

教育部教學實踐研究計畫成果報告
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辯論式教學法及問題導向學習法於提升外籍生學習成效之行動研究

Action Research on Improving the Learning Effects of Foreign
Students by Debate-Based Teaching and Problem-Based Learning

醫學分子檢驗學/Molecular Diagnostics

計畫主持人(Principal Investigator)：蔡婉琪

共同主持人(Co-Principal Investigator)：無

執行機構及系所(Institution/Department/Program)：

高雄醫學大學醫學檢驗生物技術學系

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一、研究動機與目的(Research Motive and Purpose)

(1) 計畫動機

文化的差異，造成亞洲之外的外籍生對台灣傳統課堂講授方式學習成效不彰，因此後學不斷思索該如何提升外籍生的學習成效？經觀察，外籍生較樂於表達自我及在課堂上與老師、同學互動，因此啟發後學嘗試以創新式的翻轉教學，改以學生為主體，改變單向授課模式，以解決問題為導向，設計學習主題及教案，使學生針對教案中的脈絡與線索充分進行討論及報告，並佐以主題式辯論，更加提高互動程度，使學生在提問答辯的攻防之間，對欲教授的知識愈辯（辨）愈明，進而引發主動學習並提升學習成效。因此，本計畫擬以創新式的翻轉教學，分別以辯論式教學法以及問題導向學習法教導學生，藉由此種翻轉教學激起學生的學習興趣及動機，進而提升學習成效。

(2) 研究目的

評估問題導向學習及辯論式教學法是否可用來增進外籍學生醫學分子檢驗學之學習成效，並作為發展適性個人化教學之課程分流設計依據。

二、文獻探討(Literature Review)

醫學教育培育具醫學知識與技能的醫療人員，以能慎重、友善對待嚴肅生命問題為教育目標（謝博生，1997）。因此，醫學教育需要提供有效的學習方式讓學生能從課程中受益而發展能力，以解決病人的醫學問題，讓病人受更好的照顧（Cooke 等人，2010；Swing，2007）。1950 年，美國凱斯西儲大學的威廉奧斯勒提出：醫學教育是一種需要終身學習的教育過程，教師必須教導學生正確的學習方法與研究的技能，並提早培養如何識別知識的技能。百年來的醫學教育從早期的師徒制轉成學院制之後，隨著科技的進步，各專科領域也都相當快速發展。在這知識爆發的時代，傳統課堂授課的學習模式已經無法滿足學習者的需求，也無法達成永續自我學習的教育終極目標。過去幾十年來，各國醫學教育界廣泛推動問題導向式學習（Problem-based Learning，簡稱 PBL）。「問題導向學習」起源於 1910 年，為 Flexner 所倡導的教育改革理念，內容涵蓋獨立學習及問題解決的具體構想，但一直到 1960 年末，加拿大的 McMaster 大學方才完整的予以應用（Barrows，1998）。目前廣泛使用於國內外醫學（如藥學、醫學、護理等）教育（Hwang，2002）。PBL 進行的方式在於透過一系列的問題提供學生經驗的架框，並藉由解決實際環境中的問題，讓學生經由開放式的學習環境主動探索問題，並強調以學生為主導的自導式（self-directed）學習，利用小組討論的方式進行合作，以達成學生解決問題的能力與培養學生日後終身學習的目標。醫學教育期望學生不但能學得問題解決的策略，更希望學生能獲得「如何學習的能力」（Lee 等人，1997；田國慶，2014）。

許多研究指出：PBL 較傳統教學法更有助於提升學習成效（Koh 等人，2008；Kassab 等人，2005；Mattick 及 Knight，2007；Rendas 等人，2006；Hur 及 Kim，2007）與學生的批判性思考能力（Yuan 等人，2008），PBL 也能增加醫學生的知識並提升其面對病患問題的解決能力（Rosing，1997），然而，另有一些研究則顯示：PBL 對於學生的學習成效並未達統計上顯著（Beringer，2007；Cohen-Schotanus 等人，2008），對於提升學生的批判性思考能力未達統計上顯著（Hussain 等人，2007），在增加醫學生的知識、表現和解決病患問題的成效亦十分有限（McParland 等人，2004；Smits 等人，2002）。然而，廖遠光等人收集了 PBL 相關實徵研究文獻共 67 篇，採用後設分析法進行了量化的文獻回顧，證明 PBL 對於學業成就及高層次思考能力皆具有正向的效果，且顯著優於傳統教學（廖遠光及張澄清，2013）。因此推動 PBL 有其重要性與必要性。

本計畫另一個要使用的新式教學法為辯論式教學。辯論式教學是將學習的主導權由教師轉移到學生身上，以反向思維和發散性思維為特徵，由小組或全班成員圍繞特定的論題辯駁問難，各抒己見，互相學習，在辯論中主動獲取知識、提高素養的一種教學方式。辯論的歷史與人類語言的歷史一樣久遠。如最著名的莊子與惠施公的濠梁之辯；孟子也曾自述：「予豈好辯哉？予不得已也」而得到古今好辯之名。

每一種教學方式都有其理論基礎，辯論教學也不例外（古容綺，2017），過去的文獻就曾提出數個與辯論教學活動有關的理論：

一、布魯納（Bruner）的「發現學習論」

布魯納（J.S.Bruner, 1915~2016）是美國哈佛大學的心理學教授，他強調學習時，結構的重要性，認為教材的結構與學生的認知結構必須互相配合。他提倡發現學習（learning by discovery），鼓勵學生個人自己去思考、比較、對照、運用各種策略，以發現教材所含的重要概念。認為學習的主要條件是主動探索，並從事物的變化中發現其原則，強調學習情境的結構性，培養學生自行求知的判斷力，靠著自行探索，發現自己的錯誤並修正，其學習效果比被動接受更有效。

