

中國文化大學教師教學創新暨教材研發獎勵成果報告書

壹、計畫名稱

運用3D虛擬實境遊戲訓練英文語言實驗學生英文情境口語

貳、實施課程、授課教師姓名

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參、前言

近年來，原本只用於遊戲產業的 3D 虛擬實境程式漸漸運用於教育學習，成為語言教學的趨勢。學生可以操作自己的虛擬人物阿凡達(AVATAR) 然後藉由訊息或者是語音與其他虛擬人物溝通。許多研究指出 3D 虛擬實境程式對於學生的語言學習有莫大的成效，學生可以參與由虛擬實境模擬出來的真實語言學習情境，進行有情境的社會互動(CONTEXTUALLY SOCIAL INTERACTIONS)，包含降低學生語言產出的焦慮(DUNCAN ET AL., 2012)，增加更多同儕互動跟幫助(LAN ET AL., 2013)，讓學習產生真實感 (LAN ET AL., 2013)等等。教師將比較兩個語言實驗的班級，一個班級運用申請課程利用師大藍玉如教授與科技輔助語言學習實驗室開發的 3D 沉浸式 (3D IMMERSIVE PROGRAM) OIV，讓學生藉由角色扮演的的方式，在虛擬實境的程式之下操作虛擬人物阿凡達(AVATAR)進行重要的英文生活口語對話，包含去餐廳點餐，去醫院看病，去市場選購生活用品等等。另外一個班級則為控制組，使用傳統的角色扮演教學，讓學生聆聽相關影音檔案，包含去餐廳點餐，去醫院看病，去市場選購生活用品等等，再以四到五個人一組的方式，自己設計對話，並且在台上表演。教學成果有下列衡量方式 1. 前測，後測: 請學生在教學之前跟之後寫出去餐廳點餐，去醫院看病，去市場選購生活用品這三個情境的英文對話，並比較控制組跟實驗組的對話的差別 2. 問卷: 控制組跟實驗組的學生將會被給予問卷，問卷個別有三個面向的問題 (1) 該教學法對於英語口語語言學習的幫助 (2) 該教學法的困難 (3) 該教學法對於學習動機的影響。題型包含有五個選項 LIKERT-SCALE 問題跟文字問題。研究分析將採用質化跟量化的混合分析法，運用量化的方式分析兩組學生在前測跟後測的進步，以及比較兩組學生對於教學的態度。教師並且運用質化的方式分析學生上台角色扮演跟運用 3D 虛擬實境程式角色扮演的異同。

肆、計畫特色及具體內容

1. 計畫緣由與目的

近年來，原本只用於遊戲產業的3D 虛擬實境程式漸漸運用於教育學習，成為語言教學的趨勢。學生可以操作自己的虛擬人物阿凡達(Avatar) 然後藉由訊息或者是語音與其他虛擬人物溝通。許多研究指出3D 虛擬實境程式對於學生的語言學習有莫大的成效，學生可以參與由虛擬實境模擬出來的真實語言學習情境，進行有情境的社會互動(contextually social interactions)，包含降低學生語言產出的焦慮(Duncan et al., 2012)，增加更多同儕互動跟幫助(Lan et al., 2013)，讓學習產生真實感 (Lan et al., 2013) 等等。

教師擔任的語言實驗班級為文化大學D 層級的學生（文化大學最低程度的學生），教師有感於學生對於英語口語上台時的焦慮，以及對於遊戲學習的喜愛，因此預計採用3D 虛擬實境程式讓學生可以像玩線上遊戲一樣，操作自己的虛擬人物，進行英語的口語對話。希望藉由這種方式降低學生英語口語使用的焦慮感，並增進學習的興趣跟樂趣。

2. 計畫特色(含針對創新性之說明)

本教學創新的特色在於運用虛擬實境遊戲學習的方式，融入英語口語，特別是重要日常生活情境的英語的口語練習當中。一般學生台灣學生在生活當中缺乏運用英語的真實情境，雖然在教室上的教學，教師常常會要求學生做角色扮演，並上台演出，然而傳統教學下的角色扮演有許多教學上的不足。首先，教學缺乏真實的場景，學生常常自行「幻想」教學的場景，例如餐廳場景，市場場景，或者是醫院場景，然而缺乏真正的視覺效果，讓讓會讓學生的想像力缺乏，也進一步的影響到學生的口語產出的豐富度。再者，許多英語學習者，特別是低成就的學生，對於上台使用英文口語對話有相當大的焦慮感跟恐懼感，縱使教師要求學生上台是一片美意，學生常常會臨陣脫逃，或者是因為自己不夠好的表現而感到自卑跟沮喪。

使用3D沉浸式 (3D immersive program) 虛擬實境遊戲的教學可以達到更多傳統教學法沒有的教學利益 (Reisoğlu et al., 2017)，克服傳統教學上的許多問題。首先，虛擬實境遊戲的教學可以有效地降低學生上台講英文的焦慮感。再者，由於現代的學生幾乎都有玩線上遊戲的經驗跟興趣，虛擬實境遊戲的教學在遊戲中學習，可以激發學生的學習興趣。另外，虛擬實境遊戲的教學提供相關物件讓學生可以建立學習的情境(learning context)，有效地讓學習產生真實感 (Lan et al., 2013) 並產生沉浸式學習的相關效果，激發學習動機(Ellis, 1996) 最後，虛擬實境遊戲的教學激發學生互動合作學習的動機，增加更多同儕互動跟幫助(Lan et al., 2015)。

本課程學生為文化大學D等級學生(程度最差的學生)，因此他們亦具有上面提到的低成就英語學習的上述問題。本教學創新計劃希望運用虛擬實境遊戲的教學，降低他們的英文口語發表焦慮感，更進一步地藉由遊戲中學習大量提升他們的學習興趣跟成效，激發學生互

