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汉语述补结构数据库的构建及其可视化研究¹

(Development of an Online Database for Chinese Resultative Verb Compounds and Its Application Based on Data Visualization Technology)

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摘要: 本文简述了“现代汉语述补结构用法词典”在线数据库的构建情况, 提出基于该数据库、大规模语料库及已有的语义知识库, 用事件语义相关度计算的方法来度量两个谓词性成分(V1, V2)构成述补结构的可能性, 并探讨了述补结构用法词典数据及事件语义相关度计算的可视化呈现及其在对外汉语教学中的应用。

Abstract: This paper describes the development of an online database for Chinese resultative verb compounds. Based on the database and related linguistic resources, including a semantic lexicon and a large-scale corpus, the authors propose a new computing method using semantic correlations to determine if two verbs can be formed as a Resultative Compound. In order to use the database and the computational method to support Chinese teaching and learning as a second language more efficiently, a web-based demo program is developed with the help of data visualization technology.

关键词: 述补结构, 在线词典, 复合事件, 语义关联度, 可视化

Keywords: Resultative verb compound, Online database, Composite events, Semantic correlation, Data visualization

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1. 引言

现代汉语述结式由两个谓词性成分（本文记作 V1-V2）黏合而成（比如“吃饱、哭肿、唱红、洗干净、摆放整齐”等）。该结构典型的语义模式是：V1 所表示的动作导致出现 V2 所表示的状态。比如在“吃饱”中，“吃”这个动作行为导致其主体（一般是人或动物）处于“饱”的状态。很显然，V1 和 V2 之间应该有事理上的因果联系，而如果缺乏这种联系，就无法构成述结式，比如“吃饿”一般情况下就不是一个合格的述结式，因为作为 V1 的“吃”按常理不会导致“饿”这个结果状态。对于母语者来说，V1 跟 V2 是否能构成述结式，似乎不是一个问题。但是，对于计算机理解中文信息来说，判断一个 V1-V2 组合是否构成述结式，却并不简单。因为到底如何判断“事理上的因果联系”以及什么样的因果联系能用述结式这样的结构来编码表达——这实际上是一个涉及到深层语义理解的复杂问题。根据砂岡和子（2013）的考察，汉日机器翻译对述结式的翻译就存在很多问题。另外，对于很多非母语者来说，汉语的述结式也是比较独特、不容易掌握的一种结构，在其他语言中可能需要用两个小句或其他复杂的动词性结构来表达的事件因果联系，在汉语的述结式中则可以用一个 V1-V2 黏合型的紧凑的谓词性结构来表达，这种结构和语义上的非常大的错位，往往使得非母语者很难把握其使用条件，因而在阅读理解时很容易误解汉语述结式的意思，而在自己的表达中，则会倾向于避免使用 V1-V2 述结式²。

汉语学界以往对汉语述补结构进行过广泛和深入的研究，但主要是集中在 V1-V2 整体的论元结构如何由 V1 和 V2 各自的论元结构导出、述结式与相关句法结构（如“把”字句、重动句等）的互动、述结式的认知研究等方面（参见：Li 1990，黄锦章 1993，王红旗 1995，郭锐 1995,2002，袁毓林 2001，施春宏,2008，宋文辉 2007 等），而对于述结式的能产性问题，即什么样的 V1 和 V2 会构成述结式，却关注的不多。下面四个例子，显示了在实际使用中，汉语 V1-V2 述结式具有很强的能产性。

- [1] 他演哭戏很感人，把导演都给哭哭了。
- [2] 吃懂法兰西
- [3] 别让公共场所的劣质洗手液“洗脏”了你的手
- [4] 中国学生吻吻美国机场一个热吻引发的思考

“哭哭”表面上是一个动词重叠形式（比如“哭哭闹闹”），但在例 1 中，却是典型的述结式，前一个“哭”是“他哭”，后一个“哭”是“导演哭”。两个“哭”分属不同的施事论元。例 2 中的“吃懂”是一个少见的组合，但其语义模式也符合典型述结式的要求，V1“吃”的结果是导致其主体（人）更懂得法国（的

²我们曾经考察过母语为日语的汉语初级学习者所写的 58 篇汉语作文，发现述结式使用频率很低，但只要用了，一般都没有用错。暨南大学唐玲的硕士论文《印尼留学生粘合式述补结构习得状况研究》（2004 年）也注意到了类似的现象。该文考察发现印尼留学生学习汉语粘合式述补结构时，结果补语正确使用率高，但掌握的补语量非常少。

文化)了,即 V2“懂”所指示的状态。例 3 中 V1“洗”导致了一个不合常理的结果“脏”(跟预期的符合常理的结果“干净”相反)。例 4 是文章的标题,其中的“吻瘫”更是表达了极为罕见的两个事件之间的因果联系:“中国留学生接吻”(事件 1)导致“美国机场陷入瘫痪状态”(事件 2)。

显然,一方面,V1-V2 述结式的构成形式及其用法特点很像是一般的复合动词(compound verb),另一方面,V1-V2 又像一般的短语结构那样是能产、开放的(参见下文第二节的讨论)。因此,从面向计算机的汉语信息处理以及面向非母语者的汉语教学的需要来说,关于 V1-V2 构成述结式的判别条件,就是一个很值得探讨的问题。就这个问题,本文提出的思路是:对于大量常见的述结式,可以像对待一般复合动词那样,以词典数据库形式来描写其基本构成与用法特点。而对于 V1-V2 临时组合能否形成述结式,则可以从复合事件中两个子事件之间的语义相关度计算的角度,对 V1-V2 构成述结式的可能性进行估计。下文第二节扼要介绍我们在“述补结构用法词典”方面做的工作;第三节讨论对 V1-V2 的语义相关度进行计算的具体方法;第四节介绍利用可视化技术展示述补结构用法词典的相关研究成果及其在对外汉语教学中的可能应用;第五节是结语。

2. 现代汉语述补结构用法词典

由于汉语述补结构的独特性,对外汉语教学界一直把述补结构的的教学作为重点和难点。针对述补结构的的教学策略之一就是,把具体的用例尽可能多的穷举出来,加以细致的描写。比如北京语言大学王砚农等(1987)和刘月华等(1998)就分别编纂了述补结构的专题词典。前者集中在结果补语述结式,后者则是趋向补语的用法详解。不过,这些传统的纸本工具书在使用便利性、例句的鲜活性等方面还是有一些不足,为了学习者和研究者在互联网环境中能更有效地使用电子化的语言资源,在 2007 年到 2010 年间,北京大学与日本早稻田大学合作,构建了“现代汉语述补结构用法词典”的在线数据库(A Database for Chinese Resultative Verb Compounds,以下简称 DCRVC),通过互联网供学习者和研究者使用(网址:<http://ccl.pku.edu.cn/vc>)。目前 DCRVC 收集的述补条目共 21031 条,其中述结式 7942 条。主要描述的信息包括(1)述补结构的释义;(2)述补结构的事件语义角色;(3)述补结构的用例(每条至少 3 个汉语例句,有部分条目还有汉语例句的日语和英语译文);(4)述补结构的类型(分为“结果补语、趋向补语、可能补语、程度补语、介词补语 5 类),等等。下面是通过网页显示的述结式“吃遍”在数据库中的部分信息。

表 1: 现代汉语述补结构用法词典条目示例

吃¹ 【chi1】	词性: 动词	HSK: 甲	该述语有 2 个义项, 点击下方链接查看各义项 吃1 吃2	
	吃遍	chi1 bian4	补语类型: 结果补语	CCL频次: 24 来源: 砂岡
	中文	日文	英文	
释义	某个地方的或某类食品、药物等都品 尝过。			
例句	<ol style="list-style-type: none"> 小李吃遍了京城的美食楼。 小时候, 家里穷, 各种野菜都吃遍了。 他从小就是个病秧子, 吃遍了各种药也不见成效。 	<ol style="list-style-type: none"> 李さんは北京のグルメを食べ 尽くした。 幼い頃、家が貧しかったの で、あらゆる種類の野草を食 べ尽くした。 彼は子供のころから病気が多 く、あらゆる種類の薬を服用 したが効果はない。 	<ol style="list-style-type: none"> Mr. Li has eaten all the delicious dishes of the capital city. When I was a child my family was poor that we ate all kinds of vegetables. He has always been a ill boy since he was little, he has taken various kinds of medicine but did not see the results. 	

为便于了解 DCRVC 中数据的总体情况, 下面给出一些统计数据。

表 2: DCRVC 条目数统计表

类型	数据	
述语	词	1639
	义项	2014
补语	词	494
	义项	580
述补结构	21031	

表
4 :

表 3: DCRVC 各类型补语统计表

补语类型	数目	百分比
结果补语	7942	37.76%
趋向补语	7267	34.55%
可能补语	3390	16.12%
程度补语	1336	6.35%
介词补语	1096	5.21%
总数	21031	100%

DCRVC 述语分
组带不同类型
补语条目统计

动词类别	结果补语	趋向补语	可能补语	程度补语	介补补语
HSK(甲)	2110(26.57%)	1516(20.86%)	939(27.70%)	400(29.94%)	238(21.72%)
HSK(乙)	2552(32.13%)	2563(35.27%)	1057(31.18%)	437(32.71%)	364(33.21%)
HSK(丙)	1148(14.45%)	1131(15.56%)	513(15.13%)	199(14.90%)	159(14.51%)
HSK(丁)	736(9.27%)	642(8.83%)	226(6.67%)	90(6.74%)	88(8.03%)

非 HSK	1396(17.58%)	1415(19.47%)	655(19.32%)	210(15.72%)	247(22.54%)
合计	7942(37.76%)	7267(34.55%)	3390(16.12%)	1336(6.35%)	1096(5.21%)

我们同时也考察了北语王砚农等（1987）编的述补词典的条目以及北大计算语言所“人民日报分词和词性标注语料库”³中的述结式用例。其中，北语述补词典中共有述语 984 个，补语 321 个，述补条目 4106 个。人民日报语料库中述结式用例中共有述语 1641 个，补语 220 个，述补结构 3835 个。比对 DCRVC 跟这两个述结式数据源，可以发现，尽管 DCRVC 中已经收录述结式近 8000 条，但在这两个述结式数据源中未出现（未登录）的记录条数仍占相当高的比例。如下面表 5、6 所示：

表 5：DCRVC 中未登录北语词典述结式条目的比例统计

	《北语词典》总条数	DCRVC 中未登录条数
述语	984	134 (13.62%)
补语	321	46 (14.33%)
述补结构	4106	1750 (42.62%)

表 6：DCRVC 中未登录人民日报语料库中述结式条目的比例统计

	《人民日报》述结式用例数	DCRVC 中未登录条数
述语	1641	876 (53.38%)
补语	220	34 (15.45%)
述补结构	3835	2368 (61.74%)

以上考察说明，尽管用穷举的办法可以列出相当数量的述结式，但由于述结式的能产性，以词典列举词条的方式来描写述结式，还是有一定局限的。因此仍有必要对 V1-V2 构成述结式的条件做进一步深入分析。下面就来讨论从可计算的角度判断 V1-V2 构成述结式的定量方法。

3. V1-V2 的事件语义关联度计算

3.1. 基于复合事件语义关联的 V1-V2 述结式分析框架

比较容易想到的一个思路是：DCRVC 数据库中已有的述补结构实例可以看作是比较典型的述结式（范例）的集合。对于一个新出现的“V1-V2”组合，可以通过比较它跟现有的述结式范例的相似程度，来估计这个新的“V1-V2”组合是否构成述结式。

³语料包含 1998 和 2000 年两年全年的《人民日报》文字内容，五千多万字。本文统计所用的述补结构用例材料由北大计算语言所段慧明老师提供。特此致谢。

不过，单纯基于相似度来评估 V1-V2 构成述结式的可能性，也有可能造成误判。比如在已有述结式数据库中有“放跑”“放走”等实例，现在要判定“摆-走”构成述结式的可能性，基于“摆”跟“放”有相似性，而“走”跟“跑”也有相似性，就容易把“摆-走”看作是述结式，但这显然与一般人语感不符。这实际上就又回到了 V1-V2 构成述结式的语义模式问题，即 V1 跟 V2 之间一般应具有“致使-结果”的事件关系。可见，跟比较 V1-V2 与已知述结式范例之间的相似程度相比，更合理的方法是估计 V1 和 V2 之间是否具有“致使-结果”事件语义联系。

从事件语义关系的角度来看，现代汉语的述结式可以看作是一个复合事件的压缩编码形式（詹卫东 2013）。如下面例子所示：

	事件 1	事件 2	复合事件（压缩编码形式）
[5]	妈妈喂女儿。	女儿饱了。	妈妈喂饱了女儿。
[6]	张三洗衣服。	衣服干净了。	张三把衣服洗干净了。

两例中都是事件 1 的发生导致了事件 2 的发生，并且这两个事件存在着共有事件角色。例 4 中的共有事件角色是“女儿”，例 5 中的共有事件角色是“衣服”。复合事件的语义结构可以用下面图 1 表示。

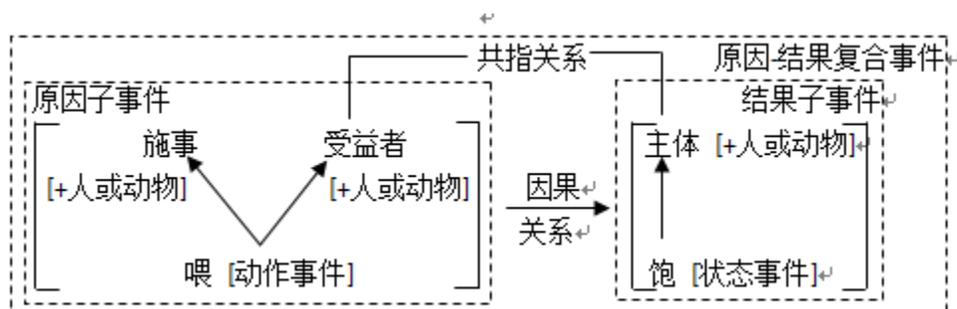


图 1：复合事件“喂饱”的事件语义结构示意图

基于上面这样的分析框架，可以把影响 V1-V2 构成述结式的条件归纳为：

条件 1：事件 1 和事件 2 存在共有事件角色；

条件 2：事件 1 和事件 2 之间存在“致使-结果”的语义关系。

对两个谓词性成分构成述结式的合法性的研究，不仅要回答它们能否构成一个述结式，还要回答所构成的述结式的可接受度有多大的问题。在上面这两个条件的基础上，我们提出关于述结式中复合事件的语义关联度的两个假设。

假设 1：构成述结式的两个谓词性成分（V1，V2）所激活的事件（记作 A，B）之间必须存在共有事件角色，且共有事件角色在这两个事件中的凸显程度影响了述结式中复合事件的语义关联度。

假设 2: 构成述结式的两个谓词性成分所激活的事件之间存在“致使-结果”的语义关系，“致使-结果”复合事件的语义相关度影响了述结式中复合事件的语义关联度。

据此，我们提出述结式中复合事件语义关联度的计算公式，这也是 V1-V2 构成述结式的可接受度的定量描述公式：

$$ER = \alpha * ER_1 + (1 - \alpha) * ER_2 \quad (\text{公式 1})$$

公式 1 中 ER 表示复合事件的语义关联度；ER1 是共有事件角色在两个子事件中的凸显程度。ER2 是两个子事件之间的“致使-结果”语义相关度。 α 是权重，用于调节上述两个因素对计算结果的贡献程度，可根据实验情况调整。下面分别说明公式 1 各部分的具体计算方式。

3.2. 共有事件角色凸显度计算 (ER1)

计算 ER1 的具体步骤如下：

- 1) 获取事件角色：以句子为单位，在语料中抽取包含 V1、V2 的句子中共现的名词性成分，构成 V1、V2 所代表的事件 E₁、E₂ 的潜在事件角色集合 R₁、R₂；
- 2) 抽取共有事件角色：集合 R₁ 和 R₂ 的交集，构成事件 E₁ 和 E₂ 的共有事件角色集合 R₀；
- 3) 分别计算 R₀ 中的事件角色在整体事件角色集合中所占的比例，取二者的最小值作为结果输出。

具体的计算公式如下所示。

$$ER_1 = \min \left(\frac{\sum_{r \in R_0} C(r)}{\sum_{r \in R_1} C(r)}, \frac{\sum_{r \in R_0} C(r)}{\sum_{r \in R_2} C(r)} \right) \quad (\text{公式 2})$$

其中，C(r)是事件角色 r 在事件中出现的频次。这里不妨看一个例子：对于“吃-饱”来说，计算“吃”和“饱”这两个事件的共有事件角色在事件中的凸显程度的过程如下：

- 1) 分别抽取“吃”和“饱”这两个事件的事件角色，结果如下：

R₁ (吃): {“饭” : 7863, “人” : 5269, “东西” : 2357, “晚饭” : 1924, “肉” : 1562, “菜” : 1187, “药” : 1044, “午饭” : 992, “时候” : 903, “水” : 825, ……}

R₂ (饱): {“肚子” : 380, “饭” : 371, “人” : 285, “口福” : 90, “人们” : 64, “墨” : 48, “肚皮” : 48, “笔” : 45, “酒” : 42, “书” : 42, ……}

- 2) 抽取共有事件角色，结果如下：

R₀: {“饭”，“人”，……}

- 3) 根据公式 2 进行计算：

$$ER_1 = \min\left(\frac{7863 + \dots + 5269}{7863 + 5269 + \dots + 825}, \frac{371 + \dots + 285}{380 + 371 + \dots + 42}\right) = 0.6467$$

3.3. V1-V2 复合事件语义关联度计算 (ER2)

公式 1 中计算 ER2 可以利用两个资源, 分为两个部分进行。一是依赖大规模语料库的基于概率统计的计算; 一是依赖现有语言知识资源的基于事件相似度的计算。前者基于大规模语料的计算覆盖率较高, 但准确率往往较低; 后者基于知识库资源的计算方法准确率高, 但覆盖率较低。综合考虑这两种度量方法, 可以有效的融合这两种计算方法的优点。ER2 的具体计算公式如下:

$$ER_2 = \beta \cdot ER_{21} + (1 - \beta) \cdot ER_{22} \quad (\text{公式 3})$$

其中, ER_{21} 是基于语料库概率统计的语义关联度计算结果; ER_{22} 是基于语义知识资源的语义相似度计算结果。 β 是权值, 用于调整两种计算方法的贡献度, 可根据实验效果进行调整。下面分别来看公式 3 中 ER_{21} 和 ER_{22} 的具体计算方法。

(一) 基于语料库中 V1-V2 共现概率的语义关联度计算

先看 ER_{21} 的计算方法。一般地, A、B 两个事件若存在“致使-结果”语义关系, 从时间顺序上来看, A 事件的发生要早于 B 事件。反映到语序上, 则是代表 A 事件的谓词 V1 先于代表 B 事件的谓词 V2 出现。因此, 对两个事件之间的“致使-结果”语义关系的计算, 可以简化为 V1、V2 在实际语料中顺序出现时的相关度计算。这里, 我们用 V1-V2 的点式互信息 (PMI, pointwise mutual information) 来估计二者所代表事件的相关程度。 ER_{21} 的计算公式如下:

$$ER_{21} \equiv \log \frac{\#(v_1, v_2) / \#}{\frac{\#(v_1) \cdot \#(v_2)}{\#}} = \log \frac{\#(v_1, v_2) \cdot \#}{\#(v_1) \cdot \#(v_2)} \quad (\text{公式 4})$$