二、蘇格拉底提問式教學法

"蘇格拉底提問式教學法"是指在與學生談話過程中，並不直截了當把學生所應知道的知識告訴他，而是通過討論問答甚至辯論方式來揭露對方認識中的矛盾，逐步引導學生自己最後得出正確的答案。蘇格拉底方法作為學生和教師共同討論、共同尋求正確答案的方法，有助於激發和推動學生思考問題的積極性和主動性。

三、人本主義

人本主義認為每個學生都有學習潛在能力，應順應天賦並給予機會，有效的學習必須靠學生自主學習、探索發現，教材必須符合學生生活經驗，主張合作學習，除了培養學生的求知能力，發展人際溝通能力，養成團隊精神，也是人本主義的重點。

結合以上理論，就形成一種以學生自學為取向的教學策略，強調學生們在教師的引導下進行學習、在合作學習的過程中追求新知、將學習內容與現實生活結合。傳統的課堂教學是單一學科知識的傳授，學生也是單一學科知識的獲取，注重認知學習；而辯論式教學的課堂更注重學生學習的過程與方法，需要學生縱向橫向地將大量相關知識加以整合並綜合運用。因此學生就不單單是知識的接受、記憶，而是知識的生成，這是一般傳統的課堂教學無法達到的。

三、研究問題(Research Question)

四、研究設計與方法(Research Methodology)

(1) 研究設計說明

醫學分子檢驗學是以分子生物學為基礎，結合各式核酸檢測方式應用於各種疾病檢驗、病原菌鑑定、藥物作用分析，甚至是親子鑑定、產前篩檢、法醫學鑑定…等，時常會出現不同狀況卻使用同樣的檢驗方法，或是同一狀況能以多種各式檢驗技術進行分析。造成以傳統課堂授課時，學生會覺得重複性高、沒有連貫性、甚至聽得一頭霧水的情形。因此，本研究希望能以一種更有系統性的教學方式，以問題為導向，引領學生主動連結過去的學習經驗與知識，試圖提出疑惑甚或解決授課者所提出的臨床狀況。並且能夠藉由同儕相互刺激，激盪出更多學習主題。本教學實踐研究計畫施作對象為高年級外籍生，後學以先前計畫所得之經驗，加上更活潑更有創意的辯論式教學法，期待能讓本就傾向開放式討論的外籍生在學習成效上獲得顯著提升。

(2) 研究步驟說明

研究對象：

課程教授及量表施測對象為高醫大醫技系外籍班三年級學生。

課程設計：

在本計畫中，將以兩種教學法進行教學：問題導向式學習法（12 週）之後接續辯論式教學法（4 週）

問題導向式學習法部分：

為了執行本計畫，設計了多份 PBL 教案，舉其中一份「十九世紀滅門懸案」為例（附件一）。故事背景是俄國末代沙皇尼古拉二世全家被秘密員警集體槍殺。由於後世為了替被滅門的沙皇二世平反，重啟調查並積極找尋沙皇二世全家的遺骨以進行 DNA 鑑定比對，然而這篇發表在重量級期刊(Gill 等人，1994)的鑑定報告卻在科學界引起軒然大波，也引發許多陰謀論的論戰。姑且不論政治背景，這份案例其實隱藏了非常多值得學生學習的分子檢驗知識。

德國教育家赫爾巴特倡導階段教學法，教學過程循著一定階段，以啟發學生的思想，增進系統的知識和培養推理的能力為目的。赫爾巴特的階段教學法原只有四段——明瞭、聯合、系統和方法，後經由齊勒和其弟子萊恩兩次的修訂，遂成為正式的五段教學法，包含預備、提示、比較、總括以及應用（李咏吟，2000）。

本計畫以改良式的五段教學法，以問題導向教學為主，搭配課堂補充講授、臨床實境影片教學，引發學生主動學習動機，培養資料統整以及知識固化的能力，並橋接下個學年的臨床實習，達到學用合一的目標。

1. 預備（preparation）：

在此階段我會先連結學生於前一學年所上的分子生物學內容，喚醒學生的分生觀念，並延伸至接下來教案中所會應用之概念，請學生回家複習/預習，並發下 PBL 教案，請學生帶回構思並自行由教科書中按圖索驥、提出學習目標，然後將各自發想的學習目標上傳網路平台，我會在平台上統整並評論，以便進入下一階的教學法。

2. 提示 (presentation) :

統整先前所設定的學習目標以及學生所提出希望學習的主題，請學生分組討論（一組 3 人）並準備下堂課進行口頭報告。學生所製作的投影片需事先於下次上課的兩天前上傳，接著會以亂數抽籤方式選定報告組別（每堂課選 4 組，每組 20 分鐘）。

3. 比較 (comparison or abstract) :

報告當天，由選定之組別先進行報告，之後由學生相互提問，釐清不懂之觀念。同時穿插隨堂小考（運用 Kahoot!），依據教科書相關章節出題，測試學生吸收程度。

4. 總括 (generalization) :

在每次教案結束前以大約 20-30 分鐘進行觀念總結與綜合評論，並分析小考時多數人答錯的題目，幫助學生更清楚該次教案的學習重點。PBL 教案約為 4 案，每案 2 幕，整體耗時約 12 週（每案均包括前述 4 階教學法）。

5. 應用 (application) :

由於前述的學習均在課堂內，並無實際與臨床接軌。為了使學生能夠感受臨床如何進行他們所學習的檢驗及分析技術，我將預先至高醫附設醫院檢驗醫學部細胞遺傳室及基因診斷室或其它醫院之分子檢驗部門，實地拍攝各個臨床檢驗流程。而該單位亦是學生大四實習時實際接觸的科室。一方面讓學生將所學的原理知識應用到實際情境，一方便幫助學生預先熟悉未來工作的情境。

