroom activities. Another purpose of the study was to investigate gender differences in learning since boys and girls sometimes have different attitudes toward technology (Whitley, 1997). Luongo (2012) further reported that “even as early as elementary school, the girls did not choose to use computer technology in school projects as often as did the boys” (p.520). In addition, due to genetic differences of the cochlea length in the ear, girls often can hear better than boys (Bonomo, 2010). Specifically, the current study was guided by the following research questions:

RQ1. What would be the perceptions of male and female elementary students on the usefulness of the Smart Board to learn Chinese?

RQ2. Would there be gender differences in the perception of using the Smart Board to learn Chinese?

RQ3. Would there be grade level differences in the perception of using the Smart Board to learn Chinese?
3 Methods

One public elementary school in the Midwestern region of the USA was selected for this study. Participants \((N = 172)\) of this study were elementary school students: 61 of them were 2nd graders (male = 37, female = 24), 57 were 3rd graders (male = 31, female = 26), and the remaining 54 students were 4th graders (male = 32, female = 22). The students’ age ranged from 7 to 11 years old (with a mean age of 8 years). These students were enrolled in a required Chinese language class where one the researchers was the instructor. The class met twice a week for 35 minutes each. During each of these classes, a certified Chinese language instructor trained to use the Smart Board for Chinese language instruction made frequent use of the Smart Board for a variety of learning activities. For example, when teaching a new term like “dragon dance,” an image of dragon dance and the Chinese term were displayed on the Smart Board (see Figure 1). Then the students were familiar with the pronunciation and writing of the term “舞龙”.

During the consolidation phase, only the image of “dragon dance” was shown, and students had to speak out the term. Then the students could check its answer in the next slide. Likewise, the Smart Board could demonstrate the order of strokes in Chinese characters writing, and the students could follow the sequence of the Chinese character writing step by step.

Figure 1  Display of image and Chinese characters on Smart Board
After three months of instruction, a course evaluation was administered to the students in grades 2, 3, and 4. The evaluation was designed to assess students’ perceptions of the usefulness of the Smart Board in assisting them to master the Chinese language based on the four core skills: reading, listening, speaking, and writing Chinese. Specifically, students were asked about how helpful was the Smart Board in helping them to read, listen, speak, and write Chinese. All items of the questionnaire used a five-point Likert-type scale (e.g., from 1 = “Not Helpful” to 5 = “Extremely Helpful”). The questionnaire was self-reported using paper and pencil. Data collection of this study was administered by the Chinese language instructor. Because of the young age the students, the instructor explained each of those items one at a time to see whether they had any questions. The students were also reminded to fill out their grade level and gender, but not to put down their name anywhere in the questionnaire.

3.1 Statistical analysis

The data were analysed by IBM SPSS Statistics: Version 22 (IBM, 2013). One-sample t-tests were used to examine the overall perceptions of male and female students in using the Smart Board to learn Chinese based on the four core skills: reading, listening, speaking, and writing Chinese. One-way ANOVA analyses were utilised to assess gender differences in the perceptions of using the Smart Board to learn Chinese based on the four core skills of reading, listening, speaking, and writing among 2nd, 3rd, and 4th graders.

4 Results

Results of the one-sample t-tests showed that all four items were significant ($p < .001$), indicating both male and female students found that the Smart Board was helpful for them to learn how to read, listen, speak, and write Chinese. The results of the one-sample t-tests and the mean scores (ranged from 3.13 to 3.56) are depicted in Table 1. It was interesting to know from the results that female students in general had higher scores in reading and listening than male students while male students in general had higher scores in speaking and writing than their female counterparts, though such differences were not significant ($p > .05$).

Results of the one-way ANOVA analyses indicated that there were no significant ($p > .05$) gender differences in reading, listening, speaking, and writing for the 2nd grade students. Likewise, no significant ($p > .05$) gender differences were found in reading, listening and speaking for the 3rd graders. However, male 3rd grade students had a significantly ($F = 7.816, p = .007$) higher mean score in writing than female students (see Table 2). The results of the 4th graders were somewhat different. While there were no significant ($p > .05$) gender differences in reading, speaking, and writing, female 4th graders showed a significantly ($F = 5.597, p = .022$) higher mean score in listening Chinese than their male counterparts (see Table 2).
Table 1  One-sample T-test examining the perceptions of male and female elementary students in using the Smart Board to learn Chinese

<table>
<thead>
<tr>
<th></th>
<th>Male Students (n = 100)</th>
<th></th>
<th>Female Students (n = 72)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ±SD</td>
<td>t-ratio</td>
<td>p</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>Reading</td>
<td>3.13 ±1.38</td>
<td>8.172</td>
<td>.000***</td>
<td>3.33 ±1.34</td>
</tr>
<tr>
<td>Listening</td>
<td>3.30 ±1.34</td>
<td>9.668</td>
<td>.000***</td>
<td>3.56 ±1.25</td>
</tr>
<tr>
<td>Speaking</td>
<td>3.41 ±1.32</td>
<td>10.691</td>
<td>.000***</td>
<td>3.28 ±1.33</td>
</tr>
<tr>
<td>Writing</td>
<td>3.48 ±1.47</td>
<td>10.091</td>
<td>.000***</td>
<td>3.13 ±1.49</td>
</tr>
</tbody>
</table>

Notes: *** p < .001.

