

混合專題式問題導向教學策略 以提升研究論文數據分析之能力



教育部教學實踐研究計畫成果報告 (發表序號：醫學D-14)

計畫編號：PMN1134688

計畫年度：113

課程名稱：數據分析實務

計畫主持人：謝宜蓁

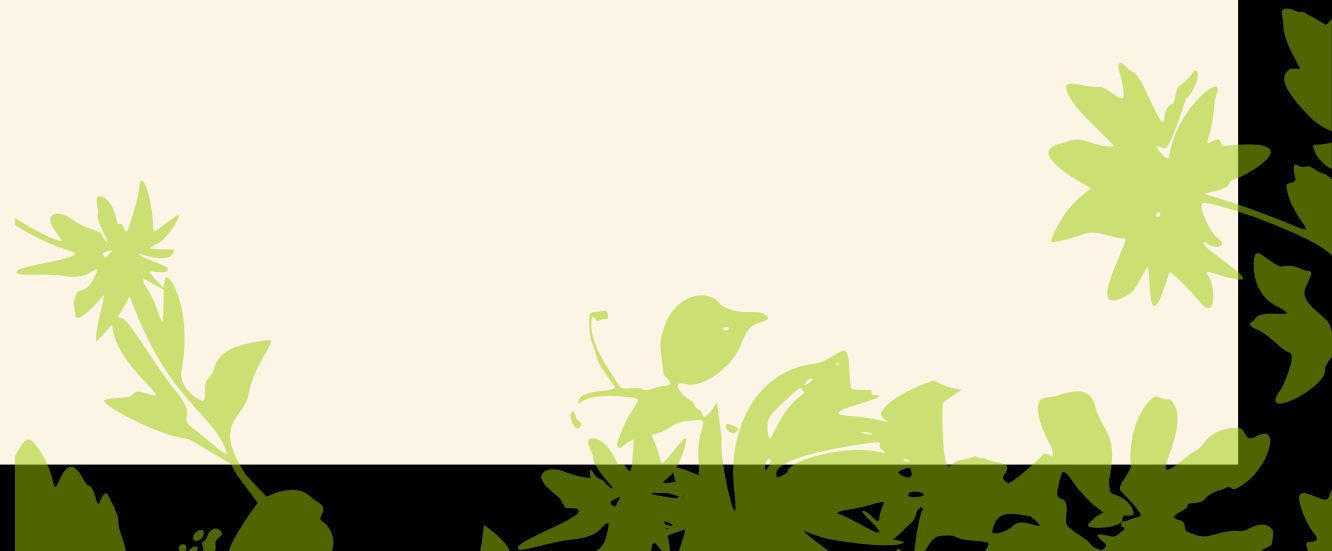
執行機構：台北醫學大學神經醫學博士學位學程

報告大綱

- 研究動機
- 研究目的
- 教學設計與規劃
- 研究設計與執行
- 教學暨研究成果
- 教學省思與建議



研究動機



教學現場面臨之困境

我們的學生常見的困擾...