動合作學習的動機，增加更多同儕互動跟幫助，整體提升日常英語口語，包含在餐廳點餐，市場買菜，或者是醫院看病的英語口語流暢度跟豐富度。

3. 執行內容、方法

本教學創新分為實驗組以及控制組。實驗組的班級使用虛擬實境遊戲的教學練習日常英語口語，包含在餐廳點餐，市場買菜，或者是醫院看病的英文口語，而控制組學生則使用傳統的角色扮演教學，讓學生聆聽相關影音檔案，包含去餐廳點餐，去醫院看病，去市場選購生活用品等等，再以四到五個人一組的方式，自己設計對話，並且在台上表演。如下：

控制組 實驗組

1. 去餐廳點餐相關場景 學生五個人一組，自行創作跟餐廳點餐，做五個人的角色扮演，角色包含餐廳老闆，餐廳服務員，兩位客人。三個相關情節如下 1. 找尋餐廳資訊，討論餐廳資訊以及電話訂餐廳 2. 到餐廳用餐，發現食物裡面有蟑螂，跟餐廳老闆抱怨 3. 打電話到消基會抱怨餐廳的衛生問題，並填寫餐廳評論。創作完之後到台上做角色扮演。

學生五個人一組，一個人操作一個虛擬人物，包含餐廳老闆，餐廳服務員，兩位客人，運用虛擬實境的程式，錄製以下三個情節的對話。1. 找尋餐廳資訊，討論餐廳資訊以及電話訂餐廳 2. 到餐廳用餐，發現食物裡面有蟑螂，跟餐廳老闆抱怨 3. 打電話到消基會抱怨餐廳的衛生問題，並填寫餐廳評論。

2. 去醫院看病 學生五個人一組，自行創作醫院看病的三個相關情節。做五個人的角色扮演，角色包含病人本人，病人女朋友，一位醫生，一位護士，一位醫檢師。三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。創作完之後到台上做角色扮演。

學生五個人一組，一個人操作一個虛擬人物，包含病人本人，病人女朋友，一位醫生，一位護士，一位醫檢師，同學們運用虛擬實境的程式，錄製到醫院看病的三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。

3. 去市場選購生活用品 學生五個人一組，自行創作市場選購生活用品的三個相關情節，做五個人的角色扮演，角色包含：一對情侶，賣場老闆，賣場服務員，一位朋友。三個情節如下 1.到不同的大賣場購買需要的用品 2. 回到家裡布置派對，發現用品有瑕疵，打電話給賣場抱怨跟要求退貨。3. 買

回要的東西，進行一場很棒的聖誕節派對。創作完之後到台上做角色扮演。

學生五個人一組，一個人操作一個虛擬人物，包含一對情侶，賣場老闆，賣場服務員，一位朋友，同學們運用虛擬實境的程式，錄製到醫院看病的三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。

4. 實驗組以及控制組詳細各周課程進度如下表

Week 實驗組 控制組

	控制組	實驗組
1. 去餐廳點餐 相關場景	學生五個人一組，自行創作跟餐廳點餐，做五個人的角色扮演，角色包含餐廳老闆，餐廳服務員，兩位客人。三個相關情節如下 1. 找尋餐廳資訊，討論餐廳資訊以及電話訂餐廳 2. 到餐廳用餐，發現食物裡面有蟑螂，跟餐廳老闆抱怨 3. 打電話到消基會抱怨餐廳的衛生問題，並填寫餐廳評論。創作完之後到台上做角色扮演。	學生五個人一組，一個人操作一個虛擬人物，包含餐廳老闆，餐廳服務員，兩位客人，運用虛擬實境的程式，錄製以下三個情節的對話。1. 找尋餐廳資訊，討論餐廳資訊以及電話訂餐廳 2. 到餐廳用餐，發現食物裡面有蟑螂，跟餐廳老闆抱怨 3. 打電話到消基會抱怨餐廳的衛生問題，並填寫餐廳評論。
2. 去醫院看病	學生五個人一組，自行創作醫院看病的三個相關情節。做五個人的角色扮演，角色包含病人本人，病人女朋友，一位醫生，一位護士，一位醫檢師。三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。創作完之後到台上做角色扮演。	學生五個人一組，一個人操作一個虛擬人物，包含病人本人，病人女朋友，一位醫生，一位護士，一位醫檢師，同學們運用虛擬實境的程式，錄製到醫院看病的三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。

3. 去市場選購生活用品	<p>學生五個人一組，自行創作市場選購生活用品的三個相關情節，做五個人的角色扮演，角色包含：一對情侶，賣場老闆，賣場服務員，一位朋友。三個情節如下 1. 到不同的大賣場購買需要的用品 2. 回到家裡布置派對，發現用品有瑕疵，打電話給賣場抱怨跟要求退貨。3. 買回要的東西，進行一場很棒的聖誕節派對。創作完之後到台上做角色扮演。</p>	<p>學生五個人一組，一個人操作一個虛擬人物，包含一對情侶，賣場老闆，賣場服務員，一位朋友，同學們運用虛擬實境的程式，錄製到醫院看病的三個相關情節如下 1. 本身有肥胖問題，並且在爬山中間突然昏倒，懷疑自己有腦瘤跟心臟病 2. 到醫院掛號以及看診。並且做斷層掃描跟量血壓，發現自己有高血壓問題，但是沒有腦瘤 3. 回到家裡開始努力做運動，改善肥胖問題跟高血壓問題。</p>