辯論式教學法部分：

12 週的教案學習結束之後，針對幾個現今熱門或主流的討論議題，設計辯論主題，以 squared debate 的方式，讓學生自由選擇擔任正方或反方辯士（雙方人數相等）。例如："Will medical technologist be replaced by AI (Artificial Intelligence)?"，讓學生分為支持方與反對方，每人需針對主題及立場準備 7 分鐘的演講及投影片。在辯論開始之前，會針對辯論題目進行正反方支持度調查，先對學生對於這個議題的預設立場做前測，並同步公佈統計結果。在學生交叉演說後，不開放雙方交叉提問而是開放 10 分鐘讓聽眾同學提問。待完成討論，再針對剛剛的題目重新調查，藉以得知在充分正反論述後，學生對於這個議題的立場是否受到影響。

研究工具：

研究工具經相關文獻蒐集、整理與分析，依據建構之理論模式及文獻探討找出研究問題架構及方向。利用 Google 表單架設線上問卷並確立內容效度後，以前測方式確立問卷信度後再進行正式施測。整門課程開始前及結束後將請同意受測之修課同學進行問卷前測及後測，以評量此翻轉教學法是否引發學生學習動機、增加學習成效，及其他相關調節。問卷設計如附件二。

五、教學暨研究成果(Teaching and Research Outcomes)

1. 教學過程與成果

如期末成果發表會成果所示（附件三）

2. 教師教學反思

在教學過程中觀察到使用 PBL 結合辯論式教學法教導外籍生醫學分子檢驗學，相較

於過去以傳統講述法授課，學生較能融入課堂情境並對於教案中所提出之學習目標進行課前準備、課中演示及課後複習。在前測所得量化結果及質性反饋中，超過五成學生認同此教學法較傳統課堂講述方式有趣，較能引發學習動機。然而，亦有不少學生認為此教學法較無效率，亦較難系統性地吸收知識。此外，同學們反應，對於自己所分配到的課程內容因為花很多心力準備，因此最為熟悉，然而對於其他課程內容，卻須取決於該內容的準備同學是否用心準備。此外，學生認為同學的上課表達方式不若教師授課來得有系統、有重點、有效率，建議老師可在創新教學法之前利用約 30 分鐘時間先以傳統授課方式講述。

3. 學生學習回饋

如期末問卷調查結果及教學評量所示（附件二、四）

六、建議與省思(Recommendations and Reflections)

文化的差異，造成亞洲之外的外籍生對台灣傳統課堂講授方式學習成效不彰。相較於習慣國高中填鴨式教育的台灣學生，外籍生更樂於表達自我及在課堂上與老師、同學互動。因此以 PBL 結合辯論式教學法，透過一系列的問題與活動，使外籍學生針對教案中的脈絡與線索充分進行討論及報告，並佐以主題式辯論，提高互動程度，使學生在提問答辯的攻防之間，對欲教授的知識愈辯（辨）愈明，進而引發主動學習並提升學習成效。

然而，根據課程結束後的學生反饋，雖然學生大多同意此種創新教學方法較有趣，也能讓自身主動探究更深入的知識，但有近 1/4 學生認為，如此的教學缺點為較無組織性及效率，因此若能結合傳統授課於新式教學法當中而不偏廢，當能使教學成效最佳化。

一. 附件

1. 附件一：課堂所使用之教案之一—The bloody extinction of a whole family in 19th century
2. 附件二：Students' Perceptions about Learning Outcomes of Problem-Based Learning (PBL) and Debate Teaching Method (DTM)_期末問卷
3. 附件三：109 教學實踐研究計畫期末成果報告
4. 附件四：外籍班醫學分子檢驗學期末教學評量

The bloody extinction of a whole family in 19th century

Scenario 1: Unravel the enigma

In the early morning of July 17, 1918, a massacre that shocked the world occurred in the Yekaterinburg area of Russia. The last Russian Tsar Nicholas II, who had been overthrown by the February Revolution, was rushed to the basement of a villa by the Bolshevik secret police to execute the shooting! Nicholas II, Queen Alessandro Feodorovna and their 22-year-old eldest daughter Olika, 20-year-old two-woman Princess Tajiana, 19-year-old three-woman Princess Maria, 14 years old The little girl Princess Anastasia and the 14-year-old son, Prince Alexei, were shot by machine guns and the blood was full of houses. It was terrible. Also being executed together were their family physicians, three servants and Princess Anastasia's pet, a British mastiff. After being shot, their bodies were dismembered and set on fire. The remaining bones were also immersed in sulfuric acid and completely destroyed.

However, there is a legend in this bloody case... It is said that two bodies were not found during cremation, and it was suspected that two children of the Tsar had escaped from the bullet and the bayonet. Therefore, there were several impostors who claimed to be Grand Duchess Anastasia of Russia (Anna Anderson was the best known), and it was also the story of the movie "The True and False Princess- Anastasia".

In 1994, an astonishing article was published in the eminent journal *Nature Genetics*. Pavel Ivanov, a geneticist at the Engelhardt Institute in Moscow, and Peter Gill at the British Forensic Center, pointed out that through a series of gender DNA tests and DNA Sequencing of bone cell nuclear, combined with mitochondrial DNA testing, confirmed that the nine bodies were the last Tsar Nicholas II, his queen Alex Sandra, their three daughters and four others (probably a family physician and 3 servants). The Prince Alexei and a daughter (probably Anastasia) are indeed not among them. In addition, the results of the study also confirmed that the famous Anna Anderson and the Tsar Royals have no blood relationship, the story of the True and False Princess has come to an end. It is widely believed that the mystery of the death of the last Tsar has finally come to a finale.