其中, $\#(v_1, v_2)$ 为两个谓词性成分在语料中前后共现于一个句子中的频次, $\#(v_1)$, $\#(v_2)$ 分别为两个谓词性成分在语料中出现的频次, $\#$ 为语料总频次。

(二) 基于词典知识库中词语相似性的语义关联度计算

再来看 ER_{22} 的计算方法。 ER_{22} 是对任意两个 V1-V2 组合, 计算其与已有的典型述结式的最大相似度。具体计算公式如下:

$$ER_{22} = \max_{w_1 \in \|V1\|, w_2 \in \|V2\|} (\text{Sim}(w_1, V1), \text{Sim}(w_2, V2)) \quad (\text{公式 5})$$

其中:

1) $\|V1\|$ 是 DCRVC 中所有带 V2 补语的述语集合, 对于 $\|V1\|$ 中的每一个词语 w_1 ,

计算其与 V1 的词语相似度 $\text{Sim}(w_1, V1)$;

2) $\|V2\|$ 是 DCRVC 中所有给 V1 作补语的词语集合, 对于 $\|V2\|$ 中的每一个词语 w_2 , 计算其与 V2 的词语相似度 $\text{Sim}(w_2, V2)$;

3) 最终结果为 $\text{Sim}(w_1, V1)$ 和 $\text{Sim}(w_2, V2)$ 中的最大值。

4) $\text{Sim}(w_1, V1)$ 和 $\text{Sim}(w_2, V2)$ 的计算则直接采用了刘群、李素建 (2002) 基于《知网》语义资源的词语相似度计算方法。

下面以“吃-懂”组合为例说明 ER_{22} 的计算步骤:

(1) 在 DCRVC 中查找“懂”的述语集合, 记作 $\|V1\| = \{\text{看、读、}\dots\}$;

(2) 在 DCRVC 中查找“吃”的补语集合, 记作 $\|V2\| = \{\text{饱、光、遍、急、}\dots\}$;

(3) 计算“吃”跟 $\|V1\|$ 中每个元素 (w_1) 之间的相似度, 计算“懂”跟 $\|V2\|$ 集合中每个元素 (w_2) 的相似度⁴。在所有相似度中取最大值作为结果输出。

$$ER_{22}(\text{吃, 懂}) = \text{Max}(\text{Sim}(w_1, \text{吃}), (\text{Sim}(w_2, \text{懂})) = \text{Max}(1, 0.2424, \dots) = 1$$

显然, 若 V1, V2 跟已有的典型述结式越相似, 则 V1 和 V2 的语义关联度越高, 二者越有可能构成述结式。如果 V1、V2 都是 DCRVC 中已有的述语词和补语词, 且二者构成述结式, 则 $ER_{22}(V1, V2)$ 的值为 1。如果 V1、V2 在 DVRVC 中均未出现, 则规定 $ER_{22}(V1, V2)$ 的值为 0。

至此, V1-V2 复合事件的关联度计算得以落实。根据实验, 上面公式 1 和公式 3 中的权值 α 和 β 分别取 0.1 和 0.7, 所得 V1-V2 事件语义关联度计算结果在准确率 (precision) 和召回率 (recall) 两个指标上可以达到最优。因此, V1-V2 事件语义关联度计算公式最终可确定为:

$$ER = 0.1 * ER_1 + 0.9 * (0.7 * ER_{21} + 0.3 * ER_{22}) \quad (\text{公式 6})$$

4. 述补结构词典的可视化应用

为了更直观地展示 DCRVC 数据库中的述补结构数据, 为对外汉语教学与研究提供更好地计算机辅助, 本文尝试借鉴数据可视化 (data visualization) 技术, 在网页环境下为用户提供 DCRVC 数据库的查询以及文本中述补结构的自动识别服务。这一节介绍目前开发的原型系统 (以下简称 VisualRVC⁵) 的主要功能。

4.1. 查询述语和补语的相关信息

⁴基于 DCRVC 中的述语和补语条目, 以及刘群、李素建 (2002) 基于《知网》数据库的相似度计算程序, “吃”跟“看”的相似度值为 1; “懂”跟“急”的相似度值为 0.2424。

⁵<http://ccl.pku.edu.cn:8080/visualization>

算结果及相关的述语、补语、事件角色等基本信息。

下面图 5 和图 6 是上述步骤的示意图：



图 5：“抽取述结式”结果界面示意图

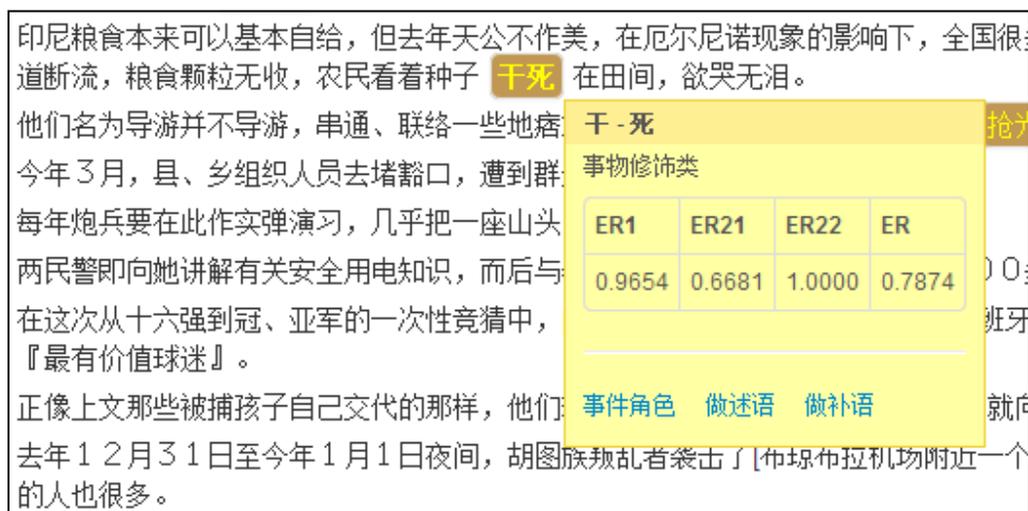


图 6: 述结式具体信息及其他相关操作

图 5 中，程序对本文中自动识别出来的述结式做了高亮显示（highlight），并用不同颜色区分了述结式的不同小类。文本上方提供了一个平滑条，由用户自主设定阈值，可以综合考虑准确率和召回率的平衡。在这个页面上可以看到：滑动条上滑块位置变化引起阈值发生变化，文本中述结式的识别结果也相应发生变化，其中未达到阈值（关联度不够高）的述结式将不被高亮显示。

图 6 展示了当鼠标悬停在文本中某个述结式实例上, 程序会弹出一个框图, 显示该述结式的事件语义关联度计算结果, 并可以链接到 DCRVC 数据库, 进一步查询述语 (V1) 和补语 (V2) 的相信信息, 也可以从语料库中查询各自所代表事件的事件角色 (即如图 3、图 4 显示效果)。

5. 结语

本文介绍了构建现代汉语述补结构用法词典的背景及在线数据库的现状, 探讨了在复合事件语义分析框架下, 通过计算 V1-V2 的事件语义相关度, 来判断 V1-V2 构成述结式的可能性 (条件)。尽管基于本文提出的计算公式, 对一定规模的 V1-V2 组合进行初步试验, 结果表明这种计算方法具有一定的可行性 (马腾, 2014), 但本文所提出的计算方法存在的问题也是比较明显的。除了公式 6 中各组成部分的细节可以再完善外, 还应该更全面地考虑 V1-V2 组合的外部环境因素。以本文开头举的例 1 中比较极端的述结式例子“哭哭”来说, 它的上文中“把”“给”这类标志词, 是可以提示这一环境中的 V1-V2 更倾向于解读为述结式的, 但如果仅从事件语义关联度的角度来计算“哭”跟“哭”的关联, 二者因为完全同形, 无法代表两个本质上不同的事件 (两个“哭”的参与角色是不同的), 这时候用本文的计算方法, 就有点缘木求鱼的味道了。当然, 考虑的特征因素越多, 计算的复杂性就越高。本文所提出的计算公式的优点是计算简单。在有了述补结构数据库以及事件语义相关度计算方法的基础上, 本文利用数据可视化技术, 开发出一个原型系统, 来直观展示述补结构数据库的内容及在文本中自动标识 V1-V2 述结式。我们期望, 对于汉语述结式的教学和研究, 本文提出的这一思路以及初步的工作成果, 是一次有意义的尝试。

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语音识别技术在中文教学中的应用：
一堂汉语拼音练习课的启示
(The Application of Speech Recognition Technology in Chinese
Language Learning: What Can Be Learned From a Pinyin
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摘要： 本文通过对一次汉语拼音课堂练习活动的观察初步探讨了借助语音识别技术进行拼音练习的三个基础问题。我们观察到目前的中文语音识别技术，比如像 Google 公司的语音识别引擎，可以给学生提供有意义的练习机会。这表现在 Google 语音引擎识别常用且有意义的言语时准确率更高，不能正确识别时给出的（出乎意料的）反馈让学生们觉得有趣，降低了他们的学习焦虑，学习变得更主动。虽然本研究有限的观察数据并不能充分证明语音识别技术对二语习得的益处，但我们至少观察到了学生学习行为的一些积极改变，这些改变是有助于二语习得的。我们的观察还表明在借助语音识别技术帮助学生进行拼音练习时最好使用（接近）真实的言语提示，避免使用无语义的音节组合或在真实生活中使用频率低的言语表达。

Abstract: This paper reports the findings from a language lab session where speech recognition technology was used to give students practice opportunities in Chinese Pinyin pronunciation. Our limited observations suggest that current Chinese ASR technologies, as exemplified by Google's Web Speech API, can provide opportunities for students to engage in meaningful pronunciation practices. This is demonstrated by students' more willingness to practice, and relaxed reactions to both the expected and unexpected feedbacks from the Google speech engine. Though we do not have sufficient data to demonstrate the effectiveness of current speech technologies in improving second language acquisition, our observations do indicate that it helps to lead to some good learner behaviors in language learning, which are acknowledged to be good indicators of better language acquisition. Our observations also suggest that when designing Pinyin activities it is better for instructors to provide students with meaningful and frequently used prompts rather than isolated syllables groups or low-frequency expressions.

关键词：语音识别，中文教学，拼音练习，二语习得，教学法

Keywords: Automatic speech recognition, Chinese language teaching, Pinyin practice, Second language acquisition, Pedagogy

1. 引言

自然语言处理中的自动语音识别(Automatic Speech Recognition, ASR)是指将语音转换成文本 (Speech-to-text) 的技术, 其起点可以追溯至上世纪三十年代 Bell Labs 的研究¹。在互联网和移动终端普及之前, 为用户提供语音识别服务主要是通过安装在单机上的应用程序和有限能力的中央控制系统来实现, 比如 Windows 操作系统的声控功能, Rosetta Stone 外语学习软件²、和在美国常见的电话语音客服系统等。近几年来随着云计算、移动(互联网)和大数据技术的广泛使用, 尤其是其本身的不断进步, 语音识别技术在更广的范围内得到了应用。比如各大互联网公司都为其操作系统和服务软件提供了语音识别支持(如 Apple 公司的 Siri³、Google 和 Microsoft 公司的语音检索服务等)。不少移动终端制造商也为其智能手机和平板电脑配备了语音输入和应用, 用户可以通过智能移动终端的语音输入和 Google 公司的 Chrome 等浏览器使用语音识别服务。

在外语教学中使用语音识别技术是一件很自然的事情。在语音识别技术发展 (Huang, Baker 和 Reddy, 2014) 的各个阶段, 外语学习者和教师、外语教学研究者以及应用开发厂商都尝试过将语音识别技术用于各种语言的教学, 探讨过其应用于语言学习各个方面的可能和问题(Holland 和 Fisher, 2007)。被关注的话题包括语音识别处理各个语言的可能和有效性(如最近的 Liakin, Cardoso 和 Liakina 等, 2013; Mushangwe, 2015), 在外语学习中使用的有效性和学习者对其的感知 (Cordier, 2009), 以及使用语音识别技术的教学方法(如 Morton, Gunson 和 Mervyn, 2012)等。早期较为他人熟知的带有语音识别功能的外语学习软件包括 Rosetta Stone⁴和 TELLMEMORE⁵等。

较之于早期使用语音识别技术, 目前的语音识别技术在其使用场景和便利性、尤其是可识别的语言内容开放性、反馈信息、以及第三方应用开发等方面有了很大的改观, 主要表现在以下三个方面:

(1) 可使用语音识别技术场景和便利性的改变

¹参见: https://en.wikipedia.org/wiki/Speech_recognition

²参见: <http://www.rosettastone.com/>

³参见: <https://www.apple.com/ios/siri/>

⁴参加: <http://www.rosettastone.com/>

⁵参见: <http://tellymore.com/home.aspx#&panel1-1>

早期的语音识别大都通过安装在单板机上的软件进行。用户使用语音识别受制于机器的可移动性,可使用语音识别软件的场所有限。但是随着智能移动终端和移动互联网的普及以及使用成本的降低,用户可以更为方便地使用语音识别技术应用。与早期只能在单板机上使用语音识别软件的不便相比,他们现在可以更方便地在比如手机上或通过网页浏览器在更多的场所提交需要识别的语音,并获得反馈信息。

(2) 可识别的语言内容和识别反馈信息的改变

早期的语音识别应用软件都是使用了 HMM 等统计算法进行语音模式匹配⁶,安装在单板机上,与外部没有数据交换,用户的语音输入和获得的识别反馈只是局限于事先编程好的有限内容。与此相比,目前用户大都可以通过移动端或网页浏览器更随意地提交语言输入给处于云端的语音识别引擎,并从那里获得识别反馈信息。这些基于云端的语音识别引擎不仅使用了传统的统计算法,而且还借助了语音和文本语料库等大数据提高识别的精度和智能反馈,极大地丰富了可识别的语音内容和与用户的交互。比如使用 Apple 公司的 Siri 引擎,用户不仅可以声控自己的 iPhone 或 iPad 进行功能性操作,而且还可以通过互联网使用 Apple 公司提供的语音搜索服务查询诸如天气和场所等真实世界信息。前者与早期的语音识别应用服务并无本质上的差异,但后者则是语音识别技术应用的一个本质性改变。正是由于这种基于云端模式的语音识别和大数据的支持,语音识别已经从仅提供单纯的语音模式识别发展到能够智能地给用户提提供真实世界的信息。

(3) 开发语音识别应用软件门槛的降低

早期的语音识别应用软件开发门槛很高,需要有专业编程人员开发。所以一般外语教师都无缘于自行开发使用语音识别技术的教学软件或课件。近年来不少掌握语音识别技术的大(互联网)公司都提供了开放性语音识别应用接口(Speech API)。比如,可用于汉语普通话语音识别的开放平台有百度公司的语音开放平台⁷、科大讯飞的讯飞开放平台⁸以及 Google 公司通过其 Chrome 浏览器提供的语音识别接口(Web Speech API)。这些接口使得第三方人员开发语音识别应用的门槛降低了很多。例如,使用 Google 语音识别接口开发最简单的应用只需掌握一些 JavaScript 的编程知识。这使得外语教师自己或借助其他程序员的帮助很容易开发一些带有语音识别功能的外语学习应用。同时,它也改变了以往学习者只能借助于键盘的书面语言输入方式与学习软件进行交互。例如,学生在外语学习平台上完成一个填空练习,以往只能通过键盘输入答案,现在也可以通过语音输入来完成。

这些语音识别技术的新发展给开发外语学习软件,设计各种教学活动带来了许多新的可能性。在使用这些新技术,尤其是将语音识别智能信息反馈融合到语言教学软件中之前,一些基本教学问题仍然需要得到验证,其中包括:1) 基于目前开

⁶参见: <http://cmusphinx.sourceforge.net/wiki/tutorialconcepts>

⁷参见: <http://yuyin.baidu.com/fc.html>

⁸参见: <http://www.xfyun.cn/>

放平台的语音识别准确率，尤其是对外语初学者多样化语音的识别准确率如何？例如，就汉语学习者而言，怎样的言语输入能被成功识别：是单纯的单字音节，还是一段有语义的言语(像汉语中的成语和常见习语表达)？2) 基于云端和大数据的语音识别引擎可以智能地提供关于真实世界的信息反馈，这些模拟了真实世界的人际交互除了给学生提供更多的口语练习机会外，是否还能提高学生们的学习兴趣？3) 将这些新的语音识别技术应用到外语教学中，有哪些需要我们关注的教学法问题？

本文借助于一次使用了语音识别技术的汉语拼音课堂练习活动试图对以上三个问题做一个初步回答。本文以下将分为三部分：第二节将描述这次拼音练习活动的基本情况；第三节将提供笔者观察到的本次拼音练习活动的一些数据，并借助于这些数据讨论使用语音识别新技术给外语教学带来的益处和教学上的注意事项；第四节将是本文的小结。这里需要事先提及的是由于参与本次课堂练习的学生人数较少，本文的讨论将只是抛砖引玉，其结论不具备统计上的定论意义。

2. 一堂汉语拼音练习课

2.1 参与拼音练习的学生

参与本次拼音练习的是笔者所在学校的初级汉语班零起点学生，共有 10 位，他们都主修其他专业。在本次拼音练习课之前，这些学生已经从零开始学习了六周的汉语，每周三课时，使用《Chinese Link (2nd ed.)》教材(吴素美等，2010)。除了学期开始两周学习拼音和其他学习内容外，他们在课外并无额外的练习汉语口语的机会，在参与本次练习活动时仍属于 ACTFL 初低水平。

2.2 本次练习活动

本次学习任务是借助之前已经学过的语言表达来复习学习过的拼音。较之于以往教师带领的汉语语音学习和通过小组活动等进行的个人练习，本次是让学生通过 Chrome 浏览器使用语音识别来口头完成一个在线拼音练习。语音识别练习直接使用了 Google 公司提供的语音识别测试页面⁹ (图一)。练习提示(Prompts)由教师提供，分五类，包括仅有声调差异的单字音节组、数字、类似音节但有声调差异的有语义的表达、学生已经学过的汉语常用表达、和中文经典短语(见表一)。之前任课教师在教拼音时使用过数字作为教学材料。因为直接使用了 Google 公司的语音识别页面，所以这五类练习提示都打印发给学生，同时提供拼音和汉字。教师要求学生每组拼音至少说两遍。

⁹参见：<https://www.google.com/intl/en/chrome/demos/speech.html>

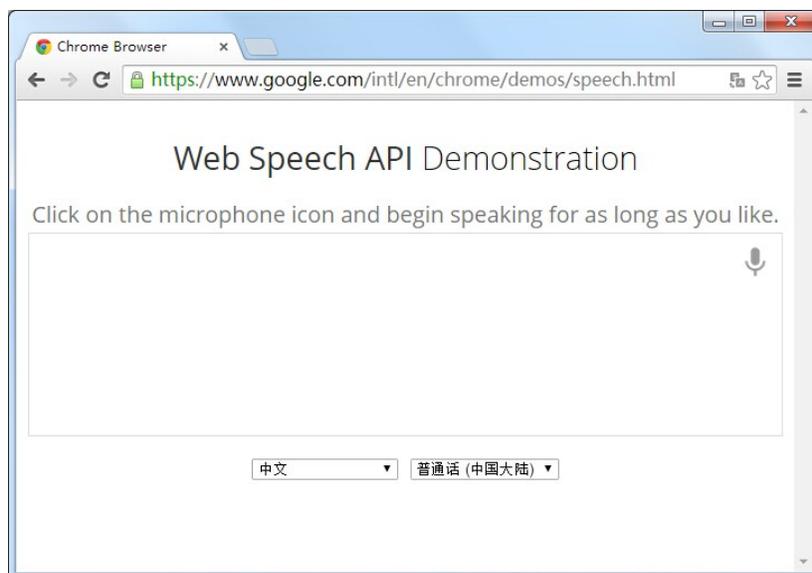


图 1: Google 语音识别测试页面

表 1: 拼音练习的提示

拼音练习种类	练习提示
1) 仅有声调差异的单字音节, 无语义	mā má mǎ mà 妈 麻 马 骂 māo máo mǎo mào 猫 毛 铆 帽
2) 数字	yī èr sān sì wǔ 一 二 三 四 五
3) 类似音节但音调不同, 有语义, 但真实世界里使用的频率很低	māmamǎimǎ 妈妈买马。 māmamàimǎ 妈妈卖马。
4) 学生已经掌握的语言表达, 有语义, 现实中常用	nǐhǎo ,wǒjiàowángdàzhōng. shìzhōngguó rén. 你好! 我叫王大中, 是中国人。
5) 中文经典表达, 汉语初学者一般没学过, 也不会使用	yuǎnqīnbùrú jìn lín 远亲不如近邻

