結合翻轉教學與 WSQ 學習單提升「聽覺輔具原理及應用」課程中學生的學習成效與臨床實作技能

Enhancing Learning Outcomes and Clinical Skills in the "Rationales and Use of Hearing Devices" Course through Flipped Teaching and WSQ Learning Sheets

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摘要

培養聽力師的「聽覺輔具原理及應用」課程中，大部分內容與生活經驗疏離。若沿用傳統的教學方式，學生難以在課堂中理解課程內容，並無法將所學應用於臨床實務。翻轉教學提供學生自主學習的機會，且能提升學生的學習成效。然而，最大挑戰在於學生課前未充分瞭解課程內容，進而影響課堂中的表現與參與度。因此，本研究想探究翻轉教學佐以重點提示學習單或觀看－統整－提問(WSQ)學習單時，是否能提升學生的學習成效與臨床實作能力。本研究對象為台中某大學 17 名三年級聽力組學生；6 名學生在翻轉教學時使用 WSQ 學習單，為實驗組；11 名學生在翻轉教學時使用重點提示學習單，為控制組。研究於學期的第 11 週進行學習成效與臨床實作能力的前測，第 12 週至第 16 週進行翻轉教學，學生需在課前觀看影片與完成學習單，課堂上進行小組討論來解決並報告臨床實務題目。第 17 週則進行學習成效與臨床實作能力的後測。本研究為準實驗設計，雖可使用共變數分析來排除可能的誤差，因樣本數有限，故同時使用魏氏曼惠特尼考驗來探討翻轉教學與學習單介入後，重點提示學習單與 WSQ 學習單在學習成效與臨床實作能力的差異。研究結果發現以共變數分析與魏氏曼惠特尼考驗探討不同學習單在學習成效的影響時皆有顯著差異($p < 0.05$)，即使用重點提示學習單者的學習成效後測成績優於使用 WSQ 學習單者。而在臨床實作上皆無顯著差異，即兩組學生的能力相當。因此翻轉教學搭配重點提示學習單可能有助於提升學業表現，但在臨床實作能力方面，兩組學生的能力皆有提升，但在統計學上沒有呈現

出顯著差異。故 WSQ 或重點提示學習單對臨床實作能力的影響，仍須進一步研究。最後，因本研究的研究樣本數有限，建議未來可以增加參與者人數，以更全面地瞭解翻轉教學與學習單對於學習成效與臨床實作技能的影響。

關鍵字：翻轉教學、WSQ 學習單、學習成效、臨床實作能力

Abstract

The "Rationales and Use of Hearing Devices" appears disconnected from real-world experiences for students. Traditional teaching methods may hinder students' ability to understand and apply content in clinical settings. Flipped teaching offers students the chance to improve learning outcomes. However, the challenge of flipped teaching is that students grasp the content thoroughly before class which impacting their performance in class. Hence, this study aimed to investigate whether flipped teaching using Key Point or Watch-Summary-Question (WSQ) learning sheets could boost students' learning outcomes and clinical skills. This study involved 17 students at a university in Taichung, Taiwan. 6 students used the WSQ learning sheets as the experimental group, while 11 students used Key Point learning sheets as the control group. Pre-test of learning outcomes and clinical skills was conducted in the 11th week of the semester, followed by flipped teaching from the 12th to 16th weeks. Students were required to watch the video and complete the learning sheets before class and engage in group discussions to solve clinical practice questions during class. Post-tests were administered in the 17th week. Although ANCOVA could eliminate potential errors, the Wilcoxon-Mann-Whitney test was chosen to compare learning outcomes and clinical skills between the two groups. Results revealed that students using Key Point sheets performed significantly better in learning outcomes compared to WSQ users ($p < 0.05$). However, no significant difference in clinical skills was observed between the groups. In conclusion, employing Key Point learning sheets in flipped teaching for the "Rationales and Use of Hearing Devices" course could enhance learning outcomes. Future studies should involve larger sample sizes to comprehensively assess the impact of flipped teaching and learning sheets on both learning outcomes and clinical skills.

Keywords：flipped teaching, WSQ learning sheet, learning outcomes, clinical skills

Introduction

Globally, 5% of the population, including 4.32 million adults and 34 million children, faces hearing impairment, a number set to rise to 2.5 billion by 2025, with 700

million needing hearing aids and aural rehabilitation (WHO, 2021). However, only about one-third of those affected wear hearing aids, with limited usage (Bisgaard & Ruf, 2017; Chia et al., 2007; Chien & Lin, 2012; Dalton et al., 2003; Dawes et al., 2014; Hartley et al., 2010; Humes, 2021; Kochkin, 1993a, 1993b, 1993c, 2000, 2009; McCormack & Fortnum, 2013; Popelka et al., 1998; Sangster et al., 1991; Smeeth et al., 2002; Ward et al., 1993; Wilson et al., 2010; Hartley et al., 2010; Hickson et al., 2010; Williams et al., 2009).