<3> 實驗組以及控制組詳細各周課程進度如下表

Week	實驗組	控制組
1	介紹課程大綱與課程進度	介紹課程大綱與課程進度
2	學生上台自我介紹	學生上台自我介紹
3	介紹去餐廳點餐相關場單字跟句型	介紹去餐廳點餐相關場單字跟句型
4	介紹學生使用 3D 虛擬實境遊戲使用& 工作坊	學生觀看跟歐美飲食文化相關的電影
5	學生使用 3D 虛擬實境遊戲設計三個跟餐廳點餐相關的情節如上述	學生做團體討論並設計三個跟餐廳點餐相關的情節如上述
6	學生使用 3D 虛擬實境遊戲設計三個跟餐廳點餐相關的情節如上述	學生上台表演三個跟餐廳點餐相關的情節角色扮演如上述
7	學生撥放團體製作的 3D 虛擬實境遊戲設計三個跟餐廳點餐相關的情節	學生投票角色扮演的優勝者
8	學生投票 3D 虛擬實境遊戲設計的角色扮演的優勝者	學生討論角色扮演的經驗
9	期中考	期中考
10	學生使用 3D 虛擬實境遊戲設計三個跟醫院看病相關的情節如上述	學生做團體討論並設計三個跟醫院看病相關的情節如上述
11	學生使用 3D 虛擬實境遊戲設計三個跟醫院看病相關的情節如上述	學生上台表演三個跟醫院看病相關的情節角色扮演如上述

12	學生撥放團體製作的 3D 虛擬實境遊戲設計三個跟醫院看病相關的情節	學生討論並投票角色扮演的優勝者
13	履歷表寫作教學	履歷表寫作教學
14	學生使用 3D 虛擬實境遊戲設計三個跟去市場選購生活用品的情節如上述	學生做團體討論並設計三個跟去市場選購生活用品相關的情節如上述
15	學生使用 3D 虛擬實境遊戲設計三個跟去市場選購生活用品的情節如上述	學生上台表演三個跟去市場選購生活用品相關的情節角色扮演如上述
16	學生撥放團體製作的 3D 虛擬實境遊戲設計三個跟去市場選購生活用品相關的情節	學生討論並投票角色扮演的優勝者
17	3D 虛擬實境遊戲角色扮演教學問卷調查	上台角色扮演教學問卷調查
18	期末考	期末考

4. 計畫可行性（計畫執行可能遇到之困難及解決方案）

這個計畫可能會碰到以下困難，教師也將提供相關的解決方案 1. 學生可能對於操作虛擬實境遊戲不熟悉，這方面將有兩個小時的工作坊，由師大的研究生教導學生一步一步帶領學生使用遊戲，並且在使用的時候，會友師大的研究生跟教師巡堂，如果學生有任何不熟悉的地方，教師跟研究生都可以隨時提供補助。 2. 學生可能會有抗拒使用新的方法學習的心態。教師將會撥放之前學生製作的學習影片，引起學生學習興趣，也安撫學生學習新事物的焦慮心情。 3. 學生可能自己沒有筆電，以致於沒有辦法使用虛擬實境的程式。教師將會提早一學期預借一個學期的電腦教室，確保每一個學生都有個人的電腦可以操作虛擬實境遊戲的腳色。

伍、實施成效及影響（量化及質化，且說明是否達到申請時所期之學習目標與預期成效）

學習目標與預期成效良好。在量化的部分，我們發現學生在後測的口語比控制組為進步，也較有創意。在質化的部分，我們發現學生對於自己的醫病溝通的使用更有信心。

相關的實施成效，於2019年12月月獲得SSCI 期刊 Educational Technology & Society的接受信函。這邊將節錄結果：

4. Results

In response to RQ1 regarding the differences in learners' use of healthcare professional-patient communicative skills when role-playing via a VW program and on stage, three themes emerged as the most

important in the differences of the two groups' skills: (1) students' creation of scenarios and plots, (2) physician-patient communication, and (3) inter-professional communication

4.1. STUDENTS' CREATION OF SCENARIOS AND PLOTS

Students' creation of scenarios and plots in the VW and on-stage groups differed greatly. As shown in Table 1, in the on-stage group, students merely provided the description of the medical situations and symptoms, and included the conventional healthcare knowledge they had acquired as children. Comparatively, learners in the VW group provided more causes and further explanations of the medical situations and symptoms. They also included more newly-learned communicative skills in their scripts. Second, the sub-scenarios of learners in the control group were only "clinic" and "home," while the VW group created more sub-scenarios, including MRT, night markets, zoos, mountain parks (see Figure 2 for screenshots of the VW scenarios). Last, they also included different types of "life experiences." Table 1 shows the contrasting differences in students' creation of scenarios and plots, including (1) the introduction of situations and symptoms, (2) the sub-scenarios included, and (3) the type of "life experience" and knowledge drawn on.

Table 1. Students' creation of scenarios and plots by group

Differences between the two classes	Control group (Class A)	Experimental group (Class B)
1. The introduction of situations and symptoms	<p>Description: Plainly described the situations and symptoms, e.g. a patient said "I don't feel well...Do you think that I have to go to see a doctor?" as the introduction of the situation before heading for the clinic.</p>	<p>Contextualization: Utilized the 3D scenarios and 3D objects, such as vegetable stands and koalas to provide further information about obesity. For example, students used "koalas" to contrast the patient's meat-only eating habits.</p>