However, it's not the end of the story...

Learning issues:

1. Nucleic acid extraction technology and related tests
2. Polymerase chain reaction (PCR) technology
3. Nucleic acid sequencing technology
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5. Forensic criminal identification and technology
6. DNA paternity testing

Scenario 2: Vulnerable identification report

In 1988, Daryl Litwin, who studied law in Sacramento, found a lot of contradictions after reading a book about the last Tsar of the Romanov dynasty. So he went to consult Alec Knight, a biologist and anthropologist. Knight raised four major doubts about the previous 1994 identification report published in *Nature Genetics*:

1. The excavation process of the nine bones is questionable. Knight believes that there are many unmarked cemeteries near Yekaterinburg, and the location where the Tsar's family was excavated has actually been opened many times, so it is difficult to determine whether the skeleton in the cemetery was the original Tsar family.
2. The handover procedures for these bones in different hands are unclear. Since Gill's report did not mention who the bones and specimens were kept, Ivanov and Gill also refused to disclose the original data, so it is not known whether the samples have been contaminated due to improper handling procedures.
3. The results in the report have flaws in analyzing DNA testing data. Since Gill *et al.* use a single skull instead of the entire skeleton as an analysis unit, there is controversy about the identification of certain people and the attribution of different bones. More importantly, on the skull that claimed to belong to the Tsar, the scars created by the assassination in Japan in 1891 were not found.
4. The DNA sequencing results are too perfect. Gill's report claims that they obtained a DNA sequence containing 1223 base pairs from the excavated bone. Knight said: "The DNA extracted from the decaying bones that have been buried in a shallow, moist earth grave for 70 years must have been degraded seriously. Even if the DNA fragments were not completely destroyed, the length exceeding 250 base pairs is not possible."; "In all past similar DNA identification cases, there has never been such a long DNA chain as mentioned in the Nicholas II family's bone identification report. Therefore, we reasonably suspect that these are considered to belong to Nicholas II and his family were contaminated."

Therefore, with the assistance of the Russian Foreign Expert Committee, Knight's research team managed to find the remains of Queen Alexandra's sister and restarted the investigation in 1982.

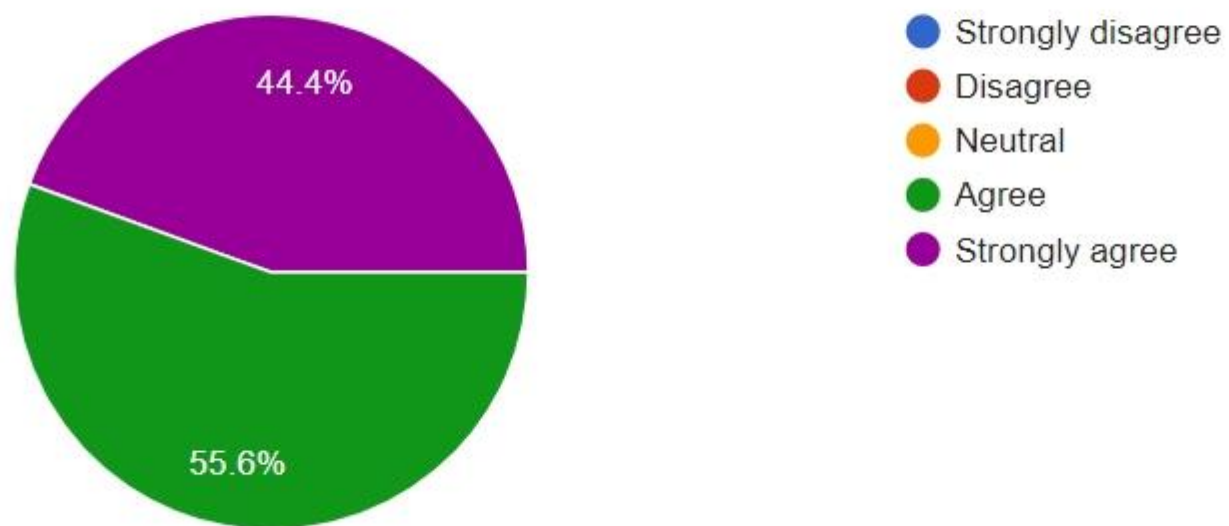
PBL and DTM helps my development of lifelong and independent learning abilities