In Taiwan, where audiologists are mainly employed by hearing aid companies (The-Speech-Language-Hearing Association, 2024). P there's a pressing need for students to gain comprehensive education in hearing aids to enhance their chances of finding employment.

The "Principles and Applications of Auditory Aids" course often feels disconnected from students' daily experiences, hindering their ability to apply theoretical knowledge to real-life situations (Ormrod, 2004; Perkins & Salomon, 1992). To bridge this gap, we propose exploring the efficacy of flipped teaching combined with Key Point and Watch-Summary-Question (WSQ) learning sheets. By summarizing key points or asking questions on the sheets before class, students engage in deep self-directed learning, aiming to enhance both learning outcomes and clinical skills in the course.

Literature Review

Flipped Teaching

Flipped teaching, also known as flipped classroom or flipped learning (Spotts & Gutierrez de Blume, 2020) shifts traditional lectures to online materials. Students interact with these resources before class, thereby maximizing valuable face-to-face time for dynamic activities such as group discussions and hands-on exercises (Sams & Bergmann, 2013; Sohrabi & Iraj, 2016; Akçayır & Akçayır, 2018; Strelan et al., 2020). This learner-centered approach has gained popularity across various disciplines, encouraging students to take ownership of their learning (Hao, 2016; Strelan et al., 2020; Gilboy et al., 2015). Research suggests that flipped teaching boosts learning performance and motivation, making it a promising educational strategy (Akçayır & Akçayır, 2018; Chiang et al., 2019; Freeman et al., 2014; Lin et al., 2019; Missildine et al., 2013; Richardson et al., 2012; Roach, 2014; Abeysekera & Dawson, 2015).

However, flipped teaching encounters challenges such as students' lack of preparation, inability to ask questions, and difficulty understanding instructional videos during pre-class learning. These obstacles impede students' self-directed learning and may impact the effectiveness of flipped teaching (Lo et al., 2017; Kraut, 2015; Sahin et

al., 2015; Scott et al., 2016; Anderson & Brennan, 2015; Guerrero et al., 2015; Zack et al., 2015; Palmer, 2015; Tawfik & Lilly, 2015).

Watch-Summarize-Question (WSQ) Learning Sheets

In recent years, researchers have explored the use of WSQ learning sheets in flipped teaching (Ancliff & Kang, 2017; Heo & Chun, 2016; Hsia et al., 2019; Soliman, 2016). In this approach, students Watch videos before class, Summarize key points , and engage in Questioning for deeper understanding (Silver & Cai, 2005; Wang & Hwang, 2017). WSQ sheets facilitate pre-class comprehension and foster independent thinking, promoting efficient and deep learning (Cankoy & Özder, 2017; Ye et al., 2018).

However, there's limited research on flipped teaching with WSQ learning sheets, particularly in university programs for audiologists. This study addresses this gap by examining the impact of combining flipped teaching with prototype WSQ sheets on students' learning outcomes and clinical skills.

Method

Participants

This study was conducted in the course "Rationales and Use of Hearing Devices" at a university in Taichung. 6 students in the experimental group used the WSQ learning sheets during flipped teaching, while 11 students in the control group used the Key Point learning sheets. Both groups were taught by the authors of this study.

Experimental procedure

The study spanned from the 12th to the 16th week of the second semester, with 150-minute weekly face-to-face classes. Employing a quasi-experimental design (Figure 1), two groups were assigned different learning sheets. The experimental group utilized flipped teaching with WSQ learning sheets (Appendix 1), while the control group used Key Point learning sheets (Appendix 2).

In the initial week, students were introduced to WSQ and Key Point learning sheets for flipped teaching. Pre-tests on learning outcomes and clinical skills were conducted in the 11th week after knowledge acquisition from weeks one to eleven. From weeks 12 to 16, both groups watched videos before class. The experimental group completed WSQ sheets, engaging in watching, summarizing, and questioning, while the control group used Key Point sheets simultaneously. Post-tests in week 17 evaluated learning outcomes and clinical skills