2. Sub-scenarios included	<p>Sub-scenarios included only clinics and the patient’s home with ordinary plots</p> <p>For example, the patient and patient’s girlfriend went to the clinic right after mentioning not feeling well at home. In the clinic, the physician did the check-up and diagnosis. The couple went back home and started doing exercise.</p>	<p>Multiple scenarios and plots, some of which were imaginative and impossible in the real world</p> <p>For example, students included plots containing “throwing hamburgers in the MRT” and “losing weight so that the helicopter would not crash again when driving it” to demonstrate the patient’s resolution to fight obesity.</p>
3. The type of “life experience” and knowledge drawn on	<p>Conventional knowledge and treatment from prior experiences of going to the clinic or watching related promotions for medical health.</p> <p>For example, learners used “mosquito bite” as the metaphor for drawing blood, borrowed from their experience of how nurses comforted them when drawing blood as children.</p>	<p>Innovative medical treatments inspired by the 3D objects and scenarios, combined with the learners’ new medical knowledge from the medicine-related courses.</p> <p>For example, learners included “an occupational therapist visiting the patient’s home to change the location of the furniture so that the residents have different moving flow at home” and “a dietician helping the patients choose the food in the night market” as medical treatments.</p>

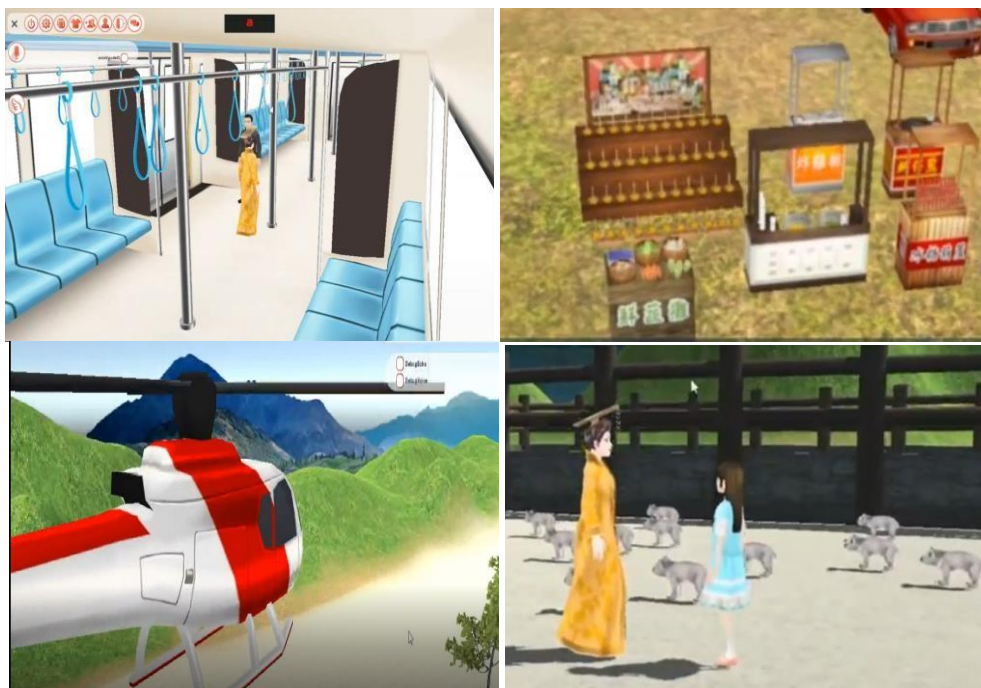


Figure 2. Screenshots of OIV scenarios

4.2. PHYSICIAN-PATIENT COMMUNICATION

Although both groups received identical instruction on healthcare professional-patient communication, “doctors” from the two groups differed in their interactions with “patients.” While the doctors from the control group either remained as authority figures or merely used “rehearsed and formulaic” polite utterances in the conversations (Wette & Hawken, 2016), those from the experimental group successfully built rapport and showed empathy to the patients throughout the medical interview. The differences between the two groups can be seen in the examples listed below.

Excerpt 1 illustrates a struggle an authoritative doctor in the control group had when trying to adopt the newlytaught communicative style (Yates et al., 2016).

EXCERPT 1. DOCTOR (D), PATIENT (P) AND PATIENT'S GIRLFRIEND (PG) (CONTROL GROUP)

1. D: OK. Ummm... Let me read about it. Ummm... How do you exercise in your
2. daily life?
3. P: I do exercise slightly... I have to do exercise every day.
4. PG: NO!!! He is a couch potato. Never exercise!
5. P: No, I use the monitor. I have the finger exercise, OK?

6. D: **YOU ARE GUILTY.** UMMM... LET ME THINK ABOUT THIS. **YOU SHOULD EXERCISE MORE**

7. ((Doctor gently slapped her own face))
8. **I say that I'd like you to do more exercise. It's better to your body.**
9. P: Oh...Oh...
10. D: **Please do more exercise. Understand?**
11. P: Oh...I... Understand!

In **Excerpt 1**, after reading the patient's test analysis, the doctor diagnosed that the patient should do more exercise (from lines 6 to 11). When requesting more exercise, the doctor started with a top-down command ("you should exercise more," line 6) following a judgment of harsh blame ("you are guilty," line 6). Nevertheless, in line 7, the non-verbal cue of the doctor gently slapping her own face indicated that she started to be aware that what she said was inappropriate based on the newly-learned physician-patient communication style. She quickly rephrased her command as a politer request with hedging "I'd like" (line 8). The use of "I say" indicated her awareness of the previous inappropriate command and a reminder for the listener of her rephrase. Meanwhile, rather than blaming the patient for the misbehavior ("you are guilty," line 6), she justified her request by informing the patient of the "benefits" of her request ("it's better to your body," line 8). She ended with a kind reminder ("Please do more exercise" in line 10). However, at the end of the conversation, her use of the tag question "understand?" (line 10) still indicated her authoritative stance, as the question implied doubt and lack of trust in the patient's understanding or willingness to obey her original "command" (line 6), although it was rephrased as a politer request later in the conversation.

On the other hand, some "doctors" in the control group tried to build rapport with patients through inserting "polite usages" taught in the class, such as greetings (Coupland et al., 1994) and elicitation techniques which

encourage longer narrative turns (Yates et al., 2016); nevertheless, the rapport built was hardly sustained throughout the conversation.