來自生命科學
/ 醫學背景



閱讀論文時跳
過統計分析



知道統計很重要，
但不敢面對

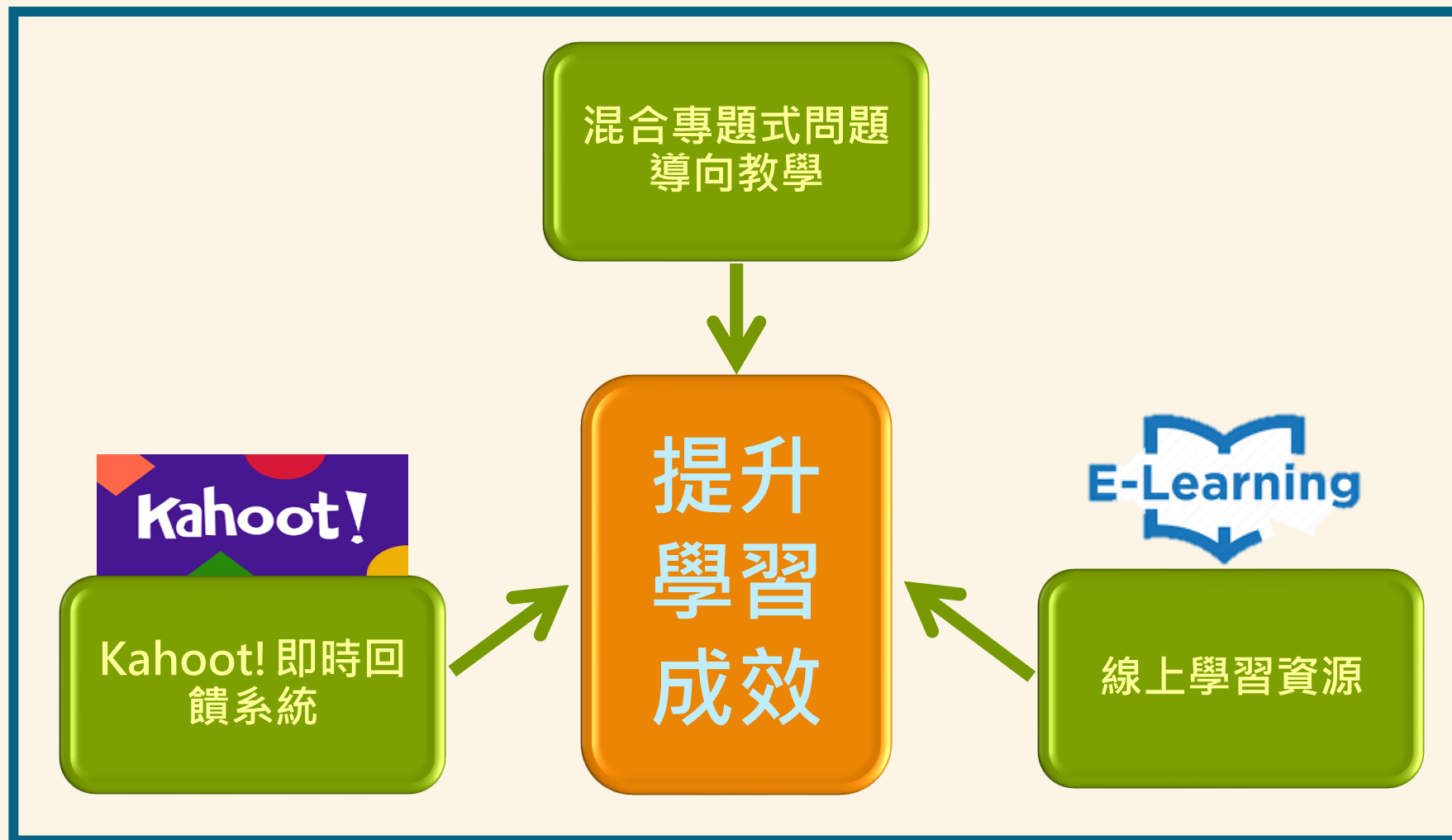


實驗數據豐富，卻不
知道怎麼分析和呈現

研究目的



研究目的與教學策略



教學設計與規劃



教學設計與規劃

- 課程安排規劃 (EMI課程：數據分析實務/Data Analysis Practice)

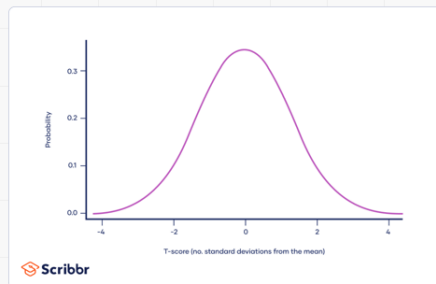
週次	課程主題	課程內容	週次	課程主題	課程內容
1	描述性統計	資料特性、變項種類、統計圖製作	9	推論性統計	多個母群體平均值比較-變異數分析
2	描述性統計	集中與變異指標	10	推論性統計	類別資料與卡方檢定
3	機率分布	機率	11	推論性統計	無母數分析
4	機率分布	離散型及連續型理論機率分布	12	迴歸分析	相關性與線性迴歸
5	推論性統計	單一母群體的區間估計與假設檢定	13	迴歸分析	邏輯式迴歸
6	推論性統計	單一未知變異母群及兩個母群體的區間估計與假設檢定	14	迴歸分析	存活分析
7	課堂回顧與練習	課堂回顧與練習	15	課堂回顧與練習	課堂回顧與練習
8	期中考	線上期中考試	16	期末考	線上期末考試

教學設計與規劃

- 教學設計-先講授基本原理並輔以SAS統計軟體教學

What is a t-distribution ?

- The t-distribution
 - Also known as the Student's t-distribution
 - A type of normal distribution that is used for smaller sample sizes and the population variance is unknown
 - A bell-shaped and symmetric, but it has heavier tails with more observations near the mean and fewer observations in the tails



Example

Drug A is beneficial for lowering cholesterol

1. Hypothesis

H_0 : cholesterol level is **not** more beneficial for Drug A group than placebo group

H_1 : cholesterol level is **more** beneficial for Drug A group than placebo group

```
1 data ttest;
2 input group chol @@;
3 datalines;
4 1 195 1 180
5 1 185 1 191
6 1 190 1 187
7 1 189 1 195
8 1 165 1 219
9 1 223 1 198
10 1 197 1 200
11 1 201 0 195
12 0 190 0 232
13 0 229 0 205
14 0 200 0 210
15 0 190 0 170
16 0 247 0 232
17 0 229 0 199
18 0 249 0 237
19 ;
20 proc ttest;
21 class group;
22 var chol;
23 run;
```

教學設計與規劃

教學設計-專題式問題導向教學

 **frontiers**
in Cardiovascular Medicine

[Front Cardiovasc Med.](#) 2024; 11: 1336676. PMID: PMC10957529
Published online 2024 Mar 8. doi: [10.3389/fcvm.2024.1336676](#) PMID: [38525193](#)

Effects of continuous supplementation of *Acanthopanax senticosus* Harms on the cardiac autonomic function of community-dwelling elderly individuals during resting and standing tests: a randomized controlled trial

[Takeru Sato](#), ¹ [Takumi Aoki](#), ² [Yuki Ito](#), ³ [Kan Oishi](#), ¹ [Masaki Fujishima](#), ⁴ [Eri Okumura](#), ⁴ and [Kojiro Ishii](#) ^{5,*}

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Cardiac autonomic function (CAF) decreases with aging, and *Acanthopanax senticosus* Harms (ASH) consumption reportedly induces anti-stress effects. This study aimed to assess the effect of continuous supplementation of ASH on CAF during resting and standing tests in the elderly population.



TABLE 2 Comparison of characteristics between the ASH and placebo groups.

	ASH group <i>n</i> = 14 (M/F: 3/11)	Placebo group <i>n</i> = 14 (M/F: 5/9)	<i>t</i>	<i>p</i>
Age (years)	72.8 ± 4.8	72.1 ± 4.2	0.42	0.682
Height (cm)	153.4 ± 6.6	156.6 ± 10.4	−0.97	0.340
Weight (kg)	57.6 ± 9.7	53.1 ± 9.6	1.20	0.241
BMI (kg/m ²)	24.3 ± 2.9	21.7 ± 3.6	1.41	0.060

Data are expressed as mean ± standard deviation. ASH, *Acanthopanax senticosus* Harms; BMI, body mass index.