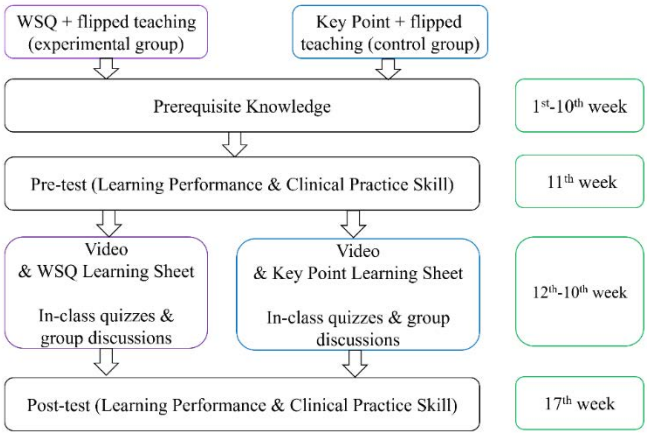

Figure 1. Experimental procedure

Research Tools

Learning Outcomes

The tool utilized in this study was developed by the author based on examination questions from the Rationales and Use of Hearing Devices of the Examination Yuan spanning 1999 to 2011. It comprised 25 questions covering 6 topics: "selection, adjustment, and verification of hearing aids, hearing aid problem, solving and fine-tuning, counseling for hearing aid users, evaluating the benefits of hearing aids, special considerations of hearing aid use in children, and consideration of monaural and binaural hearing aids." These questions served as both pre- and post-tests for assessing learning outcomes. The questionnaire demonstrated excellent internal consistency with a Cronbach's alpha of 0.827.

Clinical Skills

The clinical competency checklist developed by the author of this study is based on the 6 topics. Two experienced audiologists served as examiners, and their scores showed good consistency with a Pearson's correlation coefficient of $r = 0.998$ ($p < 0.05$).

In the clinical skill examination, different simulated scenarios were designed for each student group, comprising the patient's medical history, audiogram, needs for hearing aids, and budget. After receiving their scenario, each group had 60 minutes to discuss and present their solution to the examiner in a 20-minute session. The examiner evaluated their performance based on a checklist.

Results

Learning Outcomes

The ANCOVA ($p = 0.015$) and Wilcoxon-Mann-Whitney test ($p = 0.015$) revealed

significant differences in the post-test results between the two groups. Students using the Key Point learning sheet outperformed those using the WSQ learning sheet in terms of learning outcomes.

Clinical Skills

Both the ANCOVA ($p = 0.704$) and Wilcoxon-Mann-Whitney test ($p = 0.884$) results showed no significant difference in the post-test clinical skill scores between the two groups. This suggests that the choice of learning sheet did not impact the improvement of clinical skills in flipped teaching. In essence, both Key Point and WSQ learning sheets contributed to enhancing clinical skills to a similar extent.

Discussion and Conclusion

This study employed flipped teaching with Key Point and WSQ learning sheets to enhance students' learning outcomes and clinical skills in the "Rationales and Use of Hearing Devices" course. Results indicated that Key Point sheets outperformed WSQ sheets in post-test scores for learning outcomes, while both sheets led to comparable improvements in clinical skills.

While flipped teaching with learning sheets is common in subjects like English, Mathematics, Physics, and Dance, Lin et al. (2019) explored a variant, Annotation-Summary-Question (ASQ), which showed promise in enhancing clinical skills and critical thinking among nurse practitioners.

Despite positive impacts on learning outcomes and clinical skills, students using the Key Point learning sheet achieved superior post-test scores compared to those using the WSQ learning sheet. This highlights the need to assess different learning sheet formats for clinical skills enhancement, as textual content alone may be insufficient. Further research should explore diverse learning sheet approaches to better prepare healthcare workers during their education.

One limitation of this study is the relatively small sample size, with audiology students representing only a fraction of the cohort. Future research should consider increasing participant numbers and conducting more qualitative interviews to comprehensively evaluate the effects of flipped teaching and learning sheets.

References

1. Abeysekera, L., & Dawson, P. (2015). Motivation and Cognitive Load in the Flipped Classroom: Definition, Rationale and a Call for Research. *Higher Education Research and Development, 34*(1), 1–14.