As can be seen in **Excerpt 2**, the way the doctor from the control group communicated with the patient failed to sustain the rapport with the patient.

EXCERPT 2. DOCTOR, PATIENT AND PATIENT'S GIRLFRIEND (CONTROL GROUP)

1. D: **Hello. How can I help you?**
2. P: I often feel dizzy when I'm acting. This situation is worse when I climb
3. stairs. It bothers me a lot. **Do you think that I have a brain cancer?**
4. PG: He always told me there was something with his brain. He also thought
5. that he got diabetes. **DOCTOR, please help us!**
6. D: **OK. Maybe you** can first go to have a blood test. Then **we can see what**
7. **problem do you have.** There. ((pointing to the nurse))

In **Excerpt 2**, the doctor started the conversation with proactive greeting “Hello” (line 1) followed by a polite and friendly open-ended question (“How can I help you?” line 1), intending to build rapport with the patient. Nevertheless, after the patient and patient’s girlfriend expressed their concern (lines 3 to 5) of the possibility of the patient’s having “brain cancer” (line 3) and explicitly asking for help (“DOCTOR, please help us!” line 5), the doctor paradoxically stepped back and killed the burgeoning rapport. First, by just saying “OK” (line 6), the doctor did not uptake the patient’s concern or show understanding or empathy. Instead, he directly proceeded to suggest medical treatment (“Maybe you can first go to have a blood test,” line 6) by phrasing the symptoms as a “problem” (line 7). The doctor seemed to be detached and even careless by using “maybe,” which implied uncertainty or even unwillingness to take responsibility for his decision as a professional doctor whom the patient would like to rely on. Also, the exclusive pronoun “you” (Handford, 2010) indicated distance from the patient, suggesting that it was “the patient’s problem” that he had to face by himself.

In contrast, in **Excerpt 3**, the way a doctor from the experimental group communicated with a patient showed more empathy and support.

EXCERPT 3. DOCTOR (D), PATIENT (P) AND PATIENT'S (PG) GIRLFRIEND (EXPERIMENTAL GROUP)

1. D: **Can you tell me what seems to be bothering you?**
2. P: This morning when I dated with my girlfriend in the zoo, I felt dizzy
3. suddenly. I can see nothing at that moment and then I passed out.
4. Doctor! Do I have brain tumor? Will I die?

5. D: **IT IS VERY POSSIBLE TO BE JUST A HEAT STROKE. DON'T WORRY!**

[*MM-HM]

6. Hmmm...But I read your medical record and I found that you have
7. high blood sugar, hyperlipidemia, and osteoarthritis. So you **may** have
8. other diseases. I will arrange some further checkup for you.

In **Excerpt 3**, the doctor had a similar opening to the one in the control group (**Excerpt 2**), a polite, friendly and open-ended question (“Can you tell me what seems to be bothering you?” line 1). Nevertheless, the conversation unfolded differently. After the patient explained her symptoms and worries (line 2-4), unlike the doctor in the control group who focused only on the symptoms and proceeded directly to the medical examination, the doctor firstly showed empathy and comforted the patient (“don’t worry,” line 5) before proceeding to the medical diagnosis and examination (lines 6-8). The doctor also tried to alleviate the patient’s worry by giving a possible explanation of the symptoms (“It is very possible to be just a heat stroke,” line 5). The use of “just” (line 5) and a less severe condition (“heat stroke,” line 5) showed the doctor’s efforts to comfort the patient by reducing the level of seriousness of the situation.

Also, while the use of the modal verb “may” aimed to lessen the patient’s worry, the modal verb “might” used in **Excerpt 2** implied the doctor’s uncertainty and unwillingness to take responsibility for the medical treatment, which could further increase the patient’s concern.

4.3. Inter-professional communication

The two groups showed a contrasting style in their inter-professional communication. Doctors in the control

group adopted a more authoritarian stance (Hall, Keely, Dojeji, Byszawski, & Marks, 2004) towards other healthcare professionals, while those in the experimental group established a more egalitarian and non-hierarchical relationship (Goddard, 2012).

Excerpt 4 demonstrates the doctor's authoritarian stance toward the nurse in the control group.

Excerpt 4. Doctor (D) and Nurse (N) (Control group) 1. D:

I want his blood test. **More details, the better.**

2. N: OK

3. D: **GO GET IT!**

4. N: OK

In **Excerpt 4**, the doctor started by giving a bald directive using the first person singular pronoun ("I," line 1). Also, he did not address the nurse at all. Although the nurse actively replied to the command ("OK," line 2), the doctor continued giving an even balder directive at high volume ("GO GET IT," line 3). The doctor looked very authoritative by making two directives in a row. Moreover, the request for "more details, the better" (line 1) may imply a criticism of the nurse's professionalism (Yates et al., 2016), as the number of items analyzed in the blood test was determined by the doctor and could not be altered by the nurse. By requesting "more details," the doctor showed his concern about the possibility of the nurse's carelessness. This further implied the doctor's lack of trust in the nurse's professionalism.

In contrast, the doctor in the experimental group tried harder to build rapport with other professionals through the use of humor and compliments. **Excerpt 5** shows that the doctor in the experimental group used a humorous compliment to express her appreciation of the nurse's work ("our professional and beautiful nurse," line 1-2).