3. 语音识别结果和讨论

3.1 识别结果

为了比较 Google 语音识别结果, 笔者在课后又找了一位 ACTFL 中级水平的汉语学生和一位汉语母语者进行了语音识别对比。表二至表六穷举了各种识别结果, 但没有统计频次。

表 2: 仅有声调差异的单字音节但无语义的识别结果

语言提示	妈 麻 马 骂	猫 毛 柳 帽
本班初学者	么么么么 么么马来吗 马马马马 马 888	猫猫猫道, 猫猫猫猫 毛毛妈露曼 猫猫猫
中级水平学生	妈妈妈妈	猫猫猫猫
汉语母语者	妈妈妈妈	猫猫猫猫

表 3: 数字的识别结果

语言提示	一 二 三 四 五
本班初学者	12345
中级水平学生	12345
汉语母语者	12345

表 4: 类似音节但音调不同, 有语义, 但真实世界里使用的频率很低

语言提示	妈妈买马 vs. 妈妈卖马
本班初学者	那么差吗 那么慢吗 吗吗卖吗 妈妈卖吗 妈妈卖吗 慢慢买吗
中级水平学生	妈妈买吗 妈妈卖吗
汉语母语者	妈妈卖吗

表 5: 学生已经掌握的有语义且现实中常用的表达

语言提示	你好! 我叫王大中, 是中国人。
本班初学者	你好我叫王的中学中国人 你好我叫王大将是中国人 你好我叫王大众是中国人 你好佛教网双十中国人 你好我交往的装修窗口 你好我叫王的升学中文中国人 你好我叫王大中学中国 你好我叫王大洲是中国人 你好我叫黄的钟是中国人
中级水平学生	你好我叫王大众是中国人
汉语母语者	你好我叫王大中我是中国人

表 6: 中文经典表达, 汉语初学者一般没学过, 也不会使用

语言提示	远亲不如 近邻
本班初学者	人亲不如近邻 yuan 亲不如近邻 远亲不如近邻 娘亲不如近邻 养亲不如近邻 情不如精灵 燃情不如精灵 yvonne 情不容情
中级水平学生	远亲不如近邻
汉语母语者	远亲不如近邻

从上述各表列出的识别结果我们可以得出以下的观察:

(1) 如果只是使用无语境语义的单字音节来练习发音, Google 语音识别引擎总体上可以识别音节, 但无法区分声调。这对初级和中级水平的学生, 以及汉语母语者都一样 (表二)。

(2) Google 语音识别引擎可以准确地识别数字, 无论是针对什么水平的说话者 (表三)。

(3) 当需要识别类似音节但音调有差异的言语时, Google 语音识别引擎仍然只能识别出音节, 但无法区分声调, 虽然这个言语表达有语义, 汉语教学中常用, 但在真实世界里使用的频率很低 (如妈妈卖马, 见表四)。这种结果类似于使用单字音节的情况。

(4) 无论是哪种水平的说话者, 如果使用真实世界里常用的有语义的语音输入, Google 语音引擎识别率明显提高 (表五)。

(5) 如果需要识别的是中文的经典短语或表达, 则识别率也明显提高, 类似于第四种情况 (表六)。

综上所述, 我们可以推论 Google 的语音识别引擎除了使用了模式匹配算法之外, 还结合了语料库的使用帮助其提高识别的精度。这就是为什么需要识别有语义的汉语常用表达时无论说话者是谁它的识别准确率都会更准确。

3.2 学生在完成语音识别练习时的行为表现

在完成这次学习任务过程中, 笔者还观察到学生们的以下表现:

(1) 因为是第一次使用语音识别帮助学生练习发音, 他们对这个新颖的练习形式很好奇。较之以往的课堂练习, 学生们在本次练习过程中更加全神贯注;

(2) 学生对某些识别结果的出其不意感到很有趣, 尤其是在教师用英文解释了识别反馈信息之后。较之以传统课程上的小组训练或教师领读练习, 学生做这样的练习时更放松。

(3) 由于识别的结果时常是出奇不意, 学生在觉得很好玩的同时还更愿意主动反复尝试, 并自我纠错, 增加了练习的频率。

3.3 本次练习尝试对使用当前语音识别技术的教学启示

基于以上识别结果和对学生完成学习任务过程的观察, 我们可以得出这样的一些初步结论和教学建议:

(1) 使用语音识别技术进行汉语拼音练习可以提高学生的学习兴趣, 增加他们的学习机会。这种练习机会对很少或无机会接触汉语母语者的学生来说更有价值, 因为提高学习兴趣是帮助学习者进行二语习得的关键因素 (Dörnyei, 1998)。

(2) 学生使用语音识别技术制作的教学软件进行拼音练习, 因为识别结果时常很有趣, 所以他们在练习时也很放松, 降低了学习过程中的焦虑, 更加注重练习结果, 并能进行自我纠错 (Krashe, 1981)。如果在学生自我纠错的过程中能给他们提供参考发音, 将更有助于他们的语言习得。

(3) 如果使用语音识别技术来进行语音练习, 教师最好选取有语义且常用的短语表达, 避免使用无语义或很少使用的言语提示。使用 (接近) 真实语料可以有助于学生在与智能语音识别引擎交互的过程中模拟真实的交际任务。这个做法符合交际法教学原则, 有助于学习者的二语习得 (Richards, 2006)。

4. 小结

本文借助于对一次汉语拼音课堂练习活动的观察初步探讨了使用语音识别新技术进行汉语拼音学习的三个基础问题。我们观察到目前基于云端的语音处理技术在识别真实世界常用的言语时其准确性更高, 学生使用时会感觉有趣, 并因此会主动地反复练习和自我纠错。这里需要指出的是本次研究的数据有限, 今后需要更多的研究和数据以确认语音识别新技术对于二语习得的益处和其在外语教学中的最佳使用方法。希望本次初步的研究能起到一个抛砖引玉的作用。

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Evaluating the Impact of the Use of the Internet on Learning Chinese by Students from the Confucius Institute of the University of Zimbabwe¹ (津巴布韦孔子学院学生在汉语学习当中互联网使用及影响的评价研究)

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Abstract: The rise in technology-mediated life activities is now unavoidable throughout the world. The spread of Chinese as a second language and the emergence of the Internet as a source of information and tool for language learning are mutually enforcing trends that need attention from language learners and researchers. The students at the University of Zimbabwe are also not an exception. While the majority of these students are now using the Internet for learning Chinese, there is also need for them to develop some new critical and interpretive skills which will help them to fully utilize the internet for maximum benefit. On the other hand, the teachers of Chinese language and culture need to understand how the Internet is influencing and revolutionizing the learning of Chinese language. This paper therefore evaluates the use of the Internet by University of Zimbabwe students in acquiring Chinese and the need for new frameworks for teaching and learning strategies, which will see students benefiting more from the use of the Internet.

摘要: 随着网络技术的飞速发展, 互联网时代已经进入了我们的生活并影响了生活很多方面。二十一世纪是一个信息化的时代, 在这个时代学习一门外语是有必要的。由于中国的国际地位不断提高及中国的经济快速增长, 世界很多地方出现了汉语学习的热潮; 现在很多国家重视汉语教学, 同时互联网也已经渗透到我们生活的各个领域。现在很多师生在教学及学习汉语时也已经开始了使用互联网。通过互联网可以更快的搜到很多汉语学习资料。津巴布韦大学孔子学院的学生也不会例外。虽然大多数学生现在使用互联网进行汉语学习, 但是也需要先为他们制定一些新的网络学习技能, 网络学习方法能帮助他们

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充分利用互联网学习汉语。在另一方面，汉语教师也需要了解互联网对学生汉语学习的影响。因此，本研究试图对津巴布韦大学孔子学院的学生在学习汉语时使用网络的情况进行评价，并提出一些教学策略和新的教学框架，将来可以让学生更有益的使用网络学习汉语。

Keywords: Internet, Chinese language learning and teaching, University of Zimbabwe Confucius Institute

关键词: 互联网, 汉语学习和教学, 津巴布韦孔子学院

1. Introduction

China's rise to prominence on the global stage has made countries all over the world interested in learning Chinese language (Mandarin) and culture. In order to meet this rise in demand for learning the Chinese language, the Chinese government established Confucius Institutes in many countries. Confucius Institutes are non-profit public institutions affiliated with the Chinese Ministry of Education, designed to support the teaching of Chinese language and culture to non-native speakers of Chinese. Interest in learning Chinese as a second language is growing in many developed countries. This trend is also growing even in some third-world countries such as Zimbabwe. The University of Zimbabwe started offering Chinese lessons through the Confucius Institute since 2007; some of its achievements include the training of seven local teachers who are now teaching Chinese in the department of Modern Languages. There has been a remarkable rise in the interest in learning Chinese language and culture at the University of Zimbabwe Confucius Institute. This is supported by the University's participation in the 2013 and 2014 Chinese Bridge competitions, where students from the University of Zimbabwe were amongst the top five winners of this international Chinese competition. Promoted by the Chinese National Hanban (汉办), Chinese Bridge competitions are contests for foreign college students, who compete based on their mastery of the Chinese language. Although we have seen great passion for learning Chinese shown by the University of Zimbabwe students, some Zimbabwean students still consider Chinese a very difficult language to study.

To help students gain access to the Internet, the University of Zimbabwe provides free WIFI to all students and lecturers across faculties, thus enabling the Confucius Institute students to be able to use the Internet in their learning of Chinese. Learners of Chinese at the University of Zimbabwe can therefore download applications from the Internet, which can be used for translation or pronunciation practice. Through the use of social media applications, students are also able to communicate with native speakers of the Chinese language while they are in Zimbabwe. As propounded by Brown and Hanlon (1970), this is an important aspect in the acquisition of a second language because language acquisition is similar to the process children use in mother tongue acquisition, namely, where continuous interaction with native speakers forms the basic source of influence in their acquisition process.

Second language acquisition requires meaningful interaction with native speakers within the target language environment. Through the use of Internet, students at the University of Zimbabwe are now able to learn Chinese language, Chinese history, and culture using available online resources. From a theoretical point of view, the learning of Chinese at the University of Zimbabwe is expected to have improved due to the availability of the Internet; however the results have not changed that significantly and many students still believe that learning Chinese is very difficult. This paper therefore, will discuss and evaluate the extent to which the use of the Internet by Zimbabwean students in learning Chinese is beneficial to acquiring Chinese language and culture. The present study attempts to answer the following questions: is the Internet really benefiting students in learning the Chinese language? To what extent do students know reliable, retrievable and usable Internet resources? As Richards and Rodgers (2008:15) argue, “assumptions about how second language is learned, and preferred teaching techniques, have in common the belief that if language is to be improved, it will come about through changes and improvements in teaching methodology.” Therefore, is there a need for new frameworks for teaching Chinese language in these Internet-mediated contexts?

2. Background

The Confucius Institute at the University of Zimbabwe was established in 2007 in the Department of Modern Languages. From its establishment to the present, many developments took place; Chinese classes are not only being offered to the undergraduate students at the University of Zimbabwe but also to private students and to some high school students, primary school students and other college students around the country. The students’ aims for learning Chinese at the University of Zimbabwe differ from one student to another. For instance, some students learn Chinese in order to obtain HSK certificates (a Chinese language proficiency test designed by the HANBAN²) so that they can be employed in Chinese firms; some learn Chinese so that they can go and further their studies in Chinese universities; others learn Chinese so that they can be able to communicate with Chinese people and be able to do business with them. As Richards (2008:5) puts it, “the goal of foreign language study is to read its literature or to benefit from the mental discipline and intellectual development that result from language study.” In short, all students at the University of Zimbabwe learn Chinese to be able to use it and benefit from it.

The majority of Zimbabwean students use Shona and Ndebele languages as their mother languages and use English as their formal language. These languages are different from Chinese in terms of their writing systems. Most students at the University of Zimbabwe regard the study of Chinese as a very difficult thing since Chinese is viewed as one of the most difficult languages. This is mainly due to the fact that the Chinese

² HANBAN is the colloquial abbreviation for the Chinese National Office for Teaching Chinese as a Foreign Language. It is governed by the Office of Chinese Language Council International, a non-government and non-profit organization affiliated with the Ministry of Education of the People's Republic of China. <http://www.ask.com/wiki/Hanban>

language, unlike most other languages, is a tonal language which uses characters; hence there are many similar words with different meanings. This makes learning Chinese difficult as Colton's observed that "a literate Chinese must spend half his life in acquiring a thorough knowledge of Chinese" (in Rosenberg, 1979: 326). The Confucius Institute at the University of Zimbabwe has been sending at least ten students to China to attend an International summer school every year from 2009 up to the present. This development is one of the motivating factors which is attracting more and more students to start learning Chinese. Another motivating factor is the availability of scholarships for short courses in China or Master's Degree programs, which are offered to those who pass HSK level 3 and 4.

Due to the above motivational factors related to the studying of Chinese, the majority of students at the Confucius Institute at the University of Zimbabwe are now using all possible means in order to achieve higher proficiency levels within the shortest possible time; this includes the use of the Internet in learning Chinese. This rise in the use of the Internet in learning Chinese is supported by the availability of free WIFI throughout the University of Zimbabwe campus. Students are now able to download applications which they can use on their computers or smart phones to communicate with native speakers of Chinese. Warschauer and Healey (1998:63) stated that

"...with the advent of the internet, the computer both in society and in the classroom, has been transformed from a tool for information processing and display to a tool for information processing and communication. For the first time, learners of a language can now communicate inexpensively and quickly with other learners of the target language all over the world."

Though students at the University of Zimbabwe are now able to access much information about Chinese language and culture from the Internet, however students still acquire Chinese language slower than expected and some of them still think that the Chinese language is very difficult. This paper is designed to discuss and evaluate how the University of Zimbabwe students are benefiting from the Internet in acquiring Chinese language and culture; are they really using the Internet for the acquisition of Chinese language and culture? What sources or applications are they using to learn and improve their Chinese proficiency, and is the use of Internet really benefiting them? If so, to what extent is it benefiting them to reach their goals of learning the Chinese language? This paper will also attempt to give suggestions on how teachers and students can work together in order to make Chinese learning and teaching easier and interesting through the proper utilization of available Internet resources.

3. Literature Review

The present topic is not a pioneer study in the field of assessing the impact of use of the Internet in learning second languages. Literature available also shows that the introduction of new online language learning tools as well as the use of the Internet in

second-language learning is now regarded as one of the most powerful parallel language learning methods. Some of these new online learning tools are introduced by past researchers such as Godwin-Jones (2009), Levy (2009), Meskill & Anthony (2010) and Warschauer (2010). It is now widely accepted that the Internet is now a new source of information and reference in learning, and that most of the information which people might need to use in any subject can be obtained from the Internet. This literature review is mainly focused on the evaluations of the use of the Internet in language learning.

In an attempt to evaluate the use of the Internet as an alternative language learning method, some researchers compared Internet learning methods to face-to-face learning methods. For instance, in one study done by Cheng (2011), an interesting comparison of online and face-to-face learning was done based on the researcher's four-semester online Chinese teaching experience. Cheng (2011) argued that online Chinese instruction may obtain similar learning outcomes if it is carefully designed and well executed, but the efficiency of online learning is not as good as classroom instruction. This evaluation favors face-to-face learning methods. This implies that the use of the Internet as a learning method is a secondary or complementary method which should not be over depended on. Jiang (2014) also evaluated one popular online learning platform called Blackboard Learn™. Jiang's research evaluated the practice and effectiveness of Blackboard Learn™ features' essential to Chinese language online teaching; he mentioned some of the challenges faced when teaching online. This also suggests that while learning through the Internet is growing at a faster rate, the approach has its own limitations.

There are also some other studies which evaluate the choice of language learning applications without comparing them with face-to-face learning methods. For example, Xu (2011) believes that the choice of Internet learning tools should not be random; hence he evaluated the six commonly used web participatory learning tools, which are discussion boards, blogs, Skype-type software, Moodle-based service network, Live Mocha, and Second Life. He emphasized the importance of the selection of the virtual classroom software (VCS) for language teaching and learning based on the concepts of participation and interaction established by Fortin (1997).

Recent research such as that by Chen (2014), recommend a blended learning method, where learners can switch between devices and contexts for a fluid learning experience via learning hubs which are more interactive. Chen's research informs us that despite the rising use of the Internet in learning a second language, depending on a single piece of software, application or single website is therefore a form of underutilization of Internet resources.

There are also a number of studies that criticize the use of the Internet in second language learning. For instance, Kallen (1995) argues that students normally use the Internet mostly for socializing, thus compromising the effectiveness of the use of the Internet in second language learning. Similar criticisms were also articulated in many studies carried out in the 1990s, such as Gary, William, and David (1995), Starr (1990), Hansford & Baker (1990) and many others. On the contrary, some other researchers

support the effectiveness of socializing in second language learning. Thus, they believe that socializing through the Internet is the best method of learning a second language. For example, in a study conducted by the British Council (2007), it was discovered that 69 percent of language learners around the world acquire second language effectively when they are socializing informally. Krashen (1976) also agrees with this notion, thus he argues that those informal environments which promote real language use are more conducive to acquisition. McLuhan (1962) coined the term “global village” in the 1960s when he stated that the Internet would unite the world. The use of the Internet promotes globalization, which in turn promotes socialization between people of different cultures—“a practice which creates an appropriate environment for second language learning.

Given these contradicting views on the use of the Internet in second language acquisition, it is apparent that the evaluation of the use of the Internet in second language learning should be done with particular reference to individual case studies. Therefore, the present research, which borrows various evaluation concepts from previous studies, attempts to evaluate the use of the Internet in learning Chinese in the context of developing countries, with particular reference to Zimbabwe.

Chinese language learning was introduced at the University in 2007, but up to the present not much research has been done to evaluate the strategies and methods used by the University of Zimbabwe students in their acquisition of Chinese language through the Internet, which is now popular. Therefore, the present study is an attempt to fill this gap in order to suggest new ways in which the Internet can be used fully to benefit students in the acquisition of Chinese language and culture.

4. Methodology

In order to evaluate the use of the Internet in the acquisition of Chinese by the University of Zimbabwe students, the researchers used a qualitative research method. Interviews were carried out among three groups of students at the University of Zimbabwe. These groups include the following: ten students who attended a one-month International Summer School in China (with Chinese language proficiency (HSK) ranging from HSK level 1 to HSK level 3); ten students who have never been to China but have been studying Chinese for 2-3 years with HSK proficiency levels ranging from HSK level 2 to HSK level 3; and, a final group of students who studied Chinese language at the University of Zimbabwe and managed to acquire scholarships to further their studies in China for at least one academic year, with HSK levels ranging from HSK level 3 to HSK level 5.