9 則回應



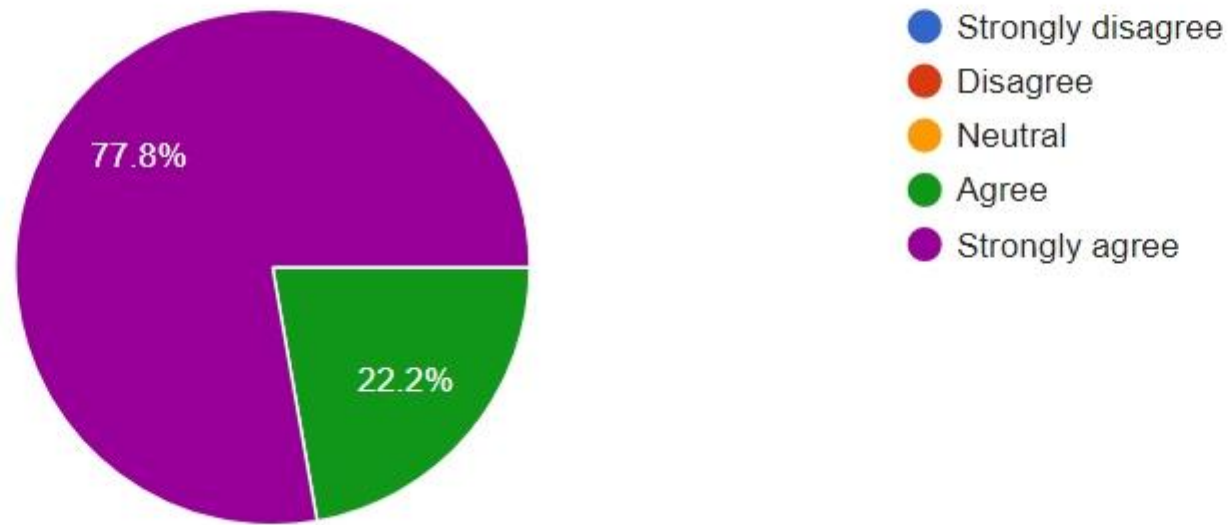
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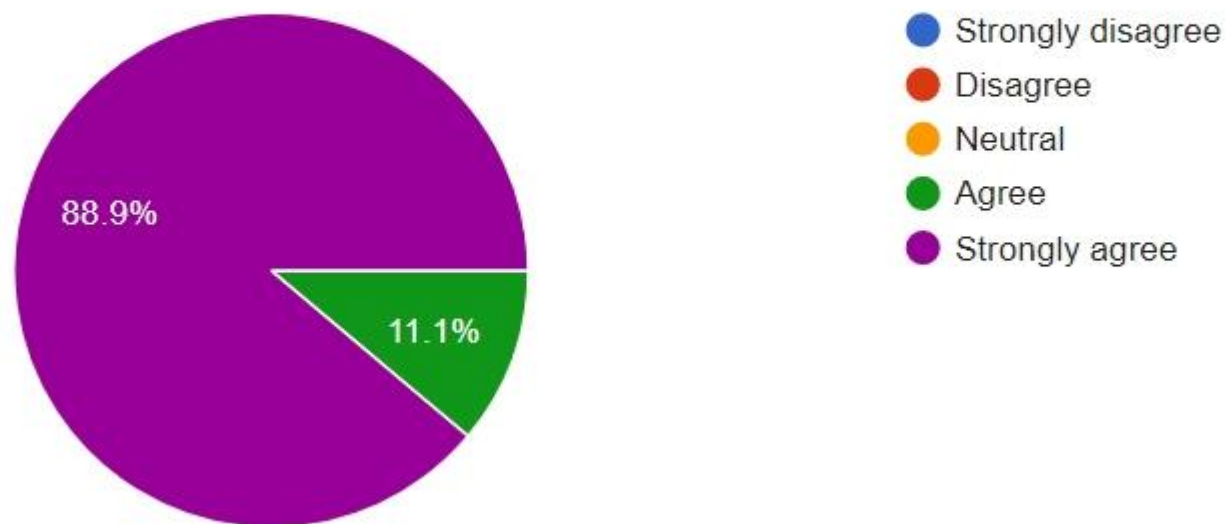
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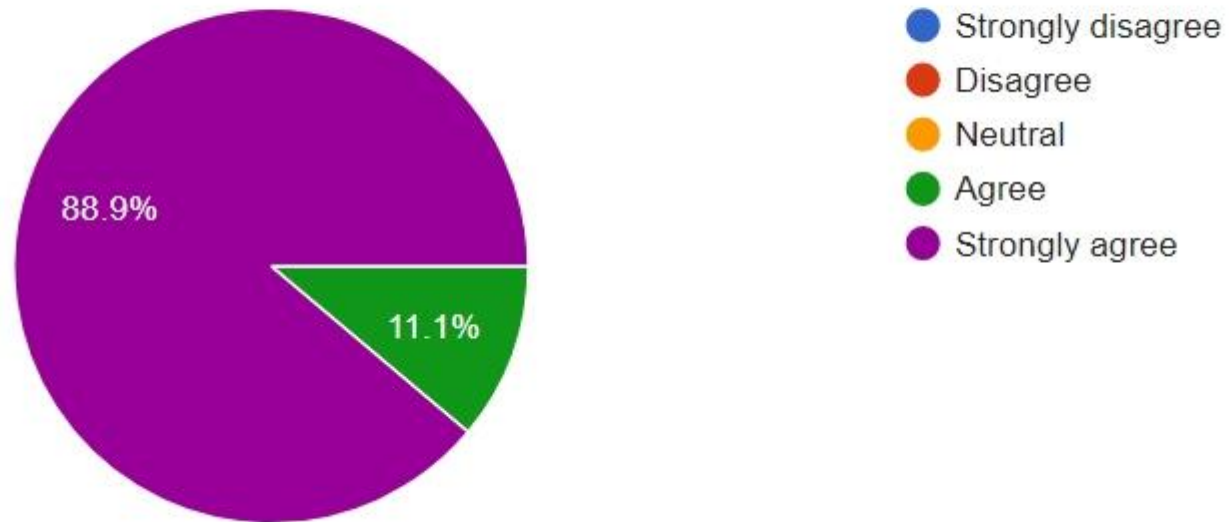
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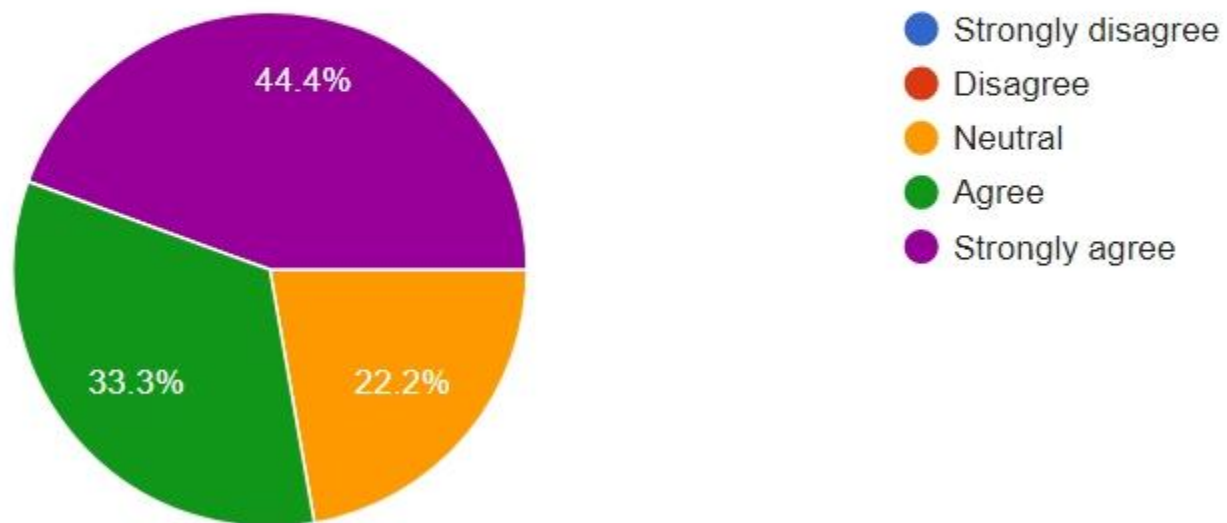
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9 則回應