EXCERPT 5. DOCTOR (D) AND NURSE (N) (EXPERIMENTAL GROUP)

1. D: I'd like you to take a blood test for me ok? **Please follow our professional**

2. **and beautiful nurse.**

3. N: Okay, please roll up your sleeve.

Furthermore, the doctor in the experimental group also showed more respect toward colleagues. As indicated in **Excerpt 6**, the doctor addressed the occupational therapist politely with a respected title ("Dr. Wu" on line 4). Moreover, instead of assuming the occupational therapist should "stand by" and wait for the doctor's

“summons,” the doctor politely checked the occupational therapist’s availability (“Do you feel free?” line 4) before making a further request (lines 4-5). Also, instead of giving a directive as the doctor did in **Excerpt 4**, the doctor used a question as a polite form to initiate the request (“Could you handle it?” lines 4-5).

EXCERPT 6. DOCTOR (D), PATIENT (P) AND OCCUPATIONAL THERAPIST (OT)

(EXPERIMENTAL GROUP)

1. D: Hi, what can I do for you?
2. P: I got my ankle sprain.
3. D: Oh, I see. I suggest you to visit a physical therapist. ((on the phone)) Hello, 4. **Dr. Wu. Do you feel free?** There is a patient leave ankle sprain. **Could you handle it?**
5. **handle it?**
6. OT: Of course. What brought you here?

In response to RQ2 regarding the differences in learners’ perceptions of learning healthcare professional-patient communicative skills through role-playing via a VW program and on stage, Table 2 shows the descriptive statistics of the results of the questionnaire of students’ evaluation of the role-play. Except for item 9 (I think the role-play in healthcare worker-patient communication I participated in during the class makes me more **emotionally involved** in the role-play), the scores of the experimental group were slightly higher than those of the control group.

Table 2. The two groups’ perceptions of the role-play activity

	Control(N=21)		Experimental(N=26)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
I think the role-play in healthcare professional-patient communication I participated in:				
1. helps my communicative skills in healthcare professionalpatient communication	3.37	0.77	3.53	1
2. helps my general English oral communication	3.33	0.75	3.44	1
3. makes my role-play in healthcare worker-patient communication more creative	3.94	0.74	4	0.71
4. makes my role-play in healthcare worker-patient communication more interesting	3.88	0.78	4.14	0.58
5. makes my role-play in healthcare worker-patient communication more imaginative	3.76	0.75	4	0.59

6. helps me relate to the healthcare worker-communication experiences in life	3.29	1.04	3.4	0.732
7. makes the role-play in healthcare worker-patient communication experience more realistic	3.34	0.89	3.47	0.71
8. increases my willingness to communicate in English	3.45	0.71	3.55	0.78
9. makes me more emotionally involved in the role-play.	3.41	0.79	3.37	0.72
<hr/>				10. reduces my a
Total	3.52		3.648	

By examining students' written responses in the questionnaire, three important themes emerged as the most important differences in the two groups' of students' perceptions of healthcare professional-patient communicative skills: (1) students' confidence in English healthcare worker-patient communication, (2) construction of learning contexts, and (3) collaborative experiences.

4.3.1. Students' confidence in English healthcare worker-patient communication

The students in the experimental group reported increased confidence and reduced anxiety in speaking English in the VW program. They claimed that, compared to on-stage role-playing, role-playing via the VW program was less embarrassing and much easier because they could focus on talking only rather than having to concentrate on the gestures and facial expressions required in on-stage role-playing. Moreover, based on the student questionnaire results, the "immersion" provided by the 3D construction and objects was helpful. First, it helped the students forget the "foreignness" of English language as a second language. Furthermore, because learners interacted with other healthcare professionals in the 3D scenarios and operated objects that resembled medical scenes, they could switch different identities of healthcare professionals and patients and develop understanding of healthcare professional-patient communication. Nevertheless, some students in the experimental group mentioned that role-playing was less emotionally involving than on-stage role-playing because they could not perform other non-verbal communication such as touching patients or having eye contact. This could explain why students' evaluation of whether role-playing is emotionally involving is lower in the VW group (3.37) than in the on-stage role-play group (3.41).

4.3.2. Construction of learning contexts

The members of the experimental group also expressed their excitement about constructing diversified 3D scenarios and objects. Those self-constructed scenarios and objects boosted their imagination in constructing 3D objects that are non-existent in daily life, further helping them compose interesting and innovative plots of the normally “stiff and structured” healthcare communication. For example, one team in the experimental group had the patient avatar take a helicopter which crashed as a humorous (but impossible) scenario to illustrate the patient’s obesity issue.

4.3.3. Collaborative Experiences

Experimental group students further reported that role-playing via the VW program facilitated collaboration, because learners with different aptitudes and abilities could take on different responsibilities, including script writing, filming, editing clips, and controlling avatars, and learners with different talents could gain a sense of achievement in the group work. In contrast, in the on-stage role-playing, only outgoing students with advanced oral proficiency were the main contributors.

Nevertheless, a few students in the experimental group complained that the 3D VW program made the division of work more difficult because more tasks were involved and not everyone was equally technology savvy or proficient in playing on-line games. In contrast, as learners in the control group had many experiences of on-stage role-playing, since it is a common language learning activity in English learning classrooms in Taiwan, they found the division of work familiar and easy.

5. Discussion and conclusion

The results showed that the control group students who did the on-stage role-play acted as authoritative doctors and failed to build rapport in both physician-patient and inter-professional communication. In contrast, doctors in the VW group successfully acquired the communication skills in building rapport with the patients and showing needed empathy. This result aligned with the prior study findings that VW benefits the learning of pragmatic skills (e.g., Melchor-Couto, 2016; Yeh & Lan, 2018) and alleviates NNS students’ difficulty in healthcare professional-patient communication (Corsorti et al., 2012; Ferguson, 2013; Wette &

Hawken, 2016).