Results: A two-way analysis of variance revealed a significant group-time interaction effect on CVRR, HF, and ΔLF/HF ratio. Following the intervention, CVRR, HF, LF/HF ratio, systolic blood pressure (SBP), HR, ΔLF/HF ratio, ΔSBP, and ΔHR improved significantly in the ASH group only.

Conclusions: Four-week supplementation of ASH improved CAF in community-dwelling elderly individuals during resting and standing tests.

TABLE 3 Group-time interactions on heart rate variability between the ASH group and placebo group.

	ASH group <i>n</i> = 14	Placebo group <i>n</i> = 14	Group × time	
			<i>F</i>	<i>p</i>
CVRR (%)				
Before	2.2 ± 1.2	2.4 ± 1.1	8.16	0.008
After	2.8* ± 1.8	2.0 ± 0.7		
LF (ms ²)				
Before	143.6 ± 140.1	132.0 ± 52.3	4.07	0.054
After	151.8 ± 132.5	89.4 ± 64.5		
HF (ms ²)				
Before	75.6 ± 65.4	101.5 ± 84.5	12.0	0.002
After	174.5** ± 120.1	81.3 ± 71.9		
LF/HF ratio				
Before	1.9 ± 1.6	1.3 ± 1.0	2.86	0.103
After	0.9 ± 0.7	1.1 ± 0.8		
HR (bpm)				
Before	72.6 ± 10.3	73.7 ± 7.7	0.02	0.878
After	67.6 ± 6.8	69.2 ± 9.0		
SBP (mmHg)				
Before	126.0 ± 15.0	122.3 ± 13.0	0.10	0.758
After	121.0 ± 13.2	118.6 ± 12.8		
DBP (mmHg)				
Before	75.6 ± 9.4	76.6 ± 6.4	0.01	0.928
After	73.1 ± 8.1	74.4 ± 8.4		

教學設計與規劃

- 教學設計-專題式問題導向教學

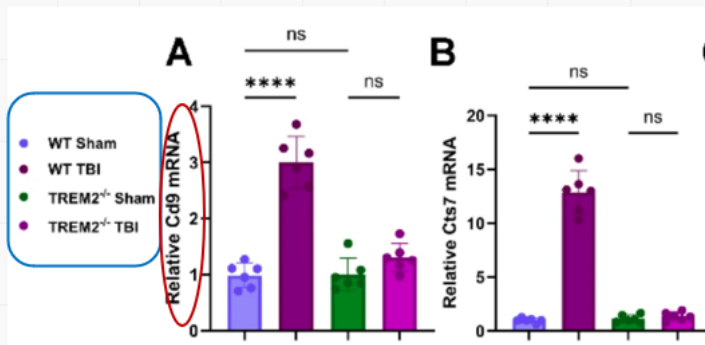
Research | [Open access](#) | Published: 13 January 2025

TREM2 affects DAM-like cell transformation in the acute phase of TBI in mice by regulating microglial glycolysis

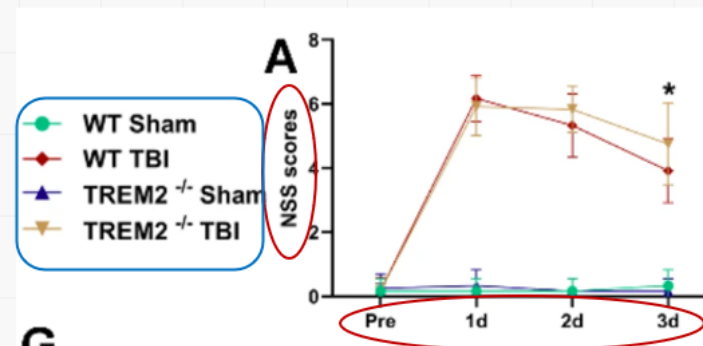
Lin Wang, Diqing Ouyang, Lin Li, Yunchuan Cao, Yingwen Wang, Nina Gu, Zhaosi Zhang, Zhao Li, Shuang Tang, Hui Tang, Yuan Zhang, Xiaochuan Sun & Jin Yan

Journal of Neuroinflammation 22, Article number: 6 (2025) | [Cite this article](#)

(A) Bar plots showing expression of selected DAM marker genes Cd9

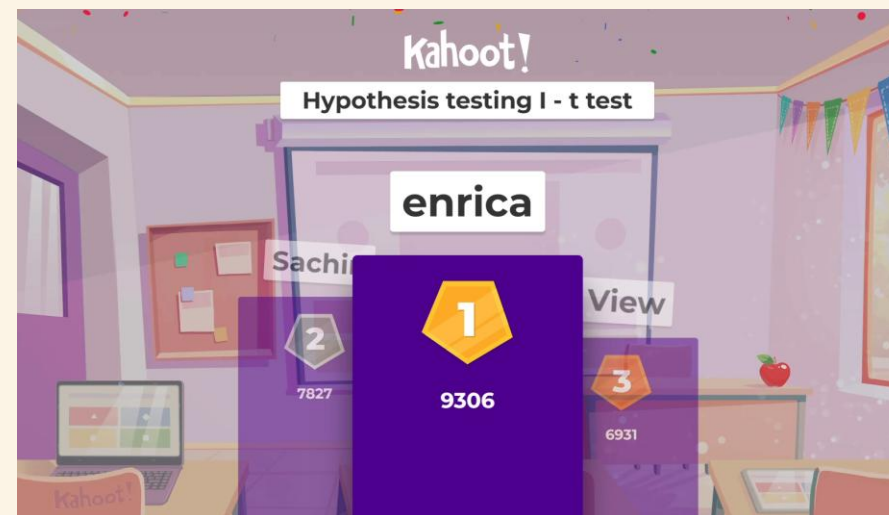


(A) Quantitative analysis of short-term neurological function by NSS scores



教學設計與規劃

- 教學設計-即時回饋互動系統



K!EDU 搜尋公開內容

YCHsiehTMU 主私人

個人 探索 資料庫 報告 群組 Marketplace AccessPass Kahoot! 共和國 玩樂區 頻道 Kindergarten...