Skype interviews, face-to-face interviews and desk research were also used to obtain information from the Chinese language teachers at the University of Zimbabwe on how the teachers are helping students in using the Internet in learning Chinese. The research was also done through observations. Since the researchers are also Chinese teachers at the Confucius Institute, observation was the most convenient method to

evaluate the effectiveness of the use of the Internet in learning Chinese. This was achieved by observing students' use of the Internet and evaluating students' progress in the acquisition of the Chinese language.

This research was done in order to find out whether the above mentioned groups have similar behaviors in terms of their use of the Internet in learning Chinese. Considering the fact that these groups have different backgrounds and exposure to the Chinese language environment, this makes them different in terms of learning strategies and materials which they use in learning Chinese.

5. Participants of the Research and their Use of the Internet

During the research, ten students were selected from those students who studied Chinese for a period of one to two years and who have HSK proficiency ranging from level 1 to level 3. The sample was extracted using random sampling from those students who attended the international summer school at Renmin University of China in 2013 and 2014. Amongst these students were three males and seven females. All of them own smart phones and computers which they used to access the Internet. Amongst the group, the male students seemed to have more Chinese friends than the females. These ten students normally use We-chat, a free social application similar to WhatsApp available on smart phones. The application is popular in Asian countries; both native speakers of Chinese and non-native speakers of Chinese who can speak Chinese use this social media platform. These students created a We-chat group, which they used for sharing information regarding the Chinese language.

During interviews, students revealed that they usually use Chinese language for chatting through this platform. Although it is possible to send instant audio messages, they prefer text messages to audio messages. This is mainly because these students are still beginners, thus though they are able to write some Chinese characters, they are not yet able to speak Chinese fluently. Consequently, in order to avoid being misunderstood they rarely send audio messages. In the social group which they called UZCI SUMMERSCHOOL (University of Zimbabwe Confucius Institute Summer School) they encouraged each other to use Chinese to communicate; however in some circumstances they used English to share some important information which they could not write in Chinese. In this group they also encouraged each other to write in Chinese characters but sometimes they used Pinyin, without tones, and the other group members would have to guess the meaning according to the context.

In addition to the We-chat application, this group of students also said all of them had a QQ³ application, which is similar to the We-chat application. From this group of

³ QQ also known as Tencent QQ in China, is an instant messaging software service developed by the Chinese company Tencent Holdings Limited. It has more than 798.2 million active QQ accounts. QQ also offers a variety of services, including online social games, music, shopping, microblogging, and group and voice chat. http://en.wikipedia.org/wiki/Tencent_QQ

ten students about six of them said that they used QQ often while four of them said that they rarely used it. The above internet applications are mainly used for interactive practice; there are other these four students who rarely used QQ were still first year students who have studied Chinese for a very short period, but were with the students who went for summer school. This exposure allowed them to be able to use internet social media used by Chinese people. However, although they had QQ accounts on their cell phones they do not use them often because these applications are in Chinese; hence due to the fact that these student's Chinese proficiency is still low they could not use it without assistance. Those who used QQ said they usually used it to socialize with their Chinese friends whom they met during their one-month stay in China. This group of students also said that they could find more Chinese friends on either QQ or We-chat.

Applications such as Pleco are also useful in learning Chinese. Pleco is a language learning application which can be used on mobile phones and can be used as an offline electronic dictionary. With this application students can search the meanings of words in a Chinese to English or English to Chinese dictionary. Searches can be done using Chinese pinyin, drawing Chinese characters on a touch pad, or typing any English word they want to search for in Chinese. These students said that during their one-month stay in China, this application was their main source of lexical reference. The picture below, which was taken from the Pleco application, shows how the Pleco dictionary can be used. When you type a word on the search box, the application gives the meaning of the term and example sentences to help with the usage of the word.



Figure 1: Using the Pleco application

In addition to Pleco, these students also used another common application called Hanping Chinese English dictionary. This application amongst others is very common with the Zimbabwean students because it also includes some HSK vocabulary (from level

one to level six). The application also offers pronunciation practice options as well as translations, hence making it an important Internet learning tool. With these applications students are able to communicate nearly anything in Chinese. During the period these students stayed in China, they depended on these applications and managed to overcome language barriers in an environment where Chinese is primarily the only language used for communication. With these online applications, students could go shopping by themselves since they could search for translations online or on the dictionaries when there was a need. During interviews, it was also found that sometimes these students would use Google translation, a function on Google.com, which is used to translate long phrases and paragraphs that cannot be translated on Pleco and Hanping dictionaries. Although the Pleco and Hanping dictionaries can provide useful examples on the usage of given words, Google translate is more convenient and user friendly since it does not only give the usage of the words but also the meaning of longer sentences. With Hanping Chinese English dictionaries students can read HSK words without the need to copy or write the words down. This is more convenient since a phone is more portable than textbooks. This allows students to study Chinese where ever they are and whenever they feel like studying.

Interviews with students who have never been to China showed that with the provision of free Internet at the University of Zimbabwe Confucius Institute, the majority of students were also able to chat and connect with native speakers of Chinese using online applications. All the interviewed students used the same applications as those who have been to China. However, unlike those who have been to China, they did not have a social group for learning Chinese and they had fewer friends compared to those who have been to China. For the latter group of students to find friends who are native speakers of Chinese, they just had to send friendship requests to any person with a Chinese name or a profile picture for Chinese person. If these recipients accepted the request, then they could become friends. Although it is dangerous to share information with strangers on the Internet, these students thought that it is very interesting to use the little Chinese language they learnt in class with the native speakers of the language.

These students also thought that online applications like QQ and We-chat helped greatly as they forced them to study hard so that they could communicate with their 'new friends.' One interviewee argued that "with each conversation you can learn some new words or some Chinese cultural information and it's interesting since it gives you pressure to study more." This group of students also said that they also used Pleco and Hanping dictionaries for reference when they encountered some difficult vocabulary during their chats with their new friends. This suggests that students at the University of Zimbabwe are now able to communicate in Chinese online through the assistance of online learning applications. The students are very satisfied with this development since they are able to communicate with native speakers of the target language and whenever they meet translation problems they can use Pleco, Google translate, Hanping etc. However, despite the fact that students are satisfied with this development, it was observed that though students use these internet applications for chatting in Chinese, sometimes they also use English for chatting.

The other group which was interviewed in order to obtain information on how the University of Zimbabwe Confucius Institute students were using the Internet in learning Chinese language was those students who passed HSK level three and were awarded one-year scholarships to pursue further studies in Chinese language in various universities around China. These students are now more fluent in Chinese. However, all of them said that the Internet is helping them greatly though they are now in an environment where the language is used every day. Though these students were exposed to the target language environment they still used Internet resources and applications for reference. These students said that the Internet is a good source of information, especially information about culture, because they can get it in English, which makes it easy to understand. In class their teachers gave them reliable Internet websites and downloadable applications where they could access information about Chinese language and culture. This differs from those students in Zimbabwe who got to know of the Internet learning applications by themselves. With these applications, the students felt that their Chinese was improving very fast. Despite the fact that they were in an environment where Chinese is spoken everywhere, they said that online applications were helping them more since they could access anything online and have Internet access all the time. For instance, when they needed directions they used applications like BAIDU DITU, a map which can be downloaded on a mobile device and can help locate directions, taxi charges, and bus routes. With assistance from their Chinese friends, they were able to use the Internet effectively and it benefitted them more than those students studying in Zimbabwe.

Overall, the use of the Internet in learning Chinese is now a common approach for both those students who have been to China before and those who have never gone to China. Students are trying to use the Internet in their Chinese language learning as an alternative learning method to empower themselves. Learning tools like dictionaries or translation applications that can be obtained from the Internet are also helping them when communicating with native speakers of Chinese online. As already observed, from the above results of the interviews, these internet users believe that use of Internet resources and applications is helpful to their acquisition of Chinese. However, is this really happening? If so, to what extent is the use of the Internet useful? Can the Internet substitute for the traditional teacher-student learning approach? Below, these issues and others will be discussed in detail.

6. Discussions

The provision and availability of the Internet has provided easy access to learning materials, as observed from the above sample of students who participated in the interviews. Being exposed to the target language or being in the environment where a second language is spoken is the best way to learn a second language. Krashen (1976) observes that informal environment which promotes real language use is more conducive to acquisition. Krashen (2005) also argued that subconscious language acquisition is more effective. The Internet provides easy access to information updates and provides learning materials for the students at the University of Zimbabwe. This availability of the Internet is helping students to access up-to-date information and more details to what

they would have learnt in class. The Chinese language textbooks being used at the University of Zimbabwe are mainly written specifically for those students studying in China. Some of the information is difficult to understand for students who have never been to China. The provision of the Internet was supposed to help as a secondary learning tool. However, there are some few challenges noted. Although there is a Confucius Institute library at the University, more and more students are now using the Internet to access information related to Chinese language and culture. Thus, they no longer depend on books since the Internet is more convenient and has all the current and necessary information that is required. The Internet has become an important linguistic medium (Wu et al, 2006).

Though the Internet is providing many learning resources for studying Chinese, it seems as though the University of Zimbabwe students are not benefiting much from it. Most of these students are still beginners who have learnt Chinese for one or two years. Their HSK proficiency level ranges between level one and two. In our survey we noted that very few of these students passed HSK level three, which means that these students have not acquired much Chinese vocabulary. Students whose proficiency level is between HSK level one and two mainly depend on pinyin, thus when chatting or searching information on the Internet most of these students cannot use Chinese characters. Rather they would prefer using pinyin since they cannot recognize a number of characters. Most of the students can recognize a certain number of characters, especially the most basic characters, such as 你好 (How are you), 我很好 (I am very well). When they chat with their friends on various social media they only use some basic characters and when the conversation goes beyond greetings or daily conversations they will then continue the conversation using pinyin or English. Another challenge is that when the students try to retrieve information about China, most of the students go to Google, where information is limited, even though much information about China is available on Baidu. Zimbabwean students are not aware of this and very few people outside China know about Baidu. When students search for information about Chinese on Google they get limited information compared to those students who use Baidu.

Most of the students who enroll in Chinese at the Confucius Institute at the University of Zimbabwe are coming from high schools in rural areas where there is no access to the Internet. The majority of these students do not even know how to operate a computer, how to type, or how use the Internet to search for information. It is only when they begin to learn Chinese that they start using computers or phones to access information from the Internet; sometimes they learn this from friends. This is inadequate because they actually do not know how to select useful information and reliable sources. Most of the students who are beginners have not acquired enough Chinese vocabulary; thus they cannot use Chinese characters in searching for Chinese- related learning materials. Therefore, it is difficult for them to access useful Chinese websites with proper online resources. These students require proper training, through workshops or extra information technology courses, which can help them learn how to use or access Chinese websites with relevant and useful materials for learning Chinese.

Use of the Internet in learning a language requires proper guidance for it to be effective. These days anyone can post anything on the Internet, even if it is unprofessional. In this paper our argument is that learning Chinese using Internet resources should receive support and guidance from the teachers. Teachers should therefore assess the reliability of certain Internet resources and recommend those websites and learning applications which are more professional or user friendly. For instance, HANBAN already recognized the importance of the Internet in learning Chinese, thus they introduced an online learning program which can be accessed on <http://liveclass.chinesecio.com/>. This online learning website is more interactive than any other Internet learning tools because the lessons are live classes where teachers and students can interact. However, this learning tool is still unknown to students in Zimbabwe. Also, for students who are still beginners to be able to join such online live classes, a workshop on how to access the lessons is probably required. When the researchers tried to access the HANBAN online live classes it was discovered that the website appears in Chinese as shown on the following picture:



Figure 2: HANBAN online live class

Therefore, Chinese language beginners need guidance on how to change the settings from Chinese to English or how to log in. After that, students should be taught how to join the class, how to adjust the microphone settings as well as how to activate the video settings. The availability of a given resource online does not mean that anybody

can use it. Therefore, it is necessary to continuously carry out workshops with learners of Chinese. During the workshop teachers and students will have to evaluate and examine the effectiveness of various Internet learning applications and websites.

Although some students are now able to interact with native speakers of the target language, it was observed that these students are not taking the opportunity to learn other aspects of the language; rather they use these applications and other internet resources simply to accomplish their assignments or engage in basic social conversations, such as “ni chi fan le ma?” (Have you eaten?), “ni jintian zenme yang?” (How are you today?), “Ni zai gan shenme?” (What are you doing?), etc. From a broader perspective, this does not seem to be beneficial, especially in terms of improving Chinese proficiency as most of the conversations are just repeated daily without much change in vocabulary or grammar. While one can argue that through the frequent use of such simple phrases, students will be able to naturally acquire the target language; however there is no guarantee that these students will be actually able to speak the language. The purpose of learning a language goes beyond texting messages.

On Google Translate, which is a function found on Google and used by many University of Zimbabwe students to translate longer sentences and paragraphs, if the phrases are long then wrong translations are normally given. If students are not guided, they end up being confused or using wrong translations. The purpose of learning Chinese is for learners to be able to use the language free of the Internet. Although the provision of the Internet is helping in providing easy access to Chinese learning materials, it is not actually helping the students to improve their spoken Chinese and other skills, such as listening. Also, since some of the translations they get online are not grammatically correct they end up acquiring wrong grammatical expressions. Below are some pictures captured from some online Google translations showing phrases which are grammatically wrong.

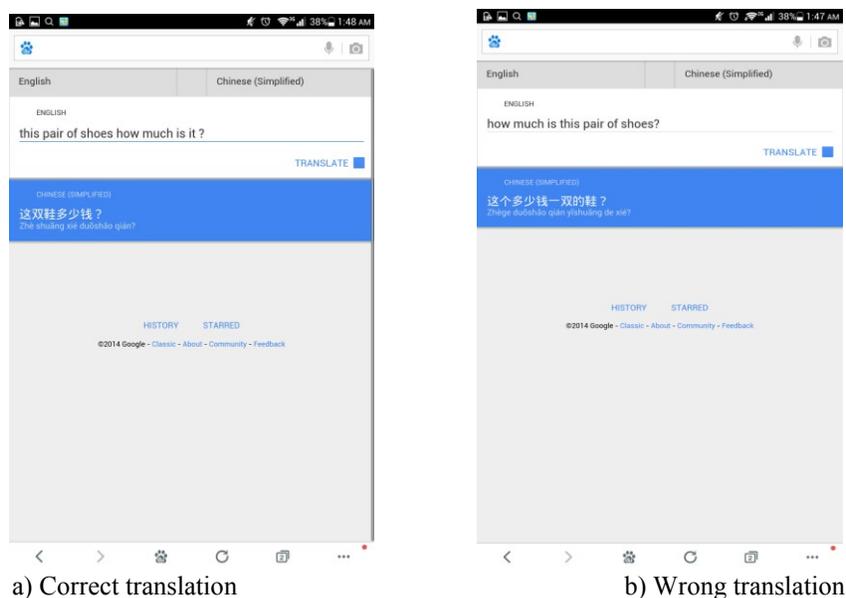


Figure 3: Online google translations

The above two pictures shows some translations which were done online through Google translations. The picture in b) with the English sentence “how much is this pair of shoes?” is a common phrase necessary for Chinese language beginners; but the translation given is not grammatically correct. Although native speakers of Chinese can understand the meaning of this phrase, the syntax is wrong, which will end up confusing students or even leading them to the acquisition of wrong grammatical patterns. The picture in a) shows a translation which was done using the same application; the English translation was twisted slightly and not grammatically correct yet it gave the correct Chinese translation. This implies that the over dependency that the University of Zimbabwe students have on the Internet is not likely going to help them improve their Chinese proficiency. There is obviously need for guidance on how students use these online learning applications.

The use of the Internet by University of Zimbabwe students in learning Chinese seems to be leading to internet dependence syndrome. For instance, when these students are given homework, instead of reading reference books given by the teachers where they can grasp the aspects they are studying, they just post the home work to their online friends who will help them do the work. Also, they no longer try to memorize phrases or new words since can easily access these phrases and words on their smartphones whenever they want. Thus, the Internet, which is supposed to be a learning tool and source of information, has become like an “external drive” where students “store” or “save” their information and retrieve it when in need. This kind of dependence syndrome encourages laziness, hence reducing the effectiveness of the use of the Internet as a learning strategy. When students in China go shopping they just use the electronic dictionaries and Internet devices to negotiate whatever they want to buy. Students are no longer worried about internalizing the language, which they feel is time consuming; rather they are worried about getting the best applications which can help them meet their needs within the shortest possible time. For instance, when they want to do assignments they just search the topic on the Internet and they get all the answers.

Overdependence on the Internet seems not to be an effective learning method since it does not offer other metalinguistic aspects of second-language learning, such as writing and acquisition of grammar. The Chinese government introduced the Chinese Proficiency Test (HSK), which requires writing characters especially for Levels 3 to 6. As observed from the present research, the majority of students at the University of Zimbabwe are over dependent on the use of the Internet and they hardly practice writing Chinese characters. When chatting or searching for information on mobile phones and computers, they only type whatever they want or need to know. This makes it difficult when it comes to the HSK examination where they are required to write, identify grammatical errors for given phrases, and construct phrases on their own. Based on this observation, we can argue that the use of the Internet in learning Chinese seems not to be helping students to improve their Chinese proficiency. In other words, the use of the Internet is merely allowing students to temporarily escape the actual challenge they have to face in acquiring Chinese language without totally eradicating the problem. While one may praise the use of the Internet for helping students to achieve the communicative

aspect of language learning, it is however ironic that students' ability to communicate in Chinese is hardly possible without the Internet.

The Internet provides easy access to information and promotes cross-cultural communication. This could have improved the learning and acquisition of Chinese at the University of Zimbabwe Confucius Institute, however the extent to which students have actually benefited from using the Internet is still questionable. This thus calls for researchers to examine the extent to which the use of the Internet benefits students in acquiring the target language in a way which will at last free them from the dependence syndrome discussed above.

7. Conclusions and Recommendations

As observed from the results above, the Internet has become an important learning tool and its impact on the acquisition of Chinese language as a second language cannot be ignored. The Internet, which is full of up-to-date information, can be a useful tool for learning second languages. On the Internet students do not only get dictionaries and links to help them study, but they can get current news, articles, magazines, movies, and music. The Internet is a rich source of information which, if used properly, can become a very powerful and useful tool for second- language learning. With the provision of the Internet, the learning of second languages should be easier and interesting and should encourage students to learn more; their Chinese should also improve from the interactions they have on various social media.

Most of the students, however, are just using Internet without much knowledge on how to effectively use it for the acquisition of Chinese. This is because students never received formal training on using the Internet for learning Chinese. Due to the fact that most of the students at the University of Zimbabwe have not received formal training in the use of computers, learning Chinese through the Internet is therefore benefiting only a few students who acquired basic skills in using computers. Furthermore, the majority of students at the University of Zimbabwe depend on those applications which can be found on English websites. The Internet has all the up-to-date information, newspapers, applications for pronunciation practice, applications for character writing and recognition, etc; however, for students to know about this they require guidance from their teachers.

We suggest that a curriculum review is required at the University of Zimbabwe. Teachers need to see the goals of the students in learning Chinese and adopt appropriate teaching methods so that learners can be able to reach their goals. As has been noted from the above discussions, some students do not know how to use the Internet to access online Chinese resources. We therefore suggest that workshops and training courses should be done to empower the students with IT skills. Learning Chinese should never be detached from IT knowledge. The world is changing, and with the introduction of new learning applications students should be in a position to search and retrieve information from the Internet on their own.