Moreover, based on the results of the questionnaire, students from the experimental group showed higher evaluation of the use of VW in the role-play compared with the learners in the control group who did the on-stage role-play, because VW enhanced their motivation and engagement in learning (Dalgarno & Lee, 2010) and reduced their anxiety in oral communication (Melchor-Couto, 2016; Yeh & Lan, 2018). As suggested by Lowes et al. (2013), medical school students face great pressure when doing in-person role-plays of medical communication. The questionnaire results of this study showed that this pressure could be successfully alleviated by the use of VW. Three important topics emerged for further discussion.

5.1. NNS' USE OF VW: CONSTRUCTING LEARNING CONTEXTS FOR LEARNING HEALTHCARE PROFESSIONAL-PATIENT COMMUNICATION

As VW enables learners to create their own learning materials and contexts (Lan, 2020) that are more contextualized, diversified and innovative with imaginative contexts (Dalgarno & Lee, 2010; Reisoğlu et al., 2017), their pragmatics skills are also enhanced (e.g., Melchor-Couto, 2016; Yeh & Lan, 2018). Nevertheless, how those learning contexts helped learners acquire effective communicative skills in the medical context in this study is more complicated than the above-mentioned study focusing on acquiring pragmatics in second language only. This is because the learners had to learn two things simultaneously: second language and cultural practice that relate to the workplace discourse and the workplace culture itself (Zappa-Hollman & Duff, 2015). Some learners struggled in transforming the L1 workplace culture into that of the L2.

In the control group, learners' exposure to and assumptions about medical workplace discourse in their L1 (Chinese) was used as a source of their role-plays in English, in which they used conventional knowledge from their medicinerelated experiences such as going to the clinic or watching health education advertisements for inventing their scenarios and plots. Although they had received instruction on effective communicative skills in English, the influence of doctors being a more authoritarian figure and the hierarchical relationship with other healthcare professionals in L1 practice was still very strong (Hall et al., 2004).

In contrast, in the VW group, the use of diversified and imaginative 3D objects and scenarios helped learners to “*transcend*” the influence of the conventional knowledge in the L1 medical workplace discourse. While the

medical discourse in Chinese was more hierarchical, authoritarian and formal, that in English valued egalitarianism relationships, rapport building and the use of informality and humor (Goddard, 2012). Learners in the VW group did not merely translate the interaction following the Chinese communicative style in medical contexts into English as the control group learners did; rather, they successfully adopted the communicative styles in English discourse.

There may be two reasons for this result. First, similar to Lan's suggestion (2014), students in this study were inspired by being immersed in the authentic contexts provided by the VW program. This immersion experience boosted their excitement and imagination (Lan, 2020; Wang et al., 2019). This further facilitated their adoption of multiple perspectives (Dalgarno & Lee, 2010) of healthcare professional-patient relationships and their inclusion of newly learned knowledge (Reisoğlu et al., 2017), such as the newly-taught communicative skills in English discourse and their newly-learned medical knowledge from their medical courses such as home healthcare.

It is important to note that while Lan (2014) and Yeh and Lan (2018) argued that learners in the VR group included their "life experiences" compared with the control group who did not, both groups in the current study adopted "life experiences" into their role-plays. This could be attributed to the fact that learners in Lan (2014) and Yeh and Lan (2018) were younger (high school students in Lan (2014) and elementary students in Yeh and Lan (2018) with less developed cognitive skills compared to learners in the current study. Immersion in authentic contexts via VR is key to younger learners' inclusion of life experiences. Nevertheless, although both groups in the study incorporated their life experiences, the experiences they included differed greatly. The on-stage role-play contained life experiences out of "conventional knowledge" situated in the world of their L1, whereas the VW role-play group adopted "innovative knowledge," including new communicative skills in English taught in the class and newly learned medical knowledge, because they were prompted by the diversified and innovative learning contexts that they created.

5.2. THE USE OF VW VS. THE USE OF VP IN ENHANCING COMMUNICATIVE SKILLS IN MEDICAL DISCOURSE

The positive results from this study align with the prior studies using VR for enhancing communicative skills in medical discourse (Bearman, 2003; Deladisma et al., 2007; Lowes et al., 2013; Pan et al., 2016; Sijstermans et al., 2007). Nonetheless, the study provides new insights in two dimensions. First, prior studies in the use of VR to enhance communicative skills mostly involved role-plays between medical students and

VPs with programmed responses, while learners in this study utilized avatars to act as different healthcare professionals and patients engaging in real interactions in the VW. The “immersion and active learner participation” (Lan, 2020) contributed to successful acquisition of communicative skills in healthcare professional-patient communication. Second, prior studies in the use of VR to enhance communicative skills examined only native-speaker students acquiring communicative skills through VR, while this study explored how the VR use helped NNS students from a College of Medicine acquire communicative skills in a second language. This echoes the call made in a review article of VR use for enhancing NNSs’ communicative skills in medical discourse (Consorti et al., 2012). Also, this is essential to healthcare professionals in Taiwan, as they have to communicate in English when encountering patients or caregivers who are not Chinese speakers.

5.3. PITFALLS OF VR USE FOR ENHANCING COMMUNICATIVE SKILLS IN MEDICAL DISCOURSE

Although the study showed learners’ positive evaluations of VR use for learning communicative skills in medical discourse, learners still had one major concern about using VR. Similar to Deladisma et al. (2007), learners of the current study also found VR less emotionally involving than on-stage role-play due to their inability to engage in non-verbal communication. Nonetheless, as argued by Black, Ayelet, Jonathan, and Cameron (2012), the sense of place (the simulated in-patient unit) and the use of avatars could be surrogates for the partial embodiment. Therefore, it could further compensate for the lack of more directly embodied face-to-face interaction. In the study, although VW groups were unable to initiate non-verbal interaction, they greatly acclaimed the 3D scenarios and objects for the real-life stimulation, which provided embodiment of medical settings. This could explain why the overall learners’ perceptions in the VW group were still higher than those in the on-stage role-play.