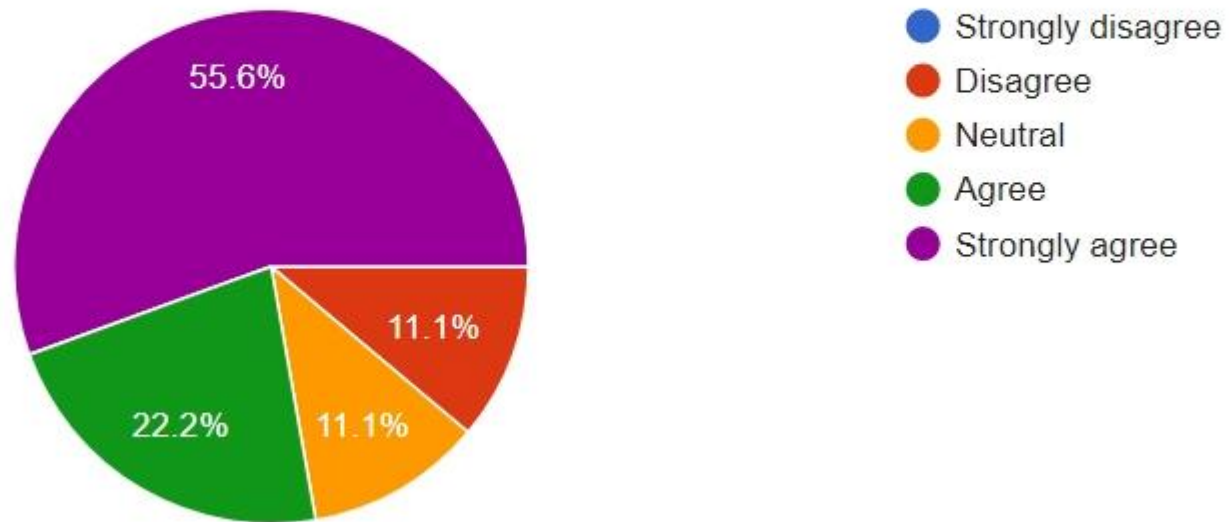
Through group discussion in PBL and DTM, I get to know people who share my interests.

9 則回應



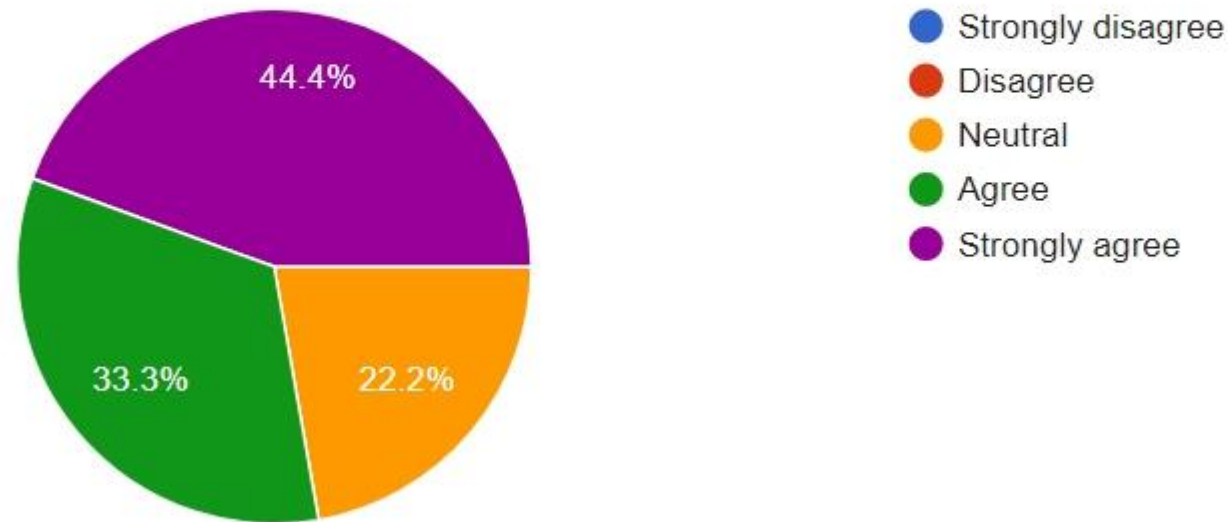
I like PBL and DTM more than the traditional lecturing.