報告

Hypothesis testing II - ANOVA

摘要 參與者 (8) 題目 (5) 意見回饋

展開檢視 精簡檢視

全部 (5)	困難題 (1)	搜尋
題目	類型	正確/不正確
1 ANOVA is used to compare the differences in ____ for more than 2 populations.	測驗	63%
2 How many independent and dependent variables are there in a One-Way ANOVA?	測驗	38%
3 What does the F-ratio in ANOVA represent?	測驗	50%
4 If the p-value in an ANOVA test is less than 0.05, what does this indicate?	測驗	75%
5 Determine whether the following scenario should use a one-way ANOVA test or two-way ANOVA...	測驗	25%

K!EDU 搜尋公開內容

YCHsiehTMU 主私人

個人 探索 資料庫 報告 群組 Marketplace AccessPass Kahoot! 共和國 玩樂區 頻道 Kindergarten...

Kahoot! Hypothesis testing II - ANOVA

1 次遊玩 8 名參與者

題目 (5)

ANOVA is used to compare the differences in ____ for more than 2 populations.

What would you use to determine whether significant differences were observed between all of the independent variable?

What does the F-ratio in ANOVA represent?

If the p-value in an ANOVA test is less than 0.05, what does this indicate?

Kahoot! 自主學習

學習 學習字卡 單人遊玩

最多 2000 名參與者。已於 3 個月前更新，可見度：私人

教學設計與規劃

- 教學設計-線上學習平台

(Week 6 / 2025/03/24) Hypothesis testing I [Class in person]				+	:
1.	SAS program and dataset	-	Read once	100%	:
2.	Data analysis practice_ t test	-	Read once	100%	:
3.	Hypothesis Testing: A Comprehensive Guide to Statistical Decision Making	-	Read once	80%	:
4.	t-Test: A Comprehensive Tutorial for Beginners	-	Read once	80%	:
5.	t test_20250324	-	Read > 109 minutes	60%	:
(Week 7 / 2025/03/31) Hypothesis testing II [Class in person]				+	:
1.	Data Analysis Practice_ANOVA	-	Read once	100%	:
2.	SAS program and dataset	-	Read once	90%	:
3.	ANOVA Tutorial: Analysis of Variance Made Simple	-	Read once	90%	:
4.	Data analysis practice_ANOVA	-	Read > 88 minutes	60%	:
(Week 8 / 2025/04/07) Hypothesis testing III [Class in person]				+	:
Please remember to complete the course evaluation. (Academic & Student Affairs Information System(Course selection))					
1.	Data Analysis Practice_Chisquare	-	Read once	100%	:
2.	SAS program and dataset	-	Read once	100%	:
3.	Chi-Square Test Tutorial: Understanding Categorical Data Analysis	-	Read once	100%	:
4.	Data Analysis Practice_20250407	-	Read > 96 minutes	60%	:
(Week 9 / 2025/04/14) Practice II [Class in person]				+	:
Dear all, Today's class is a hands-on work assignment and will be conducted in person.					

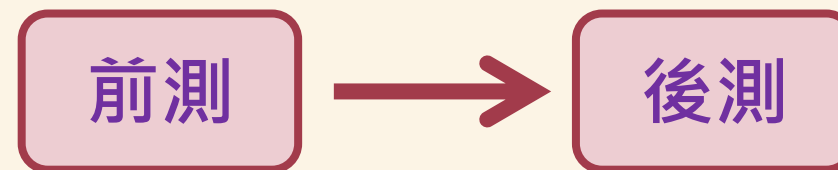
研究設計與執行



研究設計與研究對象

- 研究設計

- 單組前後測設計



- 研究對象

- 113學年度下學期選修「數據分析實務」課程之碩博士班學生

(期中考與期末考成績以及平時作業成績有與112學年度學生進行比較)

研究設計與研究對象

• 研究工具

1. 經專家審定之前後測問卷

Pre-and-Post-test for Data Analysis Practice (Pre-test Post-test)

Please complete this test to assess your knowledge pre-and post-the course training you are participating in. Your responses will be used for research purposes to help us improve and create teaching materials and methods. Thank you for your feedback.

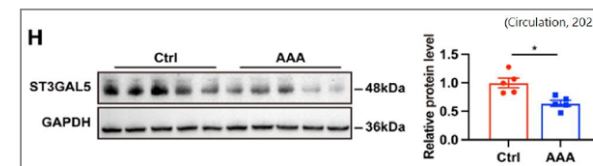
This is a cohort study of patients aged 18 years or older referred for coronary artery calcium (CAC) assessment. (CAC=0 denoted as patients without CAC while CAC>0 denoted as patients with CAC) Below table showed the baseline characteristics of study subjects.

Baseline characteristics by CAC presence among 20-30-year-olds.		
Characteristics	CAC = 0 (N = 324)	CAC > 0 (N = 49)
Age, mean (SD), y	27.5 (2.4)	27.5 (2.6)
Men, No. (%)	229 (70.7)	38 (77.6)
Race/ethnicity, No. (%) (N = 241)		
White	167 (80.7)	23 (67.7)
Asian	14 (6.8)	3 (8.8)
Black	6 (2.9)	3 (8.8)
Hispanic	16 (7.7)	2 (5.9)
Other	4 (1.9)	3 (8.8)
Hypertension, No. (%)	42 (13)	15 (30.6)
Hyperlipidemia, No. (%)	127 (39.2)	30 (61.2)
Diabetes, No. (%)	9 (2.8)	3 (6.1)
Family history of CHD, No. (%)	174 (53.7)	27 (55.1)
Current smoker, No. (%)	46 (14.2)	9 (18.4)
Statin use, No. (%)	13 (8.0)	4 (17.4)
Body Mass Index (BMI), mean (SD), kg/m ²	26.6 (5.3)	28.7 (6.3)

分數符號 (按本頁)

1. → Which variable is a continuous variable?
- A. · Hypertension
- B. · Race/ethnicity
- C. · Body mass index
3. → Which statistical method is appropriate to analyze "age" variable?
- A. · ANOVA test
- B. · t test
- C. · Chi-square test

This is a traditional western blot result. Ctrl denoted as control group while AAA denoted as abdominal aortic aneurysm group. Each group underwent five consecutive treatments at different time points.