Apart from teaching students on how to use the Internet and how to find resources on the Internet, teachers also need to inform the students about reliable websites as well as trusted online dictionaries that are available. The recently introduced online learning tools, such as the HANBAN online live class, require that students learn how to register for and access the class. All this should be the role of the teachers. We insist that learning Chinese through the Internet should not be left to the students alone; rather teachers should monitor and constantly guide the students. We believe that if students are well guided, they will be able to use the Internet effectively, hence maximizing their time learning Chinese through the Internet.

Most of the students use the Internet as an external drive where they just to keep information. It shows that students understand that they can get the information from the Internet. Teachers and researchers of second languages need to guide these students in the use of the Internet in second-language acquisition as it is apparent that these students seem to lack the ability to effectively use the Internet for language acquisition. According to the New London Group (1996:61),

“The kinds of sophisticated communication skills acquired on the internet in the 21st Century will seldom develop through practice alone. Students need the opportunity to step back under guidance of the teacher to critically analyze the content, coherence, organization, pragmatics, syntax and lexis of communication”.

The discussion of the results above shows that students are lacking guidance on how to effectively use the Internet for the acquisition of Chinese. With guidance from the Chinese lecturers at the University of Zimbabwe Confucius Institute, students can benefit fully from the use of the Internet and they will be able to acquire Chinese language skills the same way one may acquire second language in the target language’s environment. We recommend that students’ groups on the internet should include somebody who can help and guide them where there is need. This will help students to have systematic and well organized chats which involve language aspects ranging from low to high proficiency levels. According to the New London Group (1996: 61)

“Effective cross-cultural communication and collaboration, including making effective use of information in online networks, necessitates a high degree of critical interpretation, the instructor’s overt role thus should extend beyond narrow language items to also help students learn to critically interpret information and communication in a given social context”.

In conclusion, the research above has shown that the Internet is full of useful tools and information for second language learning and it brings the world together through social media. Students in Zimbabwe can experience Chinese culture through the Internet and can have a clear understanding without necessarily going to China to study. Teachers of second languages and of Chinese language in particular, have greater roles to play so that students can fully benefit from language learning through the Internet. Teachers need

to be up-to-date and also should undertake research to learn new teaching methods being used in developed countries. They also need to understand available new language learning sites so that they can also empower students from these third-world countries to compete with other students around the world. Chinese language teachers also need to evaluate the tools used by students in learning language through the Internet. Guidance should be given to students on how to effectively use the Internet in order to avoid the side effects that arise from over-dependence on the use of the Internet. The Internet is here to stay, so teachers and researchers of Chinese as a second language at the University of Zimbabwe need to develop more new teaching frameworks through providing Internet materials. Teachers should help students to move from overdependence on the Internet to natural acquisition of the target language. These are the aspects of second-language learning which await further research.

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An Introduction to Using iBooks Author 2.0 and Creating Teaching Materials for Chinese Language Instruction (介绍如何用苹果爱书2.0作者版本 以及制作中文课的教学材料)

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Abstract: This article offers a brief introductory overview of Apple's iBooks Author version 2.0, in particular new features relevant to language pedagogy, and how it can be used to create original e-books and instructional materials for Chinese (or other) language courses. Although other excellent applications used to create e-books are available, features new to iBooks Author 2.0, namely the addition of interactive widgets, differentiate it from other such applications. By providing immediate feedback to students, the Review widget in particular, I contend, has pedagogic benefits that make iBooks Author worthy of serious consideration for creating original course materials, despite proprietary limitations based on platform. The article will conclude with a summary of the benefits and limitations of using iBooks Author 2.0 to create instructional materials in Chinese.

摘要: 本文简明扼要地介绍了苹果爱书2.0作者版本的全貌,尤其是新增的有关语言教学的功能,以及如何用该版本来制作新颖的汉语及其它语言课程的电子书和教学材料。尽管市面上也有别的优秀的应用软件,但苹果爱书2.0作者版本的新功能,也就是互动视窗,令它从众多其他应用版本中脱颖而出。我可以负责任的说,苹果爱书的复习视窗是很值得考量的功能,尽管在使用平台上它有所有权方面的局限,但它通过给学生提供及时的回馈,具备了在创作课程材料时的独特教学优势。本文最后总结了使用苹果爱书2.0作者版本制作汉语教学材料方面的优点和局限性。

Keywords: Instructional design, curriculum development, computer-assisted language learning

关键词: 教学设计, 课程开发, 电脑辅助语言教学

1. Introduction

In 1967, French critic and theorist Roland Barthes famously declared the “death of the author” in an eponymous essay (Barthes). In this influential piece, Barthes argued against a method of literary criticism and interpretation that would read a literary work primarily against the context of the author’s personal life and background. Although Barthes’ essay had a significant impact in cultural circles during the post-structuralist movement of the day and beyond, rumours of the demise of the author may have been somewhat exaggerated. With the advent of the Internet and the recent proliferation of social media, especially blogs, a new type of authorship has emerged; along with it comes a radically different kind of textual production and authorial empowerment (though not perforce always better, of course). Had he lived longer, Monsieur Barthes would have appreciated, I think, many of the transformations in reading and writing as well as the production and consumption of texts brought about by age of the personal computer and Internet. Hyperlinks now provide new ways and pathways of reading that are less linear than the conventional printed text. New software, such as Apple’s iBooks Author, allows anyone with a computer or even a mobile device to now become an author.

This article offers an introductory overview of Apple’s iBooks Author version 2.0, in particular new features relevant to language pedagogy, and how it can be used to create original iBooks and instructional materials for Chinese (or other) language courses. The article is not, however, intended as an instructional manual or guidebook for the iBooks Author application; for such purposes, excellent publications and tutorials already exist (Cohen; Smolinski; Swanson) and can be referred to should readers wish to get a more complete and comprehensive overview of the application and all its various features and capabilities.

Although other fine applications used to create e-books are available (Adobe’s InDesign, PagePlus, and even Microsoft Word), features new to iBooks Author 2.0, namely the addition of interactive widgets, differentiate it from other such applications. Widgets in iBooks Author Version 2, such as Gallery, Review, Interactive Images, 3D, HTML, Scrolling Sidebar, and Pop-Over, introduce an element of interactivity, which makes works produced by iBooks Author unique compared to other e-books or standard print books. The Review widget in particular, I contend, has pedagogic benefits that make iBooks Author worthy of serious consideration for creating original course materials, despite proprietary limitations based on platform. Such widgets make iBooks Author more than just another tool to create digitized versions of textbooks or instructional materials; it allows for the creation of “transformative content,” which can go well beyond more conventional e-books’ highlighting or note-taking capabilities and thereby enhance learning.

In what follows below, this article will: briefly introduce iBooks Author and some of its basic features and functionality; provide a brief overview of how to create an iBook in the application; examine the new widget features and their possible uses for creating instructional materials; cover how to share iBooks or publish through the iBooks Store materials, including iBooks, created using iBooks Author; and conclude with discussion of both the benefits and limitations of using iBooks Author to create original instructional materials in Chinese.

2. What is iBooks Author?

With an Apple computer and iBooks Author, one can create a wide range of instructional materials easily and professionally, from stand-alone reading, vocabulary or listening assignments and other exercises to full-length language textbooks with text, graphics, multimedia files, and interactive functionality. Anything created using iBooks Author can be conveniently shared as an email attachment (depending on file size) or through file sharing services (such as [Dropbox](#)), [iTunes U](#), or the [iBooksStore](#). E-books or materials made with iBooks Author (.ibooks files), however, can only be read using Apple's iBooks application.

iBooks Author can be downloaded from the Apple App Store free of charge for anyone with an account. A localized Chinese version is also available through the App Store. The 412 MB download requires 1.2 GB of available disk space, 2 GB of RAM, and Apple's operating system 10.9 (Maverick) or later (the latest version is Yosemite, 10.10.3, with OS 10.11, El Capitan, due out fall 2015). Since OS 10.8, Apple has made its operating system upgrades free to all users. Free versions of both operating system software and iBooks Author should be appealing to educators and educational institutions, especially if budgetary constraints are an issue. For importing extant Keynote or Pages files into iBooks Author, versions 6.0 and 5.0 of those applications are required respectively. For previewing and reading iBooks, at least version 3.0 of the iBooks application is required for the iOS platform (version 7); the latest version of iBooks for the iPad and iPhone, 4.2, requires iOS 8. For the Mac desktop and laptop OS, the latest version of iBooks is 1.1.1. Some functions and features of iBooks 1.0 available only on Apple computers and laptops offer additional pedagogic benefits for language learning and will be covered in greater detail below. Finally, iTunes producer 2.9, also free, is needed should authors wish to publish their books on iTunes U or through the iBooks Store. File size for .ibooks files uploaded to the iBooks Store is capped at 3 gigabytes.

Released 16 October 2014, the latest version of iBooks Author is 2.2. Version 2.2 offers many new features, including the ability to import ePub and Adobe InDesign IDML files, blank templates to create customized books, hyperlink options to link to a location in another book or from an image, improvements in transitions in the Keynote widget, as well as the ability to enable auto-play for Keynote slideshows, and HTML and media widgets. Version 2.0 also includes many major improvements, most notably greater support for more audio and video file types, customizable fonts, and, of course, widgets, which are the main focus of this article.

3. Getting started

As with many other Apple applications, using iBooks Author is relatively simple and intuitive. Yet, as we shall see below, iBooks Author also possesses fairly powerful features that make creating sophisticated and professional iBooks fairly easy. Ideally, one should first collect instructional materials or "assets" that will make up the content of the iBook. Materials can include text, images, graphics, audio files, and movies. In *Take Control of iBooks Author*, the author suggests thinking ahead of time about how an iBook should "flow" and offers suggestions in planning the organization and layout of works created in iBooks Author (Cohen). Although one could create and edit textual material from within the iBooks Author application itself,

authors may find it easier to first develop content in an external application, such as Word or Scrivener. One can then either directly import content from external applications, such as Word, Pages, e-pubs, or Adobe's InDesign IDML files, or cut and paste content directly into iBooks Author's chapters, sections, and pages.

Upon opening the application, users are first presented with the Template Chooser window. By default, one can choose from ten landscape with portrait mode templates or seven portrait-only mode templates. Other templates are also available for purchase or as free downloads through the App Store. Although iBooks on mobile devices can display both landscape and portrait modes and will adjust formatting automatically, it is important to consider which mode to use when starting out. Portrait only resembles the conventional print book in terms of format should authors prefer this. But portrait-only mode can, as the name implies, only be displayed in portrait mode. Thus, prospective authors beware.

After selecting a template, a new iBooks Author file (.iba) will be created. By default, each new iBook is created with a book title, introductory media, a Table of Contents, which is updated automatically as chapters and titles are added, a glossary, and a sample chapter, including sections and pages. These are shown in the side bar of the document window. In the side bar, chapters can be moved by dragging and dropping to change the order of chapters in the book (the Table of Contents will reflect these changes automatically). Turn-down triangles for chapters, sections, and pages save space in the side bar and make navigating through longer iBooks easier. Sections and pages, however, cannot be moved in the side bar this way and must be edited from within each chapter. Chapters include by default the chapter first page, section first page, and a page with filler text populating it. It is therefore easy to get started and fill in text, graphics, and other media as needed. Or one may start fresh by right-clicking and selecting "delete chapter" or by selecting a blank template to begin with (in either landscape and portrait or portrait-only mode).

Adding existing content from Word, Pages, or IDML files is possible by going to the Insert menu and selecting "Insert Chapter From..." and then choosing the corresponding file to be imported. To create section breaks in the iBooks Authors document during the import, make sure first to insert section breaks in the original Word or Pages file. This is a most convenient way to create new or preserve old formatting during the import. This feature is also an effective way to integrate already created materials in Word, Pages, or IDML files into a new iBook.

Those familiar with Apple's Pages and Keynote applications will find the iBook Author's Toolbar and Inspector window to be quite familiar. Save for features unique to each application, the Toolbars and Inspector are virtually identical in iBooks Author, Pages, and Keynote. For users less familiar with these applications' interface, general knowledge of word processing programs such as Word should suffice to format iBooks as one wishes. iBooks Author makes it easy to format text, graphics, media, and layout once a template has been selected or new chapters, sections, or pages have been added. Under preferences, users may wish to select to "show alignment guides" to help with formatting. Go to Preferences under the iBooks Author menu and choose Ruler. Under Ruler Preferences, select "Show guides at object center" and "Show guides at object edges." Alignment guides make designing and creating professional-looking text and graphics intuitive, efficient, and accurate.

In iBooks Author, the toolbar is also customizable as it is in other Apple applications. The default set includes: Add Pages; View; Orientation; Text Box; Shapes; Table; Charts; Widgets; Preview; Publish; Inspector; Media; Colors; Font. Other tools, such as Instant Alpha and Mask for images, can be added to the Toolbar or accessed through the various iBooks Author menus (Format > Image >). The View tool allows users to show or hide the following: the glossary tool bar (which may be helpful for creating language-related materials and will be discussed below); the styles drawer; layouts; the format bar (for text); rulers; layout boundaries; and invisibles. It should be noted that layout styles can be customized, too, and saved as part of a custom template. The simplest way to do this is to show layouts in the View tool, duplicate a layout and rename it, then make the desired changes to the new layout style. This is especially helpful if using a customized style repeatedly for creating original materials.

The Orientation tool allows authors to see how their work will look in either landscape or portrait mode from within the iBooks Author application before sending the iBook to either an iPad or computer. This is done through the Preview function, and is a great time saver for designing one's iBook. The Preview tool allows authors to see how their works will *actually* look in iBooks 4.0 on either a connected iPad or on an Apple computer should it have iBooks 1.0 installed. If authors are working with larger or longer documents, it may be useful to select "Preview the current section" instead of "Preview entire book" from the General tab under iBooks Author Preferences. Bear in mind that longer iBooks or documents with audio, video, or graphics may take some time to load completely through the Preview function. The Publish tool button starts the process of actually publishing one's iBook through the iBooks Store, which will be covered later in the article. Publishing can also be done through File > Publish or a keyboard command.

One feature that language instructors should find quite useful in iBooks Author is the Glossary, which is included by default in all templates and can be found in the side bar. The Glossary toolbar can be turned on by going to the View button in the Toolbar or the View menu and selecting "Show Glossary Toolbar." There are three ways to add terms to the glossary. First, one can go to the glossary itself by either clicking on it in the sidebar or by clicking on the Glossary arrow on the right-hand side of the Glossary toolbar (which must be displayed). The glossary arrow button is a quick way to toggle between the document text and the glossary. From the glossary, one can manually add new terms by clicking on the + button and entering the term in the text field. Second, one can also find the actual term in the text, highlight it (or double-click on it), then right click and add the term to the glossary by selecting "create glossary term from selection" from the pop-up contextual menu. Lastly, one can highlight a term, which will then appear in the Glossary toolbar "New Glossary Term" text field. Clicking the "Add Term" button next to the text field will enter the newly selected term in the glossary. This last method generally proves to be the quickest of the three.

Terms added to the glossary will be listed alphabetically in the "Terms" column. Next to it authors can set the status of the terms using three colored dots (green, blue, and orange) as they see fit. A blue dot marks the default status of new terms. Other dots could be used to indicate the status of glossary items (created, in-progress, and completed, for example). For glossary terms in Chinese characters, iBooks Author will list them alphabetically, too, according to their initial and final. This works quite well and is most convenient for creating an easily navigable glossary of

Chinese terms in characters. It does not handle well, however, characters with more than one pronunciation. For example, entering the character 还 as hái will not work; iBooks Author glossary takes it instead as huán and lists it as such. I have not yet found a workaround for this issue, which is more serious for characters with different pronunciations whose initials are not close alphabetically (say for example 解, which can be read as jiě or xiè). Nevertheless, characters will be listed alphabetically in correct order for the most part.

One shortcoming to the glossary feature is that all definitions must be added to the glossary manually. This is not too difficult, however, if using the Dictionary application that comes standard with the Mac operating system. OS 10.10 (Yosemite) includes several excellent English, Chinese, and Chinese-English dictionaries: the *New Oxford American Dictionary* (2013), *The Standard Dictionary of Contemporary Chinese* (2012), and the *Oxford English-Chinese Chinese-English Dictionary* (2013). Authors need only look up a term in the Dictionary application, then cut and paste the proper definition into the glossary window definition field on the right. Related glossary terms for any given entry can be created easily by simply dragging related terms from the list of glossary items on the left to the related glossary terms list under the definition on the right.

Finally, the glossary also offers indexing functionality. By clicking on the “index” button under the definition, one can use the “find and replace” window to search for other instances of the same term in a text. To add other instances of a term to the index, simply click on the “add link” button on the glossary toolbar. That particular instance of a term will then be added to the index of that glossary term, showing its location in the iBook. Glossing and indexing are thus made easy in iBooks Author. Being able to create glossaries and indices easily is another powerful tool for authoring instructional materials, especially for reading assignments or acquiring vocabulary.

When viewed in iBooks on a mobile device or computer, glossed terms will show up in bold. Tapping on a glossary term will display the user-defined definition in a pop-up window. By tapping on the “dictionary” button at the bottom of the pop-up window, the dictionary definition of the term will also be shown (in the case they differ in level of detail). Tapping the “glossary index” button at the bottom will show the other related terms, if any, and other index links, if any, that were added. Another useful feature found in the “dictionary” pop-up window (activated by hitting the dictionary button) is an option to search Wikipedia or the web by clicking on their respective buttons on the bottom of the window. One major drawback, however, to the glossary function in iBooks when using Chinese characters stems from the characters not displaying noticeably bolder in iBooks, which is the prompt for readers to know that it is a glossed term. For readers using iBooks 1.0 on the Mac platform, it is also possible to actually look up any Chinese term in a text—glossed or not—using the Dictionary application through key commands or gestures. This, however, is unfortunately not possible presently on the mobile iOS. Glossed terms in Chinese text may nevertheless still prove helpful, even though it may be difficult for readers to discern Chinese characters in bold in the iBooks application on mobile devices.

Before turning our attention to Widgets, let us finally look at one final item in the default toolbar that is most crucial in the creation of iBooks, namely, the Inspector. Users of earlier versions of Pages and Keynote should already be familiar with the Inspector window, even

though the latest version of both applications has moved it to a sidebar located inside of the document window. For longtime users of Microsoft Word, the iBooks Author Inspector window is akin to the palette in older versions of the word processing application. The Inspector window can be used to change formatting and other aspects of your iBook that are not available through drop-down menu options. It includes the following ten panes: Document, Layout, Wrap, Text, Graphic, Metrics, Table, Chart, Link, and Widget. In iBooks Author, multiple Inspector windows can be open simultaneously, which facilitates authoring certain content. From the menu, go to View > New Inspector and select the pane needed for the task at hand.

In the Document Inspector, users can fill in metadata in the Author, Title, Keywords, and Comment fields. This can be useful later should authors wish to publish their work through the iBooks Store. Data about the iBooks Author document, such as word, character, pages, and graphics count, can be gleaned from here as well. There is also an option to “disable portrait orientation” if one intends for an iBook to be read only in landscape orientation (books with movie files, for example). Modifications to what is or is not displayed in the default Table of Contents page (created automatically when a template is selected), such as adding or deleting copyright information, dedications, a foreword, or sections and paragraph styles, can be done under the TOC pane in this Inspector. In an iBook, tapping on any item in the Table of Contents will bring the reader directly to that chapter, section, or page of the book, which makes navigating through the text easy and effective.