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I'd like to recommend PBL and DTM teaching method for other subjects.

9 則回應



Any comments or suggestions for this class?

5 則回應

Thank you for making this semester different in so many levels and challenging in a very fun way. I appreciate it very much. I think more teachers should try to try different methods to keep students interested in the class and you did that and more. Thank you.

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Your methods are always fun and you make the class interesting and fun and you're an amazing teacher.

Since some students don't do well when taking exams, I think this is a better way for them to learn. Preparing for an exam is very difficult sometimes as a lot of information has to be remembered. Some student may only study for the exam but don't actually retain the information. PBL allows the students to understand more and also helps to retain more information since we do our own research and then have to discuss with the class.

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I think this style is fine, but for teachers who don't think so, I recommend little quizzes (less content which is faster to study and get graded on before an exam) helps students understand what kind of information is important



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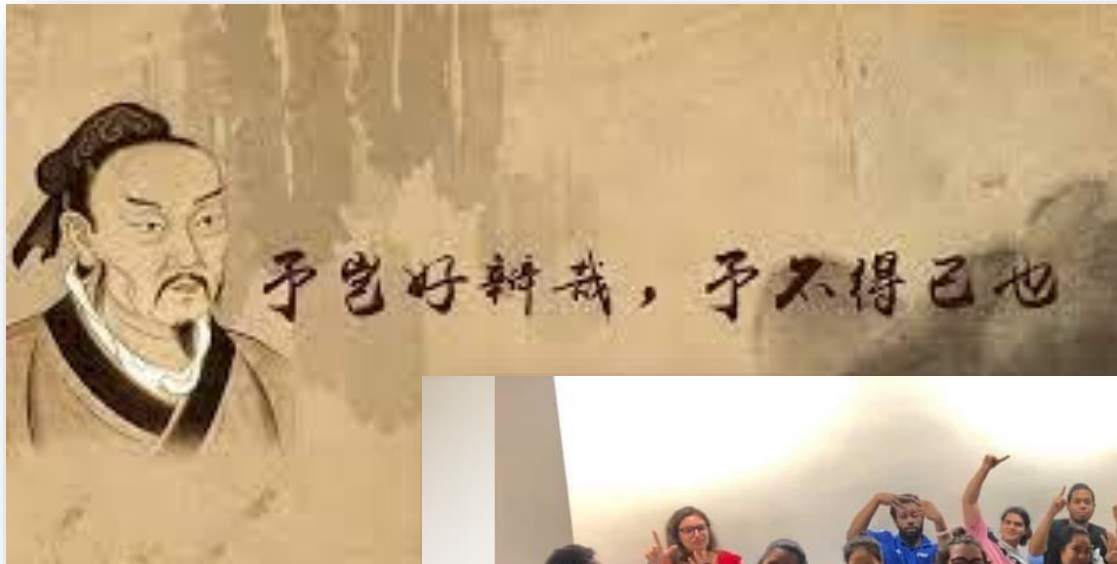
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辯論式教學法及問題導向 學習法於提升外籍生學習 成效之行動研究

Action Research on Improving the Learning
Effects of Foreign Students by Debate-Based
Teaching and Problem-Based Learning

高雄醫學大學醫技系 | 蔡婉琪



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🔒 私密社團 · 20 位成員



+ 邀請

關於 討論 公告 視訊圈 成員 活動 影音內容 檔案



Wanchi Tsai，在想些什麼？

關於

🔒 私密



高雄醫學大學
KAOSHIUNG MEDICAL UNIVERSITY

The bloody extinction of a whole family in 19th century

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Wanchi Tsai 建立了票選活動。

2019年12月24日 · 公開

...

《SQUARED DEBATE 2: "Will medical technologist be replaced by AI (Artificial Intelligence)?"》



由你新增
No



8票



由你新增
Yes



3票

新增選項

1 則留言 18人已看過



讚



留言



Wanchi Tsai 作者

No: 73%; Yes: 27%

讚 · 回覆 · 35週



高雄醫學大學
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After the presentation:

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由你新增
No



5票



由你新增
Neutral



4票



由你新增
Yes



2票

新增選項

16人已看過



高雄醫學大學
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Wanchi Tsai

2019年12月3日 · 👤



《Forum: "If you are a CEO of a DNA testing company, how will you run and trumpet your company? What product will be a big win of your company?"》

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2019年12月24日 · 公開

Who's company you want to invest?