5. → Which type of graph is on the right?

- A. · bar chart
- B. · box and whisker plot
- C. · scatter plot

6. → Which statistical method is used to compare these two groups?

- A. · Mann-Whitney U test
- B. · Kruskal-Wallis test
- C. · Chi-square test

研究設計與研究對象

研究工具

2. 設計「Rubric」 評分量表

- 評量學生平時作業表現

Data Analysis Practice			
Components/ Standard	Approaching Standard (1-2)	At Standard (3-4)	Exceeds Standard (5-6)
Hypothesis testing	✓ → The description of the question is unclear ✓ → The null hypothesis is wrong	✓ → The description of the question is not very unclear ✓ → The null hypothesis right	✓ → The description of the question is very clear ✓ → The null hypothesis right
Analytical method	✓ → Inadequate analysis method selected ✓ → Not explained why this method is used	✓ → Appropriate analysis method selected ✓ → Not explained why this method is used	✓ → Appropriate analysis method selected ✓ → Explained why this method is used clearly
Result	✓ → Significance judgment	✓ → Judgment of significance is	✓ → Judgment of significance

2. What is the test hypothesis when we want to investigate the relationship between metabolic syndrome (categorical) and age (continuous)?

Investigate whether there is a difference in age between people with and without metabolic syndrome.

(1). From the above, what is the null hypothesis and alternative hypothesis?

Null Hypothesis (H_0) = The mean age is the same between subjects with and without metabolic syndrome.

Alternative Hypothesis (H_1) = The mean age is different between subjects with and without metabolic syndrome.

(2). What is the test statistics? Please explain the result.

Since one variable is categorical (2 groups: metabolic syndrome yes/no) and the other is continuous (age), the appropriate test is: Independent samples t-test (if age follows normal distribution).

The TTEST Procedure
Variable: age (age)

ms	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
0		743	51.8654	9.7547	0.3579	40.0000	91.0000
1		257	57.4981	10.8376	0.6760	40.0000	86.0000
Diff (1-2)	Pooled		-5.6326	10.0436	0.7260		
Diff (1-2)	Satterthwaite		-5.6326		0.7643		

Method	Variances	DF	t Value	Pr > t
Pooled	Equal	998	-7.75	<.0001
Satterthwaite	Unequal	408.51	-7.36	<.0001

Method	Num DF	Den DF	F Value	Pr > F
Folded F	256	742	1.23	0.0354

研究設計與研究對象

• 研究工具

3. 設計「學習態度問卷調查」評分量表

- 瞭解學生對學習內容的態度與滿意度

Attitudes toward science learning Questionnaire

學習態度問卷調查

+

No	Questions	1: Very Disagree	2	3	4	5: Very Agree
1	I think learning "Data Analysis Practice" is interesting and valuable. (我覺得學習這個課程是有趣而且有價值的。)	1	2	3	4	5
2	I would like to learn more and observe more in the "Data Analysis Practice" course. (我想要學習更多且觀察更多有關這個課程的內容。)	1	2	3	4	5
3	It is worth learning those things about "Data Analysis Practice". (我覺得學習跟這個課程有關的事物是值得的。)	1	2	3	4	5
4	It is important for me to learn the "Data Analysis Practice" course well. (我覺得學好這個課程對我來說很重要。)	1	2	3	4	5
5	It is important to know the data analysis knowledge related to our living environment. (我覺得了解這個課程與生活環境之間的關係是重要的。)	1	2	3	4	5
6	I will actively search for more information and learn about "Data Analysis Practice". (我會主動搜尋更多資訊來學習這個課程。)	1	2	3	4	5
7	It is important for everyone to take the "Data Analysis Practice" course. (我覺得學習這個課程對每個人來說是很重要的。)	1	2	3	4	5

研究設計與研究對象

• 研究工具

4. 設計「學生對授課教師教學評量問卷」

- 作為教師教學品質自我檢視與改進的依據

Short tutor evaluation questionnaire

		Strongly Disagree(1) Strongly Agree(5)				
<i>Constructive/active learning</i>						
The tutor stimulated us...						
1.	...to summarize what we had learnt in our own words	1	2	3	4	5
2.	...to search for links between issues discussed in the tutorial group	1	2	3	4	5
3.	...to understand underlying statistical theories	1	2	3	4	5
<i>Contextual learning</i>						
The tutor stimulated us...						
4.	...to apply knowledge to the discussed problem	1	2	3	4	5
5.	...to apply knowledge to other situations/problems	1	2	3	4	5
<i>Self-directed learning</i>						
The tutor stimulated us...						
6.	...to generate clear learning issues by ourselves	1	2	3	4	5
7.	...to search for various resources by ourselves	1	2	3	4	5
<i>E-Learning</i>						
The tutor provided us...						
8.	...to easily access the course materials and assignments	1	2	3	4	5
9.	...the well E-Learning format to support our ability to learn	1	2	3	4	5
<i>Intra-personal behavior as tutor</i>						
10.	The tutor had a clear picture about his strengths/weakness as a tutor	1	2	3	4	5
11.	The tutor was clearly motivated to fulfill its role as a tor	1	2	3	4	5
<i>Global score</i>						
12.	Give a grade (1-10) for the overall performance of the tutor (6 being sufficient, 10 being excellent)	1	2	3	4	5
		6	7	8	9	10
<i>Open question</i>						
13.	Give the tutor tips for improvement (formulate shortly). Do this especially if you gave your tutor a score below six.					