The Layout Inspector allows users to create multiple columns and set gutter width between columns. Just highlight text from the document and select the number of columns to be displayed. Numbering and lettering for chapter and sections as well as pages can also be changed from this Inspector window. Numbering for chapters and section can be relative to the book, chapter, or none. For chapters, sections, and pages, numbering may be continuous or start with a given number entered into a blank field. If one wants Chapter 1 to begin on page 5 after the “Introduction,” for example, select “starts at” and enter 5 into the blank field. Various formatting options exist for numbering and lettering as well (1, 2, 3; i, ii, iii; A, B, C; a, b, c, etc.). Such options are useful if one wishes to follow publishing formatting for conventional books, which generally use a combination of Arabic and Roman numerals. In terms of pagination, iBooks Author is thus similar to most word processing software.

The Wrap Inspector determines how text will interact with images surrounding it. iBooks Author offers options for inline (moves with text), floating (does not move with text), or anchored (stays with anchor) object placement. The anchor option is helpful in the event that one adds text to or deletes text from a document, which would cause a change in formatting and pagination. In other words, anchoring ensures that text and image stay together. Selecting “object causes wrap” controls how text will arrange itself around an image in floating mode. For example, a u-shaped wrap would wrap around an image with no text on either the right or left margin of the page. Surrounding wrap would surround an image with text on all sides. Text can also wrap above and below an image, leaving a blank space to the right and left of the image. Wrap makes formatting text and graphics together simple and adds a highly professional look to iBooks. In the Wrap Inspector, an option to select “text fit” is also available. This determines how close the text will be to any given wrapped object. “Text fit” can also make text wrap around irregularly shaped objects like, say, a star. Objects must, however, be transparent (no

negative space, such as a square white background). For this purpose, .png files work best. But with Apple's Instant Alpha feature, one can remove the background of a .jpeg file, for example, and thus make it "transparent" for the purposes of wrapping text around it. With Instant Alpha and Edit Mask, images can be modified right within the iBooks Author application, which is more convenient than editing them with a different external application.

Under the Text Inspector, more conventional word processing editing controls can be found. Attributes related to text, such as color, spacing, alignment, margins, lists, indents, tabs, borders, background fill, and pagination, can all be modified from the Text, List, Tabs, and More panes in the Text Inspector. For modifying attributes of graphics created in iBooks Author, the Graphic Inspector allows users to change fill, stroke (line or picture frame), opacity, and shadow. Further modifications to images and graphics can be made under the Metrics Inspector. Changes can be made to the dimensions of an image or graphic (including reversion to original size), position (x and y axis), and angle of rotation. Images can also be flipped, both horizontally and vertically, under the Metrics Inspector. Oddly, Apple software interface designers chose to create two separate Inspectors for graphics and metrics for some reason.

The next Inspectors are Table and Chart. These understandably seem less relevant to the creation of instructional materials in Chinese or other languages. But tables could be used to create neatly aligned vocabulary lists with rows used to list lexical terms and columns dedicated to characters, pīnyīn, definition, and parts of speech. Rows and columns can be modified (number and size) easily from within the Inspector. An option to alternate row color also exists, which may make reading a vocabulary list easier visually. In iBooks Author, one can thus easily produce vocabulary lists similar to what is seen in conventional text books by using tables to create lists, add alternating shades between rows, and deleting separator lines between text fields.

Under the Link Inspector, one can create a variety of different hyperlinks to various targets. Selected text or graphics can be linked to webpages, email, bookmarks, figures (images, graphics, or widgets within iBooks Author), chapters or sections, or page numbers. If "link to figures" is selected, iBooks Author will display all figure styles, namely, audio, diagrams, figures, galleries (widget), illustrations, review (widget), images, interactive, and movies. A figure, such as an image, graphic, or widget, can be created by selecting the intended figure and going to the Widget Inspector. There under the Title pane, one selects "label" from the drop-down menu and chooses the appropriate type of figure (diagram, figure, gallery, illustration, image, interactive, movie, or review). The newly created figure will then appear back in the Link Inspector, where it can be selected and linked to. Bookmarks can also be added to a particular page and hyperlinked to targets. Hyperlinks are not only a convenient way to navigate through an iBook; they also provide powerful heuristic tools that, if used properly, can enhance the act of reading and processing information. The last Inspector window is dedicated to widgets, upon which we will now focus our attention.

4. Widgets

As noted above, widgets are new to iBooks Author version 2.0 and are what make it different than other e-book creation applications on the market. The nine new interactive widgets are: Gallery; Media; Review; Keynote; Interactive Image; 3D Image; HTML; Scrolling Sidebar;

and Pop-Over. Of these, Review may have the greatest pedagogic potential for learning outcomes and assessment and will be introduced first here.

The Review widget allows readers to check what they have learned through multiple-choice and drag-to-target types of questions. There are four types of multiple-choice formats currently available in the Review widget: text; text and image in landscape; text and image in portrait; and answers as images. Although somewhat limited in capability at this point, the pedagogic benefits of this widget stem from its ability to provide immediate feedback to students about what they have or have not learned. Research has demonstrated convincingly the positive effects of feedback on all areas of learning (Askew, 2000; Shohamy & Walton, 1992; Wiggins, 1997). These studies have overwhelmingly concluded that feedback is more effective the sooner it is provided to students. Language learning is no exception to this. In fact, with certain skills, such as listening comprehension, immediate feedback is all the more critical. Learners are less likely to remember what they heard either correctly or incorrectly on a listening comprehension exercise or assignment with the passage of time. Immediate feedback is also effective in the learning and acquisition of vocabulary. The Review widget thus could work very well for designing and creating both listening comprehension exercises and vocabulary exercises. Answers can be given immediately by clicking “Show Answer” and the total number of correct answers can be displayed at the end of a series of questions. For the time being, however, there is no way to record the score or number of correct answers for any given assignment.

One could create a simple Review exercise by inserting an audio or movie file through the Media widget, asking students to listen or view a passage, then have them answer questions that follow using the Review widget. After inserting the Review widget, questions and answers are created through the Inspector. Under the Layout pane, authors can choose the label type (Review), and whether or not to show the title and background in the Review frame in iBooks Author. iBooks Author will automatically number Review questions sequentially, which will be displayed as 1.1 for Chapter 1, question 1 if the “Show title” box is checked. Adding another Review widget will create 1.2 and so on. This is convenient for referencing questions or assignments by chapter and within chapters as homework assignments. Authors can add a description, such as “Chapter Vocabulary,” after the sequentially numbered titles in the “Accessibility Description” field of the Layout pane of the Review Inspector. For each Review widget frame, for example, 1.1, 1.2, and so on, any number of multiple-choice questions can be asked. In other words, Review is not one widget, one question. iBooks Author will automatically create a heading in the frame to indicate “Question 1 of 3, Question 2 of 3,” etc.

The actual questions are created under the Interaction pane of the Review Inspector. Questions and type of questions (multiple choice or drag-to-target) are created by clicking on the + button at the bottom of the questions field in the Inspector. For each Review widget question, the number of questions is not limited; the number of possible answers to multiple-choice questions, however, is variable and ranges from two to six (both multiple choice or drag-to-target). Once a Review question is created, authors enter the text for both the question and the answers in the document window (Widget frame), not the Inspector. The Inspector will display what is in the document window but cannot be used to input text. The correct answer for any type of question is indicated by simply clicking on it (as a student would in replying), which will mark it with a green check box.

In addition to multiple-choice questions as all text, there are options to have an image in landscape or portrait mode with two to six possible answers. Images could work well for assessing vocabulary items, with the lexical term being tested shown as an image and the multiple-choice answers displayed in characters. A final option for multiple-choice questions would be a question in text and answers (again two to six) shown as images instead of text. This, too, would work well for assessing acquisition of vocabulary items, especially nouns. Although rather limited in types of questions that can be asked, especially in comparison to other online assessment tools, course management systems, or publishers' companion websites, it is easy to create questions using the Review widget. It is also adequate, I believe, for assessing certain skills and tasks, such as listening, reading, and vocabulary. When shown Review questions in iBooks on either the iOS or Mac platform, students tap on a selected answer, which can be checked immediately by hitting the "check answer" button at the bottom of the frame. At the end of a series of questions, the number of correct responses will be shown. There is also an option in iBooks Author for Review questions to be shown as thumbnails, which saves on limited screen real estate on iPads and smaller laptops. Students can also retake Review questions as many times as they like. Studies have shown that prompt feedback and recasts can enhance the acquisition of vocabulary in learning another language (Dilans, 2010).

The second type of Review question is drag-to-target. In drag-to-target, identifications are made by dragging either labels or thumbnails in the Review widget frame to the correct target image. As with multiple-choice questions, the number of possible answers ranges from two to six. This type of question is perhaps most useful for assessing acquisition of vocabulary items. An author could, for example, use an image of various fruits and then create labels with the name in Chinese of each fruit. Target labels are created by typing text in the label attached to a circle. When this is done, a corresponding label, located at the bottom of the frame (label without a target circle) is created. The labels in the bottom of the frame are what students drag to targets on the image. For authors, dragging the newly created labels in iBooks Author to the correct position of the corresponding fruits in the image sets the correct answers. When students see a Review widget drag-to-target type of question, they will drag labels from the bottom of the frame to what they think is the correct spot on the image. As with multiple-choice questions, students can check their answers for each question immediately and see how many questions they answered correctly. Once again, immediate feedback, so crucial to learning, is provided with this type of interactive exercise. The drag-thumbail-to target seems less useful for language learning and will not be discussed here. The procedure is, however the same as creating target labels, save for using thumbnail images in lieu of labels.

Gallery is another new widget that authors may find useful for creating materials for Chinese instructional purposes. Essentially a photo gallery, it could be used to create images for vocabulary items or lexical sets. The introduction of new vocabulary items in Gallery could then be followed up by using Review to assess acquisition of terms. In Gallery, images can be browsed on a single page. As with Review, Galleries are numbered sequentially by chapter and number of series in chapter. There is also an option under the Layout pane in the Inspector to edit Gallery label styles and make them either book relative or chapter relative. Images can be added to the Gallery widget through the Inspector by clicking on the + button under the Interaction pane or by dragging and dropping images from a local computer or the Media window (located

on the Toolbar). Selected images then show up in the Gallery widget frame either as thumbnails if “Show Thumbnails” is selected in the Interaction pane or as a slide show controlled by forward and back arrows. Dots between the arrows indicate the number of photos and place in the slide show. There is no indication of the upper limit of the number of images that can be added. But some authors have created Galleries with over 100 images. After adding images, authors can switch to the Layout pane in the Gallery Inspector and choose whether they want text on the top only, both top and bottom, or both on the bottom. By selecting the top and bottom choice for layout of accompanying text, the header could be used display the category of vocabulary, say, animals, whereas the footer caption would display the definition for each individual image of an animal. Visually this could be an effective way to teach and learn lexical sets or vocabulary.

The Media widget, not to be confused with the Media browser, is not unique to e-book authoring in terms of support for audio or video files. But in iBooks Author 2.0, more media file formats are supported. Now any files that can be opened by QuickTime Player are supported. The most current list can be found [here](#). Authors can drag and drop audio or video files into iBooks Author and a Media widget will be created automatically. As with Gallery, Media frames will automatically be numbered sequentially. There is also an option under the Layout pane for text and captions to be on the top of the frame only, on both the top and bottom, or just at the bottom. If authors want just the button or toolbar to be displayed, the title, caption, and background can be removed by unchecking them from the Layout pane of the Media Inspector. On the Interaction pane of the Media Inspector, there is a choice to select either “plays on page” or “plays full-screen.” It is recommended that authors select “plays full-screen” for movies so that they can be viewed properly in iBooks on smaller mobile devices. Otherwise, the videos may appear too small if played “on page.”

As to controls, media files can be displayed with buttons, scrubber bars, or poster frame images. The scrubber bar may be the most helpful for students to control playback of files. This is especially the case should media be used for listening exercises, as the scrubber bar allows for greater control over segments of the media file being played. Students could drag the scrubber back, for example, to listen to a passage or segment again should they not have understood it completely, have questions, or wish to reconfirm what they have heard. As with Gallery, the Media widget could be used effectively in conjunction with Review to create self-paced exercises and assignments. Even used simply for audio or visual media, audio and video files can create a more fully multi-media experience for iBooks. For a digraphic and tonal language such as Chinese, having audio files of text in characters or even pīnyīn is helpful for language learners.

For authors wishing to share Keynote slide shows, this can be done easily in iBooks Author with the Keynote widget. After inserting a Keynote widget, slide shows can be added simply by dragging and dropping a Keynote file (.key) onto the widget. Adding Powerpoint slides is possible, too, by first opening up .ppt or .pptx documents in Keynote. Simply saving the opened Powerpoint document in Keynote will convert it to a Keynote (.key) file, which can then be used in iBooks Author through the Keynote widget. Some editing and modifications may be necessary, however. But generally the two applications have become quite compatible, especially in the latest versions of the software.

Slightly different layout options from the other widgets are available for the Keynote

widget. Instead of text on top, both top and bottom, or only bottom, there are choices for top and bottom or bottom only as well as free-form layout and banner layout, in which text can be displayed over the Keynote widget slide in banner form. Title and captions can be displayed or not displayed by clicking buttons on the Layout pane of the Keynote Inspector. As with other widgets, it is possible to edit how title labels display by clicking on Labels under the Layout pane. This is useful should one wish to create customized titles that will nevertheless order Keynote widgets sequentially (say, for example, Lesson 1, Lesson 2, Lesson 3, etc).

Under the Interaction pane on the Keynote Inspector, there are options to play slideshows “full-screen” or “on page.” As with movies, the full-screen option is recommended for Keynote, especially if played in iBooks on mobile devices. Options also exist to “Play automatically” and “Show transport controls,” though these only work with the “play on page” option. In iBooks full-screen mode, readers start the slide show by clicking on the Keynote widget, which will open the slide show in full-screen mode. In iBooks 1.0 for the Mac OS, the slide show can be advanced by clicking on the space bar or using the forward directional arrow. Readers can move forward and backward between slides or between builds, which are preserved by the widget, by using the four directional arrow keys on the keyboard. On mobile devices, tapping begins a slide show. Reverse pinch to view slideshows full screen on the iPad. Slides and builds can be advanced or reversed on mobile devices by using a swiping motion in the direction one wishes to go (if in full-screen view). Otherwise, transport control arrows can be used to control the slideshow in page view. When finished, readers can click on the “done” button to exit the slideshow.

For all my Chinese language classes, I use Keynote to introduce vocabulary, grammar, key sentence patterns, and for classroom exercises. Slides are shared with students as a PDF via our university course management system, D2L. Students in general find the slides a good way to review materials, even if just in PDF form. Pairing a slideshow in the Keynote widget with Review, however, will allow students to preview and review new material, then self-assess what they have learned. Again, offering immediate feedback through interactive widgets has pedagogic benefits that other e-book authoring software or PDF files cannot provide. With Review, it would be easy to create multiple-choice questions or drag-to-target exercises to assess acquisition of vocabulary terms or syntax-related questions about sentence patterns or grammar from Keynote slides. Finally, for some odd reason media files embedded in Keynote but not supported by iBooks Author as stand-alone files will play properly if imported into the Keynote widget as part of a slide show. This could serve as a workaround to unsupported media file types, though it may be easier to simply convert such files to formats that iBooks Author does support.

The last two widgets to be introduced are Scrolling Sidebar and Pop-Over. Both of these widgets, which function something like a gloss, allow authors to add text to graphics or images or as a standalone text box. They could therefore be more useful for adding additional information to the culture notes section of a text. For example, one could add a Scrolling Sidebar widget to an image of the terracotta warriors or a traditional Chinese courtyard home with an introduction in Chinese or English filling the Scrolling Sidebar. In iBooks 1.0 for the Mac OS, the operating system dictionary function is also available to look up terms in Chinese should the Sidebar include text in characters. Selected text can also be read aloud through text-to-voice capability (highlight text, right click, select “speech” > “start speaking”; see below for more

information about how to set this up). In Scrolling Sidebar, a text box is created after a widget is inserted. In the Inspector, there are options to include a title, caption, background, and border to the text box. Within the text box itself, small images or graphics can also be placed. But any such graphics cannot be expanded or zoomed in when viewed in iBooks and are thus of limited use, save perhaps for aesthetic reasons or design purposes.

The Pop-Over widget is similar to Scrolling Sidebar in that it provides a pop-up text gloss for graphics and images. After inserting the Pop-Over widget, a graphic icon and text box, with prompt to add text appears. Under Layout in the Inspector Layout pane, there are different options for displaying titles and captions for the pop-up window: top or bottom; just bottom; free form; left or right side; and banner. An option to not display title or captions also exists. But it may be helpful for readers to at least have a prompt letting them know that tapping on an image or graphic will make the Pop-Over window and text display. For longer text passages, a side scrolling bar will appear in the Pop-Over window. Like the Scrolling Sidebar widget, there is also an option to include images or graphics with text in the Pop-Over window. But any such graphics cannot be enlarged in iBooks. Although similar in functionality to Scrolling Sidebar, Pop-Over may be more helpful to gloss a set or series of images or graphics on a single iBooks page. Pop-Overs are essentially space savers on the iBooks page since they display text only after clicking on the graphic or image (whereas Scrolling Sidebar windows are always displayed). In addition to glossing cultural notes, which can be done easily with Scrolling Sidebar, too, Pop-Overs could also be used to gloss lexical terms presented as graphics or images. For example, if learning about different nationalities, which is fairly standard in many beginning-level textbooks, flags could be displayed with captions asking which country they represent and instructions to click on the flag to find out. Such an activity could then be followed up with a Review widget (using either multiple-choice questions or drag-to-target activities), which could be on the following page or linked to using the hyperlink Inspector.

The other three widgets available in iBooks Author 2.0, Interactive Image, 3D image, and HTML, are less immediately useful for creating original teaching materials in Chinese and will only be introduced but not discussed in detail. The Interactive Image widget allows readers to zoom in on a location in an image by clicking on a text box associated with that location. Perhaps this widget could be used, say, with a bird's-eye view photo of the Forbidden City. Text boxes could be added through the Inspector for Tiananmen, Hall of Supreme Harmony, Palace of Heavenly Purity, and the Imperial Garden and set to their corresponding location in the image. Clicking on any of these text boxes would then zoom in on the places selected. For 3D images, .dae files can be used by inserting a 3D widget. Options for object rotation include free, horizontal, as well as horizontal and vertical, which can be set under the Interaction pane of the 3D Inspector. Authors should also click on the "auto-rotate object when idle" box so that readers can see more easily that there is 3D image in the book. Finally, the HTML widget, which contrary to its name is *not* used for simply cutting and pasting HTML code into iBooks Author. The widget does allow for possible forms of interactivity, however, which must be coded in HTML, CSS, or JavaScript. The HTML widget requires coding knowledge and familiarity with Apple's Dashcode application, which is used to design Dashboard widgets for the Mac OS. Dashcode is available for free by registering as a developer with Apple. More information about the HTML widget can be found [here](#).