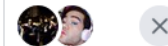
由你新增
Mary



3票



由你新增
Drago Lorenzana



2票



由你新增
Higa



1票



由你新增
Hope



1票

新增選項

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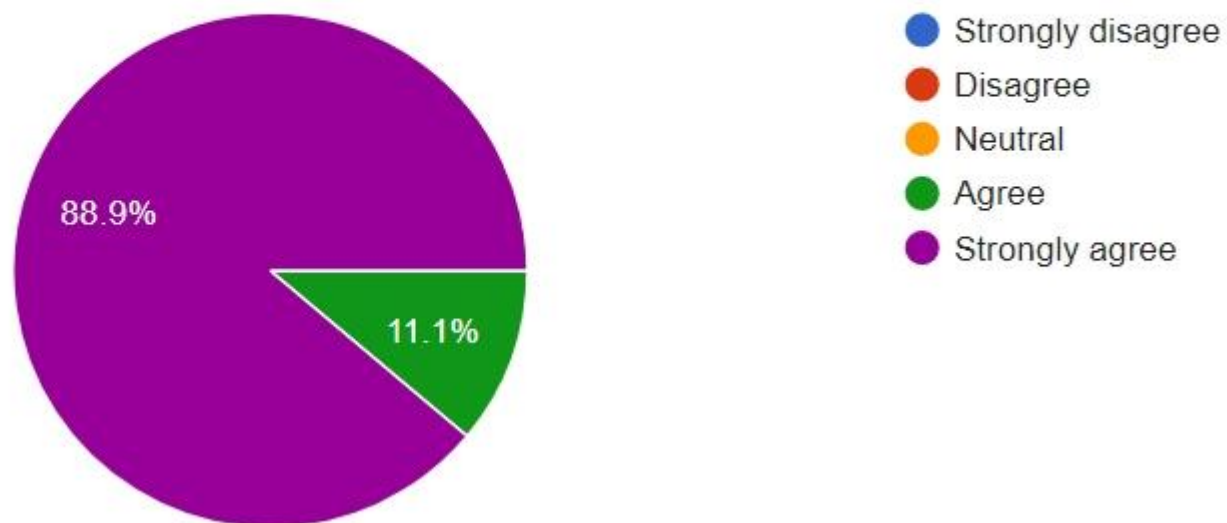
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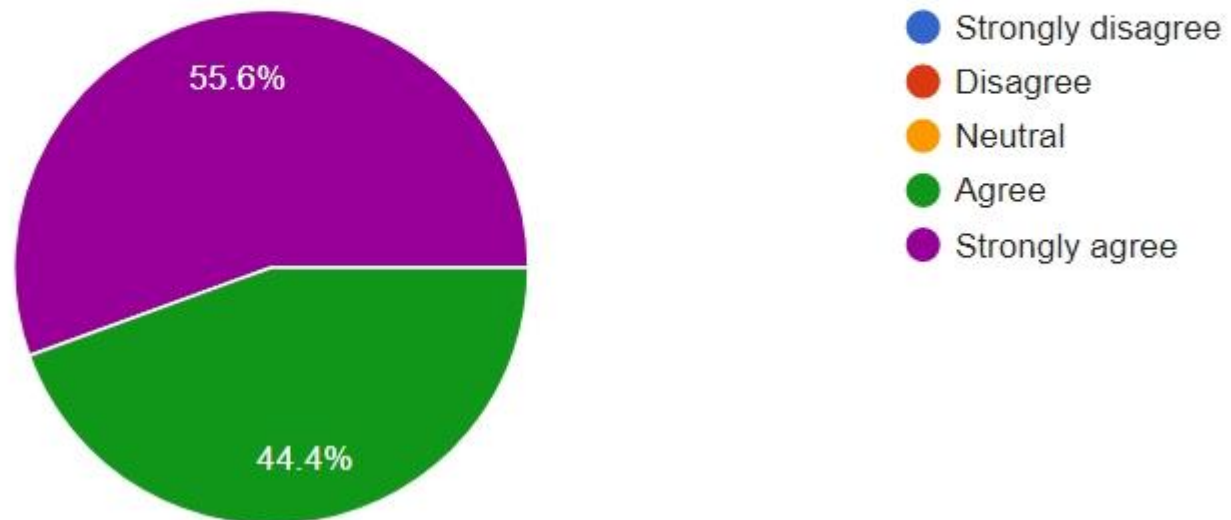
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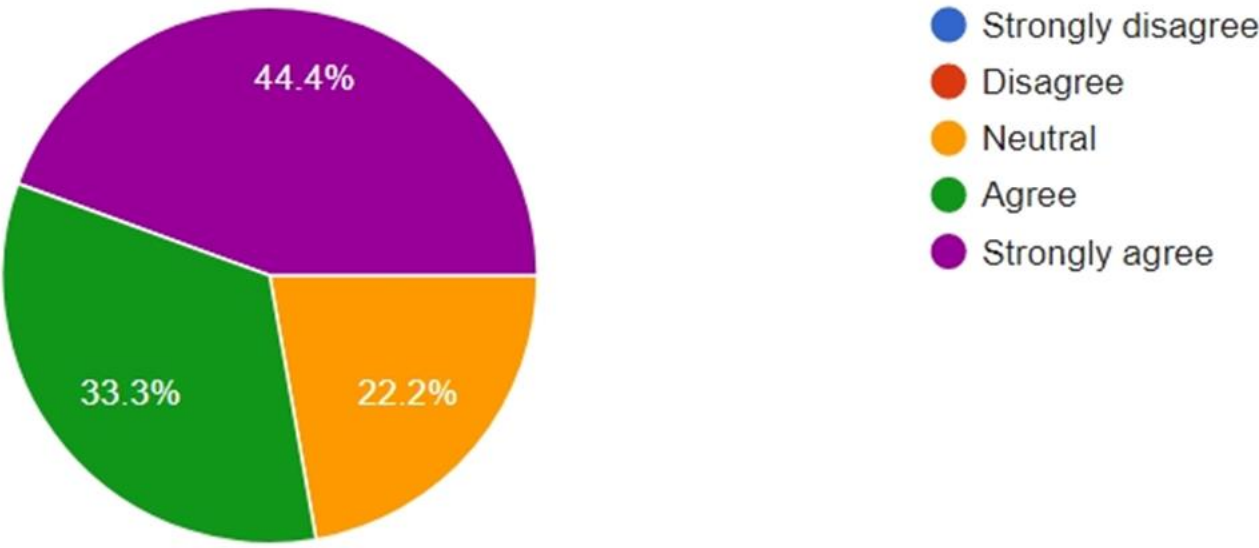


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8	6	6	6	6	6	6										
9	5	5	5	5	5	5										
10	6	6	6	6	6	6					The teacher had great patience and was very nice and helpful. Thank you very much. And she also used a very new different method which i found great for learning.					
11	6	6	6	6	6	6										
12	6	6	6	6	6	6										
13	6	6	6	6	6	6										