研究設計與研究對象

- 分析評估方法
 - 利用paired t test分析前後測問卷以了解學生學習成效
 - 使用Rubric評分表來評量學生作業的表現，分析112學年度與113學年度的學習成果導向評量成效
 - 以「學習態度問卷調查」和「學生對授課教師教學評量問卷」為工具評估學生學習之態度與滿意度





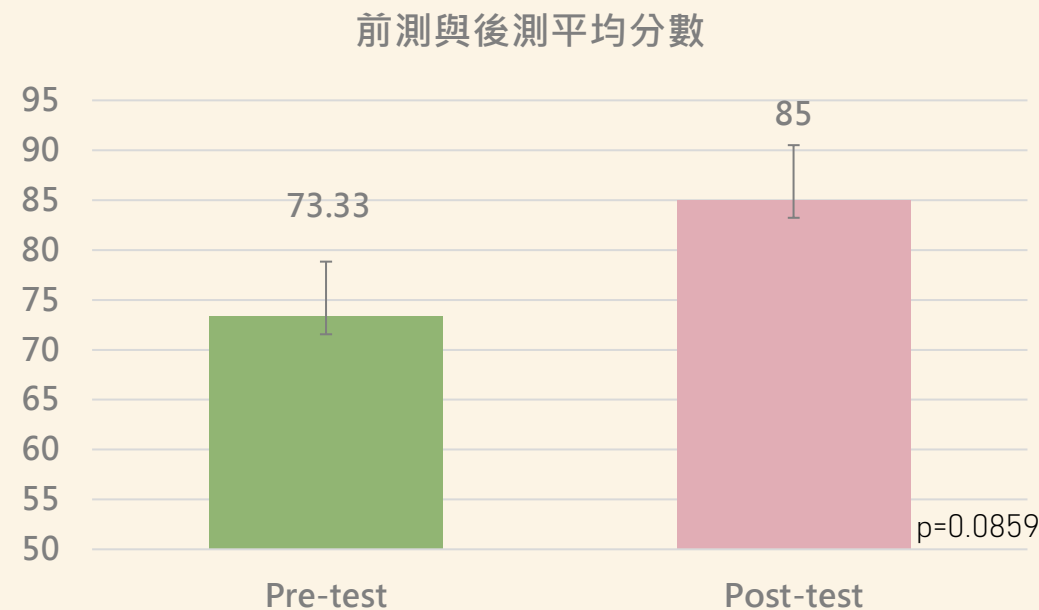
教學暨研究成果

教學過程



學習成效評估 (前後測試卷)

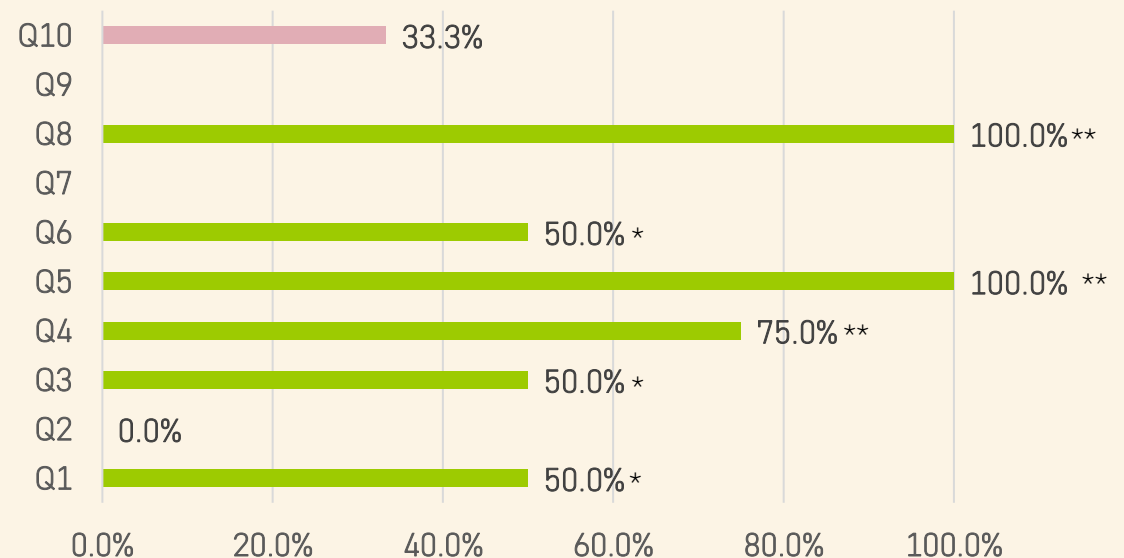
- 10位同學完整完成前後測問卷
- 平均年齡為 31.43 ± 7.58 歲
- 女性為4位(40.0%)，男性為6位(60.0%)
- 前測平均分數為 73.33 ± 16.58 分，後測為 85.00 ± 5.27 分，平均進步幅度為 11.11 ± 16.16 分($P=0.0859$)



學習成效評估 (前後測試卷)