5. Sharing and publishing e-books created in iBooks Author

After an iBook has been created and proofread, there are different ways to share or publish a work. Users should first preview their work before sharing or publishing it. Remember to switch back to “preview the entire book” under general preferences if “preview current selection” had been selected while working on an iBook (“preview current selection” is actually the recommended setting for longer works since they will preview faster in iBooks on both a Mac and iPad). For sharing, first export the work from an iBooks Author file (.iba) to an iBook file (.ibooks). This can be done from the menu (File > Export). A drop-down pane will appear allowing users to choose to export the file as an iBook (.ibooks), PDF, or text. After making a selection, users will be prompted to “save as.” A new file name and location can be specified in this window. Note that PDF versions of an e-book can be created through export. If multi-media files or interactivity are not needed, iBooks Author can still create professional looking e-books as a PDF file, which will work across all platforms with a PDF reader. iBook files can be shared different ways. If not too large, an .ibooks file, for example, could be sent as an email attachment. Larger files, however, are best shared through course CMS or LMS, file sharing services, such as Dropbox, or through iTunesU. On a Mac with iBooks 1.0 installed, the .ibooks file can be imported into the application simply by dragging and dropping it onto the Library window. For mobile devices, the .ibooks file sent as an email attachment can be saved in the iBooks library by tapping on the attachment file and selecting “open in iBooks,” which will then save it in the user’s iBooks library automatically.

iBooks created on iBooks Author may also be published through the iBooks Store. Clicking on “Publish” from either the Toolbar or from File > Publish in the menu will take authors through the process step by step, including how authors can register an account for [iTunes Connect for iBooks](#). Registration is free and only requires a valid email address. iBooks can be made available on the iBooks Store for free or for purchase. Authors wishing to provide their work for both purchase and for free will need two separate emails, however. For authors wishing to sell their work, a ISBN number, US taxpayer ID, and bank account information to process payments are all required.

6. Benefits and limitations of iBooks Author 2.0

First and foremost, iBooks Author is a free download for the Mac platform (see requirements above). Like most Apple software products, it is intuitive and easy to use, especially if authors are familiar with Apple’s word processing and presentation applications, Pages and Keynote respectively. Yet iBooks Author 2.0 is also quite powerful and can create professional-looking publications with relative ease and quickly. Since iBooks Author comes with more than one dozen templates and layouts for both portrait and landscape modes, prospective authors only need to open up the application and start adding content to create an iBook. Drag and drop for media or Keynote files makes adding content simple, too. For more advanced users, the application allows for finer levels of customization as well. Customization is conducive to creating books or materials that are best suited for certain classroom and curricular needs, where rarely, if ever, is there a one-size fits all solution. Given the ease of creating e-

books using iBooks Author and it being a free application, in certain circumstances it may be worth adopting a social constructionist approach to authorship by having students help to create content as well (which would then also be social constructivist in terms of learning experience).

Although the application name implies that “books” must be authored, iBooks Author is highly scalable, modular, and differentiated. It can create anything from the simplest of assignments, such as a reading or listening exercise with Review questions that follow, to a full-length textbook complete with audio and video files (up to three gigabyte if published through the iBooks Store). In terms of targeting learners with different levels of proficiency, iBooks Author likewise can create materials appropriate for a vast range of learners, from beginner to advanced.

Though not unique to iBooks Author, the ability to create truly multi-media content on a single device or computer is powerful pedagogically, especially with a language such as Chinese. The traditional textbook may include audio or video files either as a CD, DVD, or online. But physically such media is separate from the text itself. Playback, listening, and viewing involves using another device to listen or view. With iBooks Author, on the other hand, text and media can be integrated, which provides practical convenience and pedagogic benefits to learners. There is no time lag either between the reading of text and the ability to listen or view video related to that text. Other applications, such as Skritter or electronic flashcards, though not a part of an iBook, can be used on the same computer or mobile device as well, making either platform an even more powerful tool for one-stop integrated language learning.

Another benefit of using iBooks Author to create materials is being able to easily modify or change course content. The traditional printed textbook cannot do this until a revised edition comes out, which is very limiting and costly for publishers. Emendations can be crucial for certain types of content where relevancy and up-to-date information prove important. For example, any content covering the news or current events had best be relatively recent. It will be presumably more interesting and relevant to students’ own lives, and thus enhance motivation for learning. It can also allow students to contextualize certain information and develop metacognitive strategies to enhance their understanding, whether it be a reading or listening exercise. As Auer has shown, using the iBooks Author application can aid in promoting reading strategies and autonomous learning (Auer). Conventional textbooks (such as the Yale series of textbooks for reading newspapers) obviously cannot do this as well. Unless one is a historian or archivist, there is no need for language learners to read outdated newspapers anymore. But reading about current events, such as the outbreak of MERS or developments in Sino-US relations, through reading material created specially for iBooks, students may feel more familiar with, engaged, and thereby more interested in the material, thus stimulating learner motivation. They will also be able to apply information gleaned from news in their native language as part of a reading or listening strategy, which may help them better understand news or popular culture content in Chinese. Another more practical example could involve content about, say, taking the subway in Beijing. This is something every student traveling to China for study abroad should learn about. In late 2014, subway fares there changed from two yuan for a ride regardless of destination to a system where passengers pay according to the distance of their ride, starting at three yuan. Had a unit about taking the subway based on old information been created as content for an iBook, it would be quick and easy to update this information in iBooks Author to reflect

the current situation. Linguistically and practically speaking, having relevant, useful, and up-to-date information available is better for learning.

An additional benefit iBooks Author created iBooks, available only on iBooks 1.0 for the Mac platform, is the capability to look up Chinese terms using Apple's Dictionary application, which includes two excellent Chinese dictionaries for free as part of its 10.10 operating system (see above). By simply using a special key or trackpad command (such as a three-finger tap), highlighted Chinese terms will be defined by the Dictionary application in a pop-up window. This is a most powerful tool for learning Chinese, especially at the advanced levels, as it saves time looking up terms in a conventional print dictionary, which can be tedious. With the BetterDictionary extension added, terms can also be saved in Apple's Dictionary application for review later. In iBooks 1.0 for the Mac, there is also an option to highlight text, right click, and have the selected text read aloud. To do this in Chinese, a Chinese "voice" must be downloaded. This can be done for free through Apple and by adding a Chinese voice to the "Dictation & Speech" preference pane under System Preferences. After downloading a voice, such as Ting Ting, go to System Preferences and select "Dictation & Speech." There choose "Chinese" under "System Voice" and add the voice you wish to read aloud Chinese text.

The limitations to using iBooks Author and iBooks are primarily related to platform. To maximize the benefits of the authoring software, any work created using iBooks Author and exported as .iBooks must be viewed on the iBooks application, which runs exclusively on the Mac and iOS platforms. So intended readership must own or have access to either Apple computers (desktop and laptop), iPads, or iPhones. Even though iPhone ownership has increased dramatically, with over 700 million sets being sold worldwide and Apple holding up to 40% market share in some areas (Costello), reading iBooks on the iPhone is rather restricted, especially for the needs of instructional materials in Chinese. Many schools, however, do have Apple computers available in language labs and resource centers. Students in some school districts are being issued iPads, too. Greater availability of Apple products mitigates the platform problem somewhat. Yet, the issue still persists and must be taken into serious consideration when deciding to create materials using iBooks Author.

To get around platform requirements, there are options, of course, to export as .pdf or text files. But then iBooks Author loses its superiority in interactivity (widgets) and providing "transformative content," as well as all multi-media capability, producing nothing more than the equivalent of a conventional hard-copy book readable on mobile devices and computers. Perhaps Apple will one day develop a Windows version of iBooks, just as it did with iTunes for Windows. It also took Apple three years, however, to develop and release a version of iBooks for just the Mac platform (version 1), which offers many benefits not available on iBooks 3.0 for the iOS platform. But books are far less profitable for Apple than music in terms of gross revenue. Some suggest, too, that Apple has even inflated its numbers regarding revenue generated by iBook sales (Hoffelder), which estimates put at around one billion dollars for 2013 (compared to over 10 billion dollars in revenue from music sales through iTunes). The issue of continued development always presents a concern when committing to a new technology. But since Apple does make money off the sale of iBooks created using iBooks Author, the company has a monetary incentive to continue development of the application. It is hoped that additional new features will be made available, too. One feature already present in the latest versions of Pages

and Keynote that would presumably be easy to port to iBooks Author is “add phonetic text,” or ruby superscript, for Japanese and Chinese characters. This would make iBooks Author an even more attractive choice for creating instructional materials for the Chinese classroom. One final shortcoming related to the Review widget is the lack of any way to keep track of progress in terms of individual performance on any given assignment. Students could, of course, write down the number of correct answers for each assignment. But an automated system to track performance would work better and benefit students in terms of providing another form of feedback.

In the end, authors can determine best the lay of the land locally and decide whether or not iBooks Author suits their needs and their readership. Accessibility and availability, however, remain the crux of the matter. Thanks to support from the Director of Benedictine University’s Center for Teaching and Learning Excellence, Dr. Cheryl Heinz, and the Provost, Dr. Maria de la Camara, fall 2015 iPads will be made available to each student registered for Chinese at Benedictine University’s main campus. I am currently developing supplementary materials using iBooks Author to complement the e-book version of *Integrated Chinese*, which will be adopted for CHIN 101 fall 2015 at Benedictine University. For intermediate and advanced language courses, I will use iBooks Author to create original instructional materials, primarily for vocabulary, listening comprehension, and reading exercises. The interactive aspects of iBook Author’s widgets, especially Review and Gallery, will, I believe, help students to better acquire vocabulary, improve their listening comprehension skill through immediate feedback, and enhance their reading abilities by helping them to develop autonomous learning habits and metacognitive strategies. Feedback on the use of iPads and iBooks will be solicited at the end of each semester for qualitative research purposes; students will be asked how they think the use of iPads and iBooks impacted learning. For the intermediate and advanced courses, students will also be asked to compare their experience using iPad and iBooks in terms of learning to prior semesters when course materials were exclusively in the form of textbooks or textbooks with a companion website.

Finally, to return to Roland Barthes and the death of the author cited at the beginning of this article. It seems clear that far from being dead, authorship has survived and is even thriving. With iBooks Author, original instructional materials with clear pedagogic benefits can be created easily for the Chinese classroom by an author-instructor. Whether iBooks created using iBooks Author supplant or merely supplement existing textbooks, having the ability to author one’s own materials is empowering and will, I believe, benefit both our language students and the field of Chinese language pedagogy.

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多屏互动和屏幕镜像技术及其在语言教学中的应用 (An Introduction to Multi-Screen Interaction and Screen Mirroring Technology and Its Applications in Language Teaching and Learning)

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摘要: 随着智能手机和平板电脑拥有者人数的增加, 如何实现这些新移动设备和电视及笔记本电脑等原有设备之间的互动和资源使用最优化, 成为最近两年广大用户、生产商、技术人员及其他有关人士关心的热门问题。支持多屏互动和屏幕镜像技术的各种硬件和软件也应应运而生。本文首先对屏幕镜像和多屏互动技术作一简单解释, 其次介绍几种支持设备间屏幕镜像和多屏互动的硬件(比如 Chromecast 和 Apple TV)、软件 and 应用程序(比如 Airserver、Reflector、Ausus PC Link、Project My Screen 等), 然后对其在语言教学中的应用做些评析。文章最后推荐了一个可支持各种设备且可简单高效用在语言课堂教学中的网站(getKahoot.com)。

Abstract: As more and more people own smart phones and tablets in addition to computer and TV devices, the collocated interaction with these devices “poses the question of how to seamlessly connect the different display spaces and their afforded interactions” (Leigh et al., 2015). Building an ecology of devices to provide users with fluid experience (Rick, 2009) has received increased attention from various stakeholders across fields. This article first provides a brief explanation to the emerging multi-screen interaction and screen mirroring technology, then introduces some pieces of hardware (e.g., Chromecast, Apple TV), software, and apps (e.g., Airserver, Reflector, iTools, PC Link, Project My Screen, Doceri, Display Note) that support screen mirroring and interactions among devices (i.e., TVs, computers, smart phones, and tablets). The article then analyzes the applications of these tools in language teaching and learning. While some tools can be used in language teaching and learning, most of them have limitations, such as only supporting devices running certain operating systems, not cost effective (in terms of time and/or money) for language classrooms. Finally, the article recommends Kahoot (getKahoot.com), a free game-based online platform, supporting all devices with Internet access, which can be easily and effectively used in language teaching and learning.

关键词：屏幕镜像技术，多屏互动，移动设备，智能手机，平板电脑，语言教学

Keywords: Screen mirroring technology, Multi-screen interaction, Mobile devices, Smart phones, Tablets, Language teaching and learning

1. 屏幕镜像和多屏互动技术简介

屏幕镜像简而言之就是将一个设备的屏幕上的内容像照镜子一样在另一个设备的屏幕上显示出来。智能手机和平板电脑具有体积小，携带方便等优点。但在超过三个人同时看一手机屏幕时，就会显得太小，变成了缺点。另外，在手机上甚至在电脑上看电影显然不如在大电视屏幕上看得效果好。在教室里，教师有时需要将手机或平板电脑上的应用程序演示给全班学生们看。于是如何将智能手机和平板电脑屏幕上的内容高质、方便地投射在电视大屏幕上或者连着投影仪的电脑屏上成为广大用户和生产商所关心的问题。

此外，同时拥有电视、电脑、手机、平板电脑等多个设备的用户越来越多。用户们可以在等车时及饭前茶后利用手机随时查看最新讯息，可以从平板电脑上随时观看各种视频，并可把在电脑上未看完的文章在手机、平板电脑上继续浏览。有人形象地把今天的生活称为屏幕人生，在多屏世界中穿越（Ma, 2014）。如何最优利用多种设备的资源，实现多屏间的互动，从而使我们的工作、生活更有效、更丰富，成为移动互联网时代的热门话题和大势所趋（Leigh et al, 2015; Liu, 2014; Meihua Info, 2013; Yang, 2014）。而无线网络(WiFi)、移动数据网络、蓝牙(Blue tooth)技术的日趋普及和覆盖面的扩大以及相关标准（如 HDMI 和 Miracast 等）的制定（详细解释请见下文），进而为各种设备之间的互动提供了可能。本文首先介绍几种支持不同设备之间屏幕镜像和多屏互动的硬件、软件 and 应用程序，接着对屏幕镜像和多屏互动在语言教学中的应用作些初步探讨。

2. 几种支持不同设备之间屏幕镜像和多屏互动的硬件、软件及应用程序

目前较常用的设备有四大类：电视、电脑、智能手机和平板电脑。下面就支持（1）电视与电脑之间，（2）电视与智能手机和平板电脑之间，（3）电脑与智能手机和平板电脑的之间的屏幕镜像和多屏互动的几种硬件、软件 and 应用程序做简单介绍。

需要指出的是，在这四大类常用设备里，如很多用户已知，电脑包括使用苹果（Apple）OS 操作系统的 Mac 和使用微软(Microsoft) Windows 的 PC。而智能手机和平板电脑根据所装的操作系统不同，可分为基于 Android、iOS、Windows 操作系统的三大类。智能手机和平板电脑虽然屏幕大小不同，除了一个只能利用无线

上网而另一个既可无线上网也可通过移动数据网上网以外，在很多情况下使用起来并无太大区别，所以在本文为方便起见，放在一起讨论。

2.1 电视与电脑之间

电视与电脑之间的互动目前大多只限于将电脑的内容在电视显示屏上播放。电视与电脑之间的连接可分为有线连接和无线连接两种：

(1) 有线连接

电视和电脑之间的有线连接比较简单，只需一条 HDMI（全称为 High-Definition Multimedia Interface）线即可。HDMI 始现于 2002 年（Iannicello, 2007）。最近十年来市场上的电视和电脑产品大都提供 HDMI 连接端口。据 HDMI.org 网站介绍，到 2014 年为止，全球已有超过 1600 多家的电子消费产品生产者和电脑 PC 及移动设备的制造商采纳了 HDMI 技术，支持 HDMI 技术的各种产品已超过 40 亿。



图 1: 电脑和电视之间有线连接镜像示意图

需要指出的是有些苹果电脑并不直接提供 HDMI 端口连接，用户需要购买转换器 (Adapter) 和 HDMI 线连接（具体信息请参见苹果网站 <https://support.apple.com/en-us/HT204388>）。

(2) 无线连接

Apple MAC 电脑与电视的无线连接需要购买 Apple TV 设备。Apple TV 名字虽然有 TV，但实际上本身并不是 TV，而是中文中所说的一种电视机顶盒（参见图 2）。Apple TV 上有 HDMI 接口，可以用 HDMI 线和电视连接。包括 MAC 电脑在内的苹果电子产品一般都装有 Airplay 软件。MAC 电脑可以通过 Airplay 软件与 Apple TV 匹配实现无线连接（具体操作请参见 <https://support.apple.com/en-us/HT201343>）。Apple TV 的价格自 2015 年 3 月底，从原来的 99 美元降至 69 美元。



图 2: Apple TV

支持 PC 电脑和电视无线连接的装置有很多，比如 Google 生产的 Chromecast。Chromecast 的大小及形状同用来存储文档的一般 U 盘类似（参见图 3）。其一端为 HDMI 接口可以插在电视的 HDMI 接口处。电脑上要从 Google 的网站（<https://cast.google.com/chromecast/setup/>）下载一个基于 Google Chrome 浏览器的名叫 GoogleCast 的插件。安装成功后，在利用 Google Chrome 浏览器访问任何网页时，浏览器的右上角就会出现 GoogleCast 的图标。如想将浏览的网页投射在电视上，点一下该图标，屏幕上就会出现确认将该网页投射到与 Chromecast 相连电视上的对话框（示意图如下）。



图 3: Chromecast



图 4:使用 GoogleCast 插件示意图

Chromecast 除了支持 PC 和 MAC 电脑与电视连接外,还支持 iPad、iPod、iPhone 及基于 Android 系统的智能手机和平板电脑与电视之间的无线连接(具体做法参见下节)。值得指出的是 Chromecast 的镜像功能可以在设备的后台操作,即在利用 Chromecast 实现屏幕镜像功能的同时,用户还可在其所用的电脑或其他移动设备上进行其他任务的操作。而在先前所介绍的电脑与电视之间的有线连接则不可,其电脑屏幕与电视屏幕的显示完全相同。Chromecast 目前的标准定价为 35 美元,在 Walmart 和一些网站上还可找到更便宜的价格。

2.2 电视与智能手机和平板电脑之间

智能手机和平板电脑与电视之间的连接和以上所述电脑与电视的连接类似,也分有线连接和无线连接两种。只是由于智能手机和平板电脑因其所安装的操作系统不同,使其情况更加多样。



图 5:电视与智能手机和平板电脑无线连接镜像示意图

(1) 基于 iOS 的苹果移动产品

基于 iOS 的苹果移动产品可以通过上述的 Apple TV 利用其自身所带的 Airplay 实现与电视的无线连接和镜像映射。另外还可通过特定的转换器与电视实现有线连接。比如用一端可连接 HDMI,另一端可连接 iPad、iPod 和 iPhone 的 Lightning 插口的转换器。

此外, iPad、iPod 和 iPhone 也可通过上述的 Chromecast 硬件设备与电视无线相连。实现这一功能需要从 App Store 下载一个叫 Chromecast 的应用程序(App)。需要指出的是利用 Chromecast 将苹果的移动设备与电视连接时,只能将支持 Chromecast 的 Youtube, Hulu, PBS 等应用程序上的内容进行镜像映射。在这一点上 Chromecast 不如苹果公司自己生产的 Apple TV 与 Airplay 相配合所产生的功能强。

(2) 基于 Android 的移动设备

基于 Android 的移动设备,除了可用相应的连线和转换器与电视进行有线连接外,还可以通过上述的 Chromecast 硬件设备和下载的 Chromecast 应用程序配套使用与电视进行无线相接,从而实现屏幕之间的镜像映射。目前市场上基于 Android 的移动设备很多,比如 Asus, HTC, Huawei, Samsung 等公司出产的智能手机和平板电脑等。有些制造商也推出了自己的屏幕映射产品,比如 Samsung 生产的支持自