Table 2  Perceptions of using Smart Board in learning Chinese between male and female elementary students

<table>
<thead>
<tr>
<th></th>
<th>Male Students</th>
<th></th>
<th>Female Students</th>
<th></th>
<th>F-ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Graders (n = 61)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>2.84 ±1.40</td>
<td>3.46</td>
<td>±1.41</td>
<td>2.827</td>
<td>.098</td>
<td></td>
</tr>
<tr>
<td>Listening</td>
<td>3.76 ±1.14</td>
<td>3.46</td>
<td>±1.18</td>
<td>.971</td>
<td>.328</td>
<td></td>
</tr>
<tr>
<td>Speaking</td>
<td>3.54 ±1.32</td>
<td>3.42</td>
<td>±1.44</td>
<td>.119</td>
<td>.732</td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>3.24 ±1.59</td>
<td>3.38</td>
<td>±1.66</td>
<td>.097</td>
<td>.757</td>
<td></td>
</tr>
<tr>
<td>3rd Graders (n = 57)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>3.23 ±1.33</td>
<td>3.35</td>
<td>±1.44</td>
<td>.107</td>
<td>.745</td>
<td></td>
</tr>
<tr>
<td>Listening</td>
<td>3.29 ±1.37</td>
<td>3.54</td>
<td>±1.27</td>
<td>.494</td>
<td>.485</td>
<td></td>
</tr>
<tr>
<td>Speaking</td>
<td>3.19 ±1.28</td>
<td>3.19</td>
<td>±1.33</td>
<td>.000</td>
<td>.997</td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>4.03 ±1.28</td>
<td>3.08</td>
<td>±1.29</td>
<td>7.816</td>
<td><strong>.007</strong></td>
<td></td>
</tr>
<tr>
<td>4th Graders (n = 54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>3.38 ±1.39</td>
<td>3.18</td>
<td>±1.18</td>
<td>.285</td>
<td>.596</td>
<td></td>
</tr>
<tr>
<td>Listening</td>
<td>2.78 ±1.39</td>
<td>3.68</td>
<td>±1.36</td>
<td>5.597</td>
<td><strong>.022</strong></td>
<td></td>
</tr>
<tr>
<td>Speaking</td>
<td>3.47 ±1.37</td>
<td>3.23</td>
<td>±1.27</td>
<td>.430</td>
<td>.515</td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>3.22 ±1.39</td>
<td>2.91</td>
<td>±1.54</td>
<td>.595</td>
<td>.444</td>
<td></td>
</tr>
</tbody>
</table>

Notes:  * p < .05;  ** p < .01.

5 Discussion

The main purpose of the study was to examine the perceptions of elementary school students regarding the effectiveness of the Smart Board in reading, listening, speaking, and writing Chinese. The first research question of this study asked what would be the perceptions of male and female students on the usefulness of the Smart Board in learning Chinese. Overall, both the male and female participants found the Smart Board useful in aiding them to read, listen, speak, and write Chinese. The results of this current study
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support previous research studies that have emphasised the importance of instructional technology in the learning process. For example, Tsai et al. (2012) demonstrated that the accuracy of character handwriting in elementary school teaching and learning can be facilitated by multimedia technology interactive practice and its instant feedback. Further, Zhang (2007) commented that instructional technology (e.g., Smart Board) can help improve both the effectiveness and the efficiency of learning Chinese as a second language.

The second research question aimed at examining gender differences in the perception of using the Smart Board to learn Chinese. When considering the entire sample as a whole, we do not see any significant differences in the perceptions of using the Smart Board to read, listen, speak, and write Chinese between male \(n = 100\) and female \(n = 72\) elementary students. However, when examining the third research question to see whether there are differences in the perception of using the Smart Board to learn Chinese in different grade levels, we have found two gender differences: male 3rd graders had a slightly higher mean score in writing Chinese than female students, but male 4th graders had a lower mean score in listening Chinese than their female counterparts. We know that boys’ brains develop differently than girls, and the areas involved in language spatial memory mature about a few years earlier in girls than in boys (Hammon et al., 1999). The non-significant results among 2nd graders probably because such gender differences in brain development were not obvious in younger ages (e.g., seven years old).

When the students become more mature, the differences become more apparent among the 3rd and 4th graders. Male students in the 3rd grade perceived the Smart Board more useful in writing Chinese than girls probably because of the colour of the pen being used since the male eye is drawn to cooler colours such as black, blue, grey, and silver. In contrast, the female eye is drawn to textures and warmer colours like red, yellow, and orange. Female students in the 4th grade perceived the Smart Board more useful in listening Chinese than boys probably because of the neural connectors that create listening skills are more developed in the female brains (Sax, 2006). Based on the results of this study, third grade boys would be asked to focus on Smart Board-based learning activities while the girls are assigned to non-Smart Board-based activities to enforce their Chinese writing skills. For the same token, conversely, in the fourth grade Chinese class, girls would be asked to focus on Smart Board-based learning activities while working on their ability to accurately listen to Chinese, while boys would be assigned non-Smart Board-based activities for this purpose.

5.1 Limitations

The current study is not without its limitations. The sample size is relatively small, and all students were taught by the same instructor in the same school setting. On the positive side, this controls potential extraneous variables in the sample. On the negative side, it limits the generalisability of the results. Had the study included different teachers, different learning activities, different student bodies, different schools, or different geographic regions might produce different results. For these reason, further research studies are necessary to warrant the results.
6 Conclusions

These results are preliminary at best, but they do call attention to the issue of considering gender-based differences in learning styles among elementary school students learning not only Chinese but other subjects as well. Certainly a great deal more research is indicated, but classroom teachers would be well-advised to carefully observe and potentially capitalise on learning style differences in their Chinese language classrooms and learning activities.

References


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**Note**

The first two authors contributed equally to this paper.