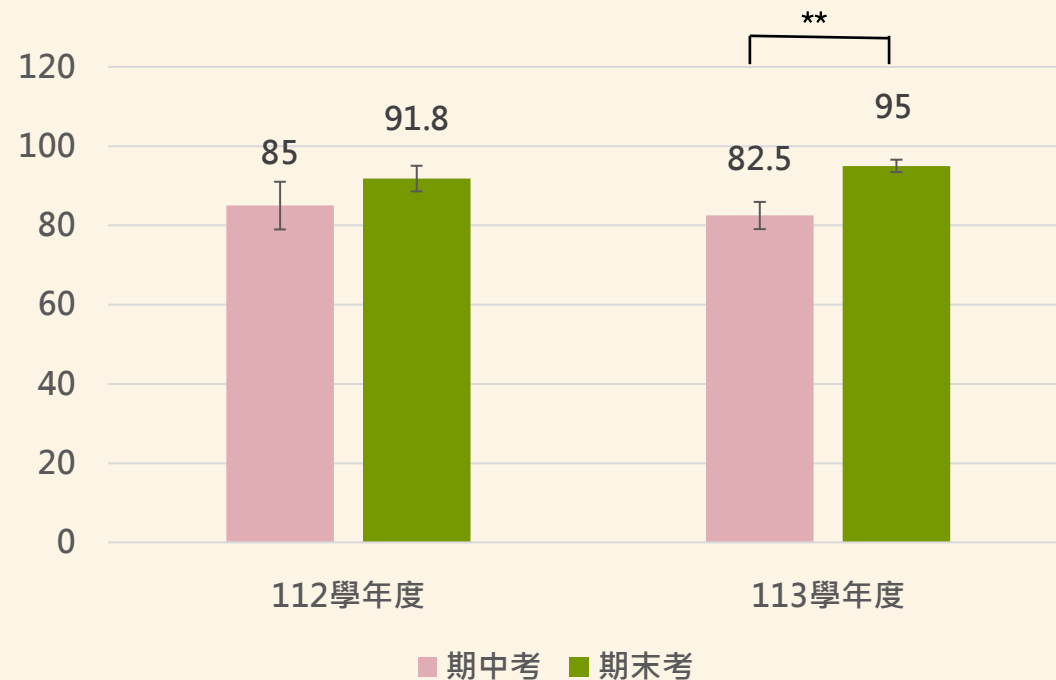
- 進步率(前測答錯，後測答對)
 - 有兩題(Q7, Q9)於前後測皆答對
 - 另有6題在前測答錯、後測答對，其進步率皆超過50%，且統計結果顯示具顯著意義($P < 0.05$)
 - 有兩題未有顯著進步(Q2, Q10)
 - 整體而言，平均進步率為57.3%，達統計上顯著意義($p = 0.007$)

各子題之進步率(前測答錯但後測答對)



學習成效評估 (期中與期末評量比較)

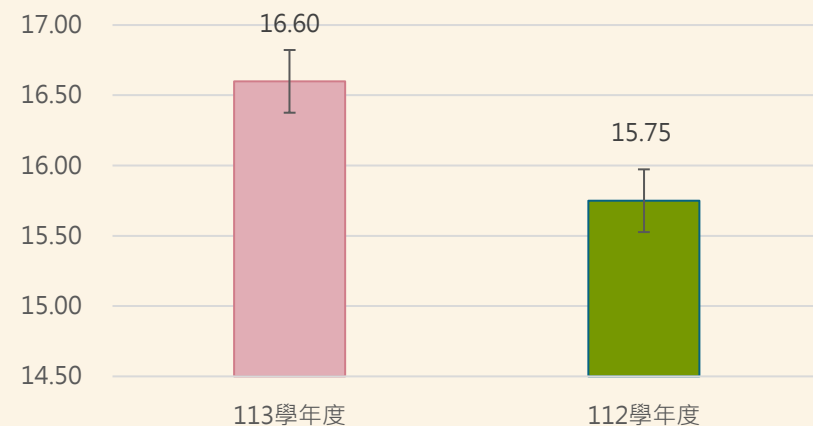
- 期中與期末評量
 - 112學期與113學期的期末成績均高於期中成績
 - 113學年的期末測驗成績顯著進步 ($p=0.0039$)



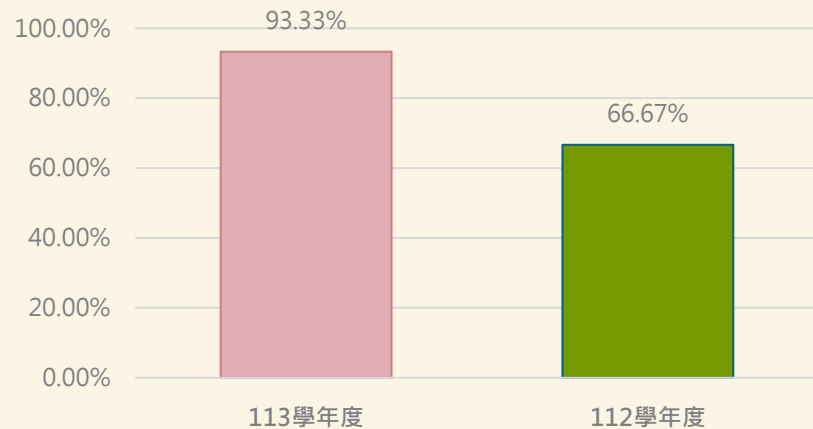
學習成效評估 (RUBRIC評量比較)

- Rubric評分表來評量學生作業表現
 - 平均分數
 - 113學年度之學生平均分數略高於112學年度($p>0.05$)
 - 評量成果標準達成率 (≥ 5 分)
 - 113學年度學生為93.33%，亦高於112學年度之學生($p>0.05$)