己公司产品的 SamsungAllShare Cast Hub。另外,市场还有第三方制造商生产的类似 Chromecast 的产品,如 Roku 公司生产的 Roku[®] Streaming Stick[®] 等产品。其他相关产品请参见 Nadel (2014)。

2012 年全球无线联盟 (WiFi Alliance) 推出了 Miracast 技术认定项目,旨在实现多媒体在不同设备、不同品牌之间无线无缝的传输和屏幕镜像。通过该技术认定的产品,由于设备内部都安装了 Miracast 技术,之间可以迅速方便的实现屏幕镜像,房间内甚至不需要有无线 WiFi 网络。关于 Miracast 技术的介绍,除了 WiFi Alliance (2012, 2015) 的网站外,还可参见 Profis (2013), Hoffman(2014), Ryan(2015)。目前市场上具备 Miracast 技术的电视、和 Android 智能手机和平板电脑等已有一些(具体产品请参考 <http://www.wi-fi.org/product-finder>)。如何将 Android 设备通过 Miracast 进行镜像映射的具体操作,可参考 Google Nexus 网站:<https://support.google.com/nexus/answer/2865484?hl=en>。

(3) 基于 Windows 的移动设备

基于 Windows 的移动设备,除了可以用上述 Roku 公司生产的一些产品外,Windows 8.1 系统以上的 Windows 智能手机还可通过手机里的 Project My Screen 应用程序,将手机屏幕直接镜像到支持 Miracast 技术的电视上(具体操作请参见 <https://www.windowsphone.com/en-us/how-to/wp8/connectivity/project-my-phone-screen>)。

另外,除了支持 Miracast 技术的电视外,市场上还推出了可以直接玩游戏、更加智能的电视,如 Android TV 等(请参见 https://www.android.com/intl/en_us/tv/),从而使屏幕镜像和多屏互动更加方便。

2.3 电脑与智能手机和平板电脑之间

(1) 电脑和 iPad、iPod、iPhone 之间

iPad、iPod、iPhone 并不能通过设备自身所带的 Airplay 与大部分苹果的 MAC 电脑直接连接进行屏幕镜像和互动,而是要经过第三方开发的软件 and 应用程序。目前有很多这方面的软件 and 应用程序,比较流行的有 Reflector 和 Airserver。这两个收费软件除了支持将 MAC 电脑和 iPad、iPod、iPhone 之间的屏幕镜像外,也支持 Windows 系统的 PC 电脑。关于这两个软件的具体购买、安装和使用请参考其网站(<http://www.airsquirls.com/reflector/>和 <https://www.airserver.com/>)。

将 iPad、iPod、iPhone 的屏幕镜像到 PC 电脑的屏幕上,除了上述的 Reflector 和 Airserver 外,还可以利用一个叫 iTools (http://pro.itools.cn/itools3_en) 的免费软件。该设备的设备管理 (Device Management) 栏下有一个 Real-time Desktop 的功能(示意图见下图 6)。该功能除了可以将 iPad、iPod、iPhone 屏幕上的操作内容完全映射到电脑屏幕外,还可对显示在电脑屏幕上的内容进行截图拍

照(screenshot) 和录像(record) (参见图 7)。需要指出的是 iTunes 软件需要和 iPhone 配合使用, 即电脑上除了 iTunes 外, 还要安装 iTunes。

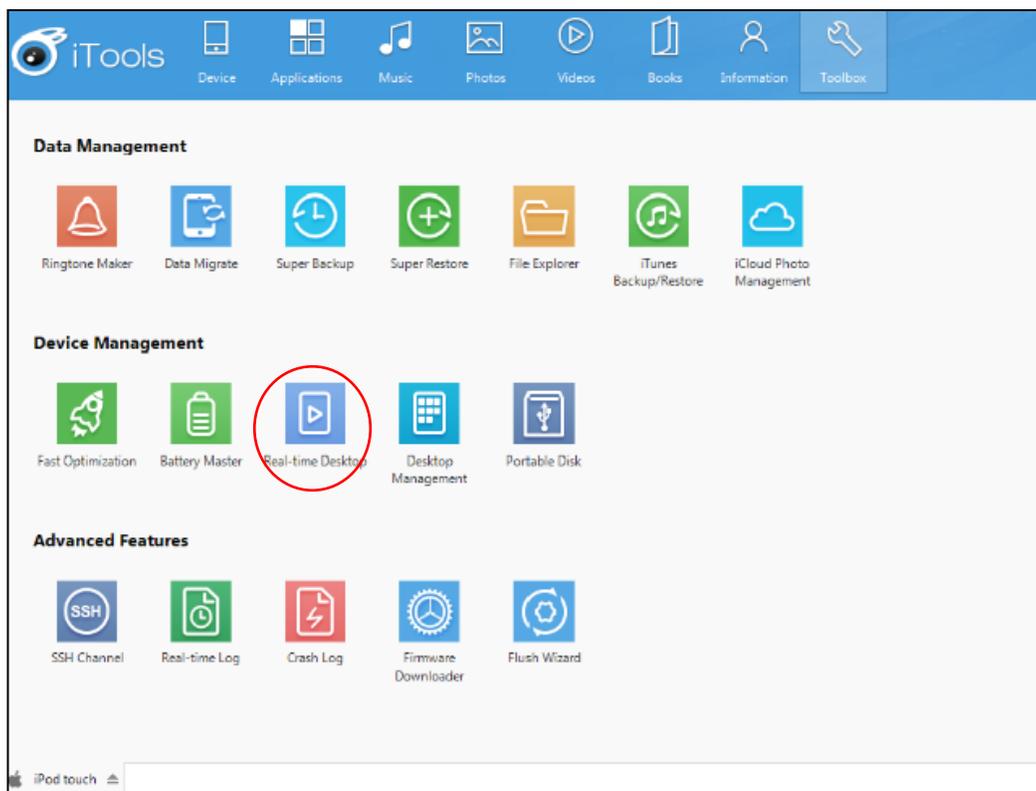


图 6:iTunes 项目管理下的 Real-time Desktop 功能示意图



图 7:通过 iTunes 的 Real Desktop 功能将 iPad 屏幕 (WordTracer App) 镜像到电脑屏幕上的示意图, 屏幕最底部的三个蓝色小按钮分别为: Screenshot, Full screen, Record.

除了上述可将移动设备屏幕镜像到电脑屏幕上的软件和应用程序外, 市场上还出现了一些可将电脑屏幕上镜像到智能手机和平板电脑屏幕上的软件和应用程序。

Doceri 就是其中一种。使用 Doceri, 需要在电脑上下载安装 Doceri 软件, 同时在 iPad 上下载 Doceri 应用程序。利用 Doceri 可以在 iPad 上控制所连接电脑屏幕上的任何内容。这样教师不需要一直站在电脑前, 而是可以拿着 iPad 站在教室里的任何地方授课。另外, 教师和学生还可利用 Doceri 在 iPad 上对电脑屏幕上的任何文件用手指或电子笔做各种注释。再者, Doceri 还可以将在 iPad 上操作的内容进行拍照和录影。Doceri 的诸多功能请参见其网站 (<https://doceri.com/index.php>)。

(2) 电脑和基于 Android 系统的移动设备之间

支持电脑和 Android 移动设备之间屏幕镜像的软件和应用程序也有一些, 比如除了上述的 Reflector 外, 还有 Asus 公司提供的免费的 PC Link 和 Remote Link。与 Doceri 的情况类似, 其使用, 要在电脑上下载 PC Link 和 Remote Link 软件, 同时在手机和平板电脑上下载 PC Link 和 Remote Link 的应用程序。



图 8: PC Link 示意图

PC Link 除了可以将 Android 移动设备的屏幕镜像到电脑上外, 还可在电脑上利用鼠标和键盘对移动设备进行控制, 并且可录下屏幕上所进行的操作。此外, 还可在移动设备和电脑之间进行文字拷贝。详细功能请参见 PC Link 的介绍 (<https://play.google.com/store/apps/details?id=com.asus.linkrim&hl=en>), 具体使用操作请参考 Asus 的网站 (<https://www.asus.com/support/FAQ/1007320>)。需要指出的是 PC Link 只支持 Android 4.4 以上的系统。另外, PC Link 本来是为 Asus 为自己公司生产的智能手机和平板电脑开发的, 所以并不一定对其他基于 Android 的移动设备都适用。

Remote Link 的功能与 Doceri 的一些功能类似。用户可以通过移动设备遥控装有 Remote Link 的电脑。另外在移动设备上写的文字可以显示在电脑上。不过其功能要远少于 Doceri。

(3) 电脑和基于 Windows 系统的移动设备之间

上述的 Doceri 除了 iPad 外, 还支持 Windows 8.1 的平板电脑。即可利用 Doceri 将电脑屏幕镜像到 Windows 平板电脑上。将基于 Windows 系统的移动设备的屏幕镜像到电脑上可以利用上文提到的 Project My Screen 应用程序。使用前需要在电脑里下载安装 Project My Screen 软件。一些最近生产的 Windows 手机里已预装了 Project My Screen 应用程序。但是需要再次指出的是 Project My Screen 只支持 Windows 8.1 系统以上的移动设备 (<https://www.windowsphone.com/en-us/how-to/wp8/connectivity/project-my-phone-screen>)。

3. 屏幕镜像和多屏互动技术在语言教学中的应用

上文就支持不同设备间屏幕镜像和多屏互动技术的几种硬件、软件、应用程序做了简单介绍。虽然本文只简单介绍了几种，但却已可以看出其情况比较复杂。仅就电视、电脑、智能手机、平板电脑这四种设备本身而言，除了成百甚至上千的琳琅满目的不同品牌外，各种设备内的操作系统也有不同，功能也常常各异，而支持它们之间屏幕镜像和多屏互动的硬件、软件 and 应用程序相应也不尽相同，普通用户包括语言教师在内很容易感到眼花缭乱，无从下手。特别是有的软件和应用程序只支持特定的版本，会让做了一些初步研究的用户进一步感到沮丧。比如笔者实验的 Android 手机的操作系统是 4.1，实验的 Windows 手机的操作系统是 8.0。经过一番研究才认识到所用的这两个设备因系统版本低而无法使用前面提到的基于 Android 系统的 PCLink 和基于 Windows 系统的 Project My Screen。无线联盟推出的 Miracast 技术认定标准，无疑会使今后不同系统、不同设备之间的互动和屏幕镜像更加简单便易。但由于市场上及用户自己对已有产品的更新换代需些时日，目前这种“诸侯割据一方”、互不支持的状况预计在短期内不会有根本性变化。

就语言教学而言，在上述三类中，电脑与智能手机和平板电脑之间的屏幕镜像和多屏互动技术最重要。前两类都涉及到电视，而现在几乎所有学校的多媒体教室已很少配有电视。其原因可能是由于近二、三十多年来随着电脑和互联网的发展，大量的电视节目的录像都可在互联网上找到，且可随时随地选择任意片段观看，从而使教学中对电视机的需要降低。当然，学生和教师在课外、在自己家里还可以选取电视上对语言学习有用的节目实时观看。另外，当在电脑或手机上浏览网页、观看视频觉得屏幕小或效果不理想时，可以利用上文中提到的通过有线或者无线连接的方式将其屏幕镜像到电视大屏幕上浏览、播放，并利用智能手机对电视进行遥控。

智能手机和平板电脑上有很多可帮助包括中文语言学习的应用程序 (Lin & Lien, 2012; Liu, 2013)。在一些情况下，教师需要将自己在自己智能手机或平板电脑上的内容推荐、演示给学生们看。教师除了可根据自己移动设备的类型，选择上文所提到的 Reflector, Airsever, iTools, 或 Project My Screen 等将其与电脑连接屏幕镜像外，还可通过调节器(如 Apple 的 Lightning Digital AV Adapter)将其直接与教室里的 VGA 端口连接，从而将手机或平板电脑屏幕上的镜像直接利用投影仪显示出来。另外一个更便易的方法，是将移动设备直接放在很多教室已经配备的 Document Camera 下，通过投影仪进行演示。这样可不需要购买和安装任何新的硬件、软件 (参见 Vincent, 2015)。

上文中提到的 Doceri 和 Remote Link 可以在移动设备上实现与电脑的镜像及远程控制电脑屏幕上的操作。但这一功能似乎对学生人数较多 (比如百人以上)，教室较大，及所讲授的内容需要教师花时间详细解释的情况更适用。仅就语言教学而言，班级规模一般最多不超过 40 人。教室也不会太大，教师通常也并不需要太大走动，便可与学生近距离互动。另外，语言教学的课堂活动，多是互动式，教师需要做的是让学生多说多练，而不是教师花太多时间自己说。

上述 Doceri 的另一功能是可支持教师和学生 iPad 或 Windows 8.1 tablet 上就屏幕上所讲授的内容做笔记。这一功能似乎可用于汉字的学习。比如教师可站在教室后面用手指在平板电脑上演示汉字的写法，学生们可在教室投影仪的大屏幕或自己的平板电脑屏幕上观看，并在自己的平板电脑上作笔记。然而，考虑到使用该功能前所需做的准备工作和所要花的时间，以及使用过程中可能会出现种种技术问题等等，笔者不建议在语言课上使用。并且，要演示汉字的写法，教师可以方便地在黑板或白板上用粉笔或白板笔（dry erase marker）直接演示。另外，由于在国外的中文教学通常课堂时间有限，课堂的大部分时间大都用在学生的口语练习、师生或学生与学生之间的互动上，一般没有太多课堂时间花在汉字的书写示范教学上。如很多专家学者及有经验的教师已经说过，技术的选择一定要为教学服务，而不应为了用技术而用技术。如果可用其他较简单的方法实现同一教学目的时，就不宜在课堂教学中采用复杂或需耗时费力准备的技术，特别是一些较新、用起来容易出现种种问题的技术。

另外，需要指出的是除了统一提供 iPad 或其他同一型号移动设备的学校外，大部分学校的学生所有的移动设备不尽相同，其设备的操作系统及版本也往往各异。教师在选择软件 and 应用程序时，要考虑到学生所有的设备可能不支持的情况（Liu, 2013）。在诸多与多屏互动有关的软件 and 应用程序中，Display Note 支持较多种的设备，并且具有很多其他软件所没有的功能（具体请参看其网站 <http://displaynote.com/>）。不过，其价格不菲，据其网站介绍，支持 10 台设备的连接一年需要 90 英镑，而同时连接 40 台一年则需 360 英镑，该价格非教师个人所承担得起。另外，仅就面对面的语言教学而言，就所要投入的时间、精力、金钱和预期产生的教学效果相比而论，预计可能不太划算。

最后，笔者要推荐一个可支持各种设备、适用于语言教学的网站 <https://getkahoot.com/>。该网站为教师提供了一个可用来设计简单、有趣课堂互动活动的平台。该网站的运作同 Polleverywhere 等网站有些类似，即教师和学生都不需要自己的设备上下载或安装任何软件 and 应用程序。教师只需要到该网站注册个账号，便可设计自己的互动项目。



图 9: Kahoot 网页截屏图

项目目前共有三类：Quiz、Discussion、Survey。题目设计的界面使用起来非常容易。并且除了支持包括中文在内的众多语言文字外，还支持图片、视频的使用（参见图 11）。题目设计完，可以让学生参加互动时，网站会为教师所设计的每个 Quiz, Discussion 或 Survey 产生一个由数字组成的 Game Pin（例子见图 10）。学生们只要到 <https://kahoot.it/>，输入该数字，并可参加活动。学生可以使用任何设备比如普通电脑、手机、平板电脑等，只要有上网功能即可。

如果教师在学生正式使用前，想自己先检测一下，该网站还提供 Preview（预览）功能。选择完该功能后，教师自己的电脑上便会出现模拟学生端的屏幕显示（见图 10）。

值得赞赏的是，其网站提供的题目模板及背景、字体预先设定的颜色等都很专业，易吸引学生的注意力和激起其参与欲望。图 11 显示的是笔者仅用了几分钟设计好的三个小问题中的一个。从中可看出该问题形式支

持汉字、字母（英文或拼音）及图片的使用。目前该网站由开发者（与 Norwegian

University of Science and Technology 有关的人员）及 Norwegian Research Council 资助，用户的使用现在仍然完全免费。就包括中文学习在内的语言教学而言，使用这样的多屏互动技术能真正做到事半功倍，不花钱、花时少但效果好。希望这样的网站越来越多。

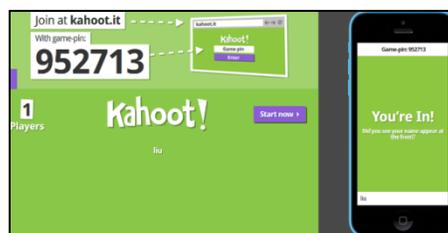


图 10: Kahoot 网站截屏图
(Game Pin 和 Preview 功能演示)



图 11: 笔者利用 Kahoot 做的一个简单样题

4. 小结

本文首先对屏幕镜像和多屏互动技术做了简单介绍，其次讨论了几种支持不同设备间屏幕镜像和多屏互动的硬件、软件和应用程序，然后对其在语言教学中应用做了评析。总体而言，目前的屏幕镜像和多屏互动技术正在蓬勃发展，但就对一般用户而言，选择起来琳琅满目，不太容易，且很多产品受到设备本身操作系统的限制，只能实现部分设备间的屏幕镜像和互动，还达不到真正意义上的跨所有设备之间的屏幕镜像和多屏互动。另外，除了大多产品仅限于镜像，并没有具备严格意义上互动的功能（Leigh et al, 2015）。就语言教学而言，虽然目前一些产品的部分功能对教学有用，但在选择在课堂上运用时，一定要坚持技术为教学服务的原则，考虑到功效问题，做到事半功倍而不是事倍功半。文章最后推荐了一个真正支持各种设备且可简单高效用在语言课堂教学中的网站 Kahoot。

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附录：文中列出的有关网站 (Appendix: Web links included in the article)

Websites listed below are in the order of appearance in the article

- <https://support.apple.com/en-us/HT204388> (Apple HDMI. *Mac computers: Frequently asked questions about using HDMI*)
- <https://support.apple.com/en-us/HT201343> (Apple TV. *Use Airplay to see your Mac screen on an HDTV*)
- <https://cast.google.com/chromecast/setup/> (Google Chromecast setup)
- <http://www.wi-fi.org/product-finder> (WiFi Alliance Miracast certified products finder)
- <https://support.google.com/nexus/answer/2865484?hl=en> (*Project your Android device's screen*)
- <https://www.windowsphone.com/en-us/how-to/wp8/connectivity/project-my-phone-screen> (Window Phones. *Project my phone screen to a TV or PC*)
- https://www.android.com/intl/en_us/tv/ (Android TV)
- <http://www.airquirrels.com/reflector/> (Reflector website)
- <https://www.airserver.com/> (Airserver website)
- http://pro.itools.cn/itools3_en (iTools website)
- <https://doceri.com/index.php> (Doceri website)

- <https://play.google.com/store/apps/details?id=com.asus.linkrim&hl=en>(PC Link App website)
- <https://www.asus.com/support/FAQ/1007320> (Asus PC Link support website)
- <http://displaynote.com/> (Display Note website)
- <https://getkahoot.com/> (GetKahoot website for teacher/creator)
- <http://www.polleverywhere.com> (Polleverywhere website)
- <https://kahoot.it/>(GetKahoot website for students/participants)

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