In conclusion, this study shows that the VW program enhanced learners’ communicative skills of healthcare professional-patient communication in English medical discourse, as learners in the VW group performed better at building rapport with patients and other healthcare professionals compared with the on-stage role-play group. Also, the learners provided high evaluations of the use of VR in learning how to communicate with patients or other healthcare professionals through role-playing via the program. It should be noted that some learners’ VW creations are creative and imaginative which would not happen in reality (such as dropping hamburgers on MRT to show patients’ resolution to lose weight). Students should be reminded that the plots they created on VW shall still be regulated by ethics and law.

Although the study sheds some new light on the under-researched area of how NNS students from a Medical College acquired healthcare communicative skills through a VW, there are still limitations that can be considered for further study. First, this study provides a rich description of the differences between learners' use of communicative skills in medical discourse via different media; yet, no statistical data of quantitative differences were acquired. Future research could utilize a pretest-posttest design and measure the quantitative differences in both English language and communicative skills of VW and on-stage role-play groups. Second, combining the students' VW video creations and five questions in the questionnaire, we found that VW seems to benefit their creativity. Nevertheless, a further and more in-depth investigation is needed to confirm this argument. Finally, the duration of the program use was short and the novelty effect may have occurred. Future research should allow longer use of the VW program to see whether the learning effects are sustained over a longer period of time.

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陸、結論

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Appendix A

Role-play Scenario: Obesity

Please write a dialogue of **20 sentences** involving five actors based on the scenario provided here. The five actors

include (三個必選: 病人, 病人家屬, 醫生; 另外三個部分, 請選擇兩個醫學從業人員)

1. you (the patient)- required 病人
2. your girlfriend (the patient's relative)- required 病人家屬
3. a doctor – required 醫生
4. two other health care workers of your choice: (下面五個當中自選兩個)
 4. a nurse 護理師
 5. a medical examiner 醫檢師
 6. a dietician 營養師
7. a physical therapist 物理治療師
8. A clinical psychologist 臨床心理學家

(1) 案件: You are a guy who weighs over 100 kgs. Because of your obesity, you also have high blood sugar, hyperlipidemia and osteoarthritis. You think you might also have **diabetes** and **brain cancer** because you feel dizzy all the time! Your girlfriend is very worried about you, so she brings you to an integrated Clinic (整合性門診) for a consultation for a further check-up and suggestions. After the check-up (blood test and computer tomography), you know you do not have diabetes or brain cancer, but you are reluctant to make a change.

(2) Your health issues:

high blood sugar (高血糖)	hyperlipidemia (高血脂)
osteoarthritis(關節炎) which comes with severe joint pain	dizziness

(3) Your excuses/barriers:

I don't like steamed food- it's not tasty	I can't afford a gym
I have tried to diet many times.	I get out of breath easily.
There aren't any buses.	Others_____

(4) Possible medical procedures you have to go through:

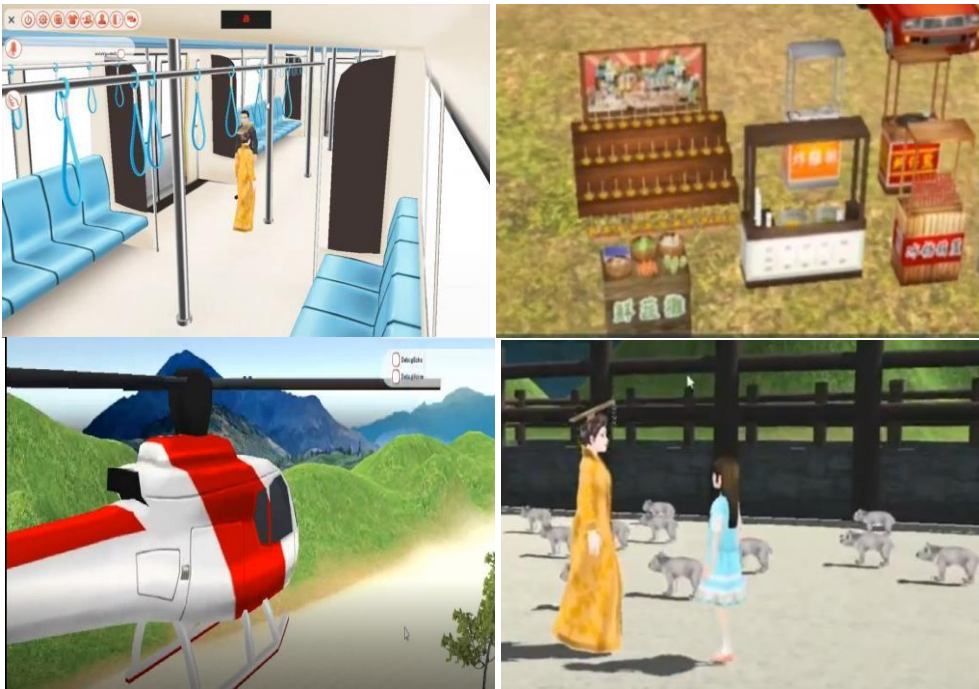
1. Blood test (抽血) to see if you have diabetes, high blood sugar and hyperlipidemia (nurse)
2. Abdominal sonography (腹部超音波) to see if you are have a fatty liver (medical examiner)
3. Nutrition evaluation and discuss if you want to try diet control (dietician)

4. Evaluate your exercise habits and discuss exercise prescription (physical therapist)

Discuss your childhood nightmares, the reasons why you “ha

柒、執行計畫活動照片

學生虛擬實境影片的截圖：



捌、附件

備註：

1. 本報告書大綱得視需要自行增列項目。
2. 成果報告書須另以光碟儲存，並另附加執行計畫活動照片電子檔(照片原始檔)。