Rubric評量平均成績



Rubric評量成果達成率



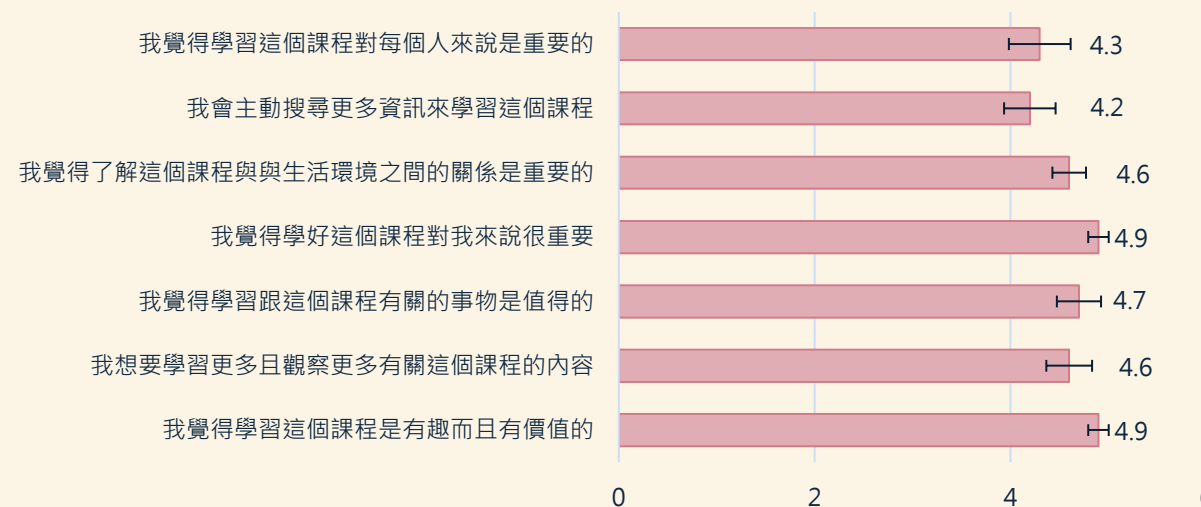
教學省思與建議



學生的學習回饋(學習態度問卷調查結果)

- 學生的學習回饋
 - 各項滿意度評分均達4分以上（五分制），顯示課程設計與教學內容能有效引發學生學習動機與興趣

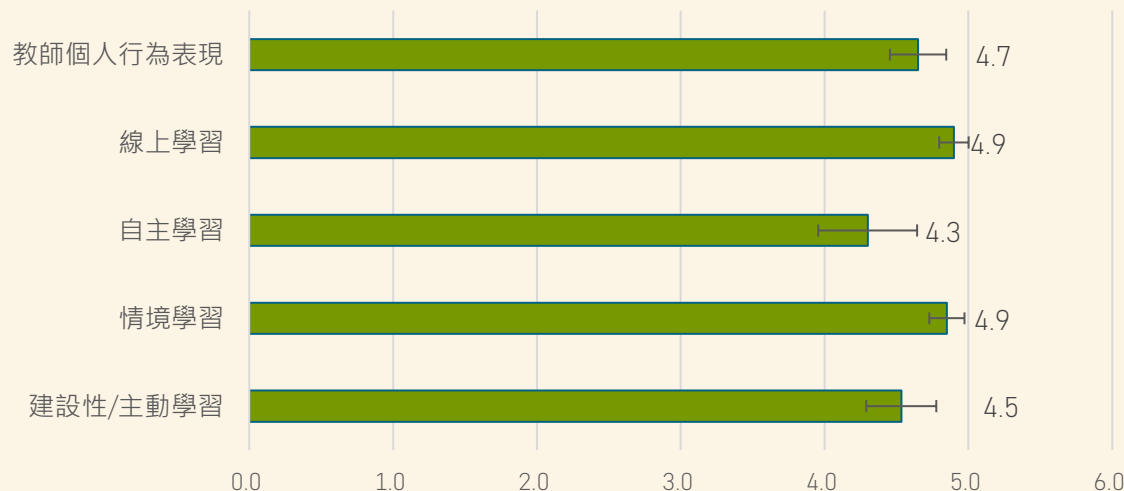
學習態度問卷調查



學生的學習回饋(學生對授課教師教學評量問卷結果)

- 學生對於教師教學評量回饋
 - 整體表現(滿分為10分)
 - 9.3 ± 0.8 分
 - 各學習層面(滿分為5分)
 - 建設性思考、主動學習、
情境模擬、自主探索及線
上學習等層面，學生給予
的評分亦皆超過4分

學生對於教師教學評量問卷



教師教學省思

提升自我能力

跳脫舒適圈，
學習新事物

本著「**易學易用**」
的教學初心



臺北醫學大學 教師教學專業認證申請表

申請日期： 114 年 8 月 12 日

姓 名	謝宜藥	系所/學程	神經醫學博士學位學程
職 稱	教授	到職日	限新進教師填寫 年 月
☐ 基礎-兩學年內完成必修 8 小時；選修 8 小時			
☐ 進階(社會實踐組)--完成必修 8 小時及選修 6 小時；且開設導向式學習課程或 USR 2 門課(或 4 學分) 原創新教學組於 10/30 教發委員會議後更名為社會實踐組			
☐ 進階(數位科技組)--完成必修 8 小時及選修 6 小時；且開設遠距課程 2 門課(或 4 學分)(共授至少 9 週以上)或將 VR/AR 導入 2 門課程(每門課至少導入 2 小時)			
☐ 進階(專業核心能力組)--完成必修 8 小時及選修 6 小時；開設核心能力課程 2 門課(或 4 學分)或將模擬教學導入 2 門課程(至少 4 小時)。原醫學模擬組更名			
☐ 進階(跨域教學組)--完成必修 8 小時及選修 6 小時；且開設設計思考或跨領域課程 2 門課(或 4 學分)·或將設計思考/跨領域教學導入 2 門課程(每門課至少導入 2 小時)			
☒ 進階(EMI 教學組)--完成必修 8 小時及選修 6 小時；且開設 EMI 課程累計達 18 小時◎參與觀課◎參加社群◎錄製課程影音介紹(前面所列均需完成)			

申請



謝謝聆聽 敬請指教