2. Akçayır, G., & Akçayır, M. (2018). The Flipped classroom: A Review of its Advantages and Challenges. *Computers & Education, 126*, 334-345.
3. Ancliff, M., & Kang, A. (2017). Flipping an EMI Physics Class: Implications of Student Motivation and Learning Strategies for the Design of Course Contents. *International Journal of Contents, 13*(4), 1–11.
4. Anderson, L., & Brennan, J. P. (2015). An Experiment in “Flipped” Teaching in Freshman Calculus. *Problems, Resources, and Issues in Mathematics Undergraduate Studies, 25*(9-10), 861-875.
5. Bisgaard, N., & Ruf, S. (2017, Oct 12). Findings From EuroTrak Surveys From 2009 to 2015: Hearing Loss Prevalence, Hearing Aid Adoption, and Benefits of Hearing Aid Use. *Am J Audiol, 26*(3S), 451-461.
6. Cankoy, O., & Özder, H. (2017). Generalizability Theory Research on Developing a Scoring Rubric to Assess Primary School Students' Problem Posing Skills. *Eurasia Journal of Mathematics, Science and Technology Education, 13*(6), 2423–2439.
7. Chia, E. M., Wang, J. J., Rochtchina, E., Cumming, R. R., Newall, P., & Mitchell, P. (2007, Apr). Hearing impairment and health-related quality of life: the Blue Mountains Hearing Study. *Ear Hear, 28*(2), 187-195.
8. Chiang, T. H. C., Yang, S. J. H., & Yin, C. (2019). Effect of Gender Differences on 3-on-3 Basketball Games Taught in a Mobile Flipped Classroom. *Interactive Learning Environments, 27*(8), 1093-1105. https://doi.org/10.1080/10494820.2018.1495652
9. Chien, W., & Lin, F. R. (2012, Feb 13). Prevalence of hearing aid use among older adults in the United States. *Arch Intern Med, 172*(3), 292-293.
10. Dalton, D. S., Cruickshanks, K. J., Klein, B. E., Klein, R., Wiley, T. L., & Nondahl, D. M. (2003, Oct). The impact of hearing loss on quality of life in older adults. *Gerontologist, 43*(5), 661-668.
11. Dawes, P., Fortnum, H., Moore, D. R., Emsley, R., Norman, P., Cruickshanks, K., Davis, A., Edmondson-Jones, M., McCormack, A., Lutman, M., & Munro, K. (2014, May-Jun). Hearing in middle age: a population snapshot of 40- to 69-year olds in the United Kingdom. *Ear Hear, 35*(3), e44-51.
12. Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active Learning Increases Student Performance in Science, Engineering, and Mathematics. *Proceedings of the National Academy of Sciences of the United States of America*.
13. Gilboy, M. B., Heinerichs, S., & Pazzaglia, G. (2015). Enhancing Student Engagement Using the Flipped Classroom. *Journal of Nutrition Education and Behavior, 47*(1), 109-114.

14. Guerrero, S., Beal, M., Lamb, C., Sonderegger, D., & Baumgartel, D. (2015). Flipping Undergraduate Finite Mathematics: Findings and Implications. *Problems, Resources, and Issues in Mathematics Undergraduate Studies, 25*(9-10), 814-832.
15. Hao, Y. (2016). Exploring Undergraduates' Perspectives and Flipped Learning Readiness in Their Flipped Classrooms. *Computers in Human Behavior, 59*, 82–92.
16. Hartley, D., Rochtchina, E., Newall, P., Golding, M., & Mitchell, P. (2010, Nov-Dec). Use of hearing AIDS and assistive listening devices in an older Australian population. *J Am Acad Audiol, 21*(10), 642-653.
17. Heo, H. J., & Chun, B. A. (2016). A Study on the Effects of Mobile-Based LMS on Flipped Learning: Focused on the Affective Pathway in Pre-Service Teacher Education. *International Journal of Software Engineering and Its Applications, 10*(12), 473–484.
18. Hickson, L., Clutterbuck, S., & Khan, A. (2010, Aug). Factors associated with hearing aid fitting outcomes on the IOI-HA. *Int J Audiol, 49*(8), 586-595.
19. Hsia, L. H., Hwang, G. J., & Lin, C. J. (2019). A WSQ-Based Flipped Learning Approach to Improving Students' Dance Performance Through Reflection and Effort Promotion. *Interactive Learning Environments*.
20. Humes, L. E. (2021, Jul-Aug 01). An Approach to Self-Assessed Auditory Wellness in Older Adults. *Ear Hear, 42*(4), 745-761.
21. Kochkin, S. (1993a). MarkeTrak III: Why 20 million in U.S. don't use hearing aids for their hearing loss. Part I. *Hear J, 46*, 20-27.
22. Kochkin, S. (1993b). MarkeTrak III: Why 20 million in U.S. don't use hearing aids for their hearing loss. Part II. *Hear J, 46*, 26-31.
23. Kochkin, S. (1993c). MarkeTrak III: Why 20 million in U.S. don't use hearing aids for their hearing loss. Part III. *Hear J, 46*, 36-37.
24. Kochkin, S. (2000). MarkeTrak V: Consumer satisfaction revisited. *Hear J, 53*(1), 1-8.
25. Kochkin, S. (2009). MarkeTrak VIII: 25-year trends in hearing health market. *Hear Rev, 16*, 12-31.
26. Kraut, G. L. (2015). Inverting An Introductory Statistics Classroom. *Problems, Resources, and Issues in Mathematics Undergraduate Studies, 25*(8), 683-693.
27. Lin, H. C., Hwang, G. J., & Hsu, Y. D. (2019). Effects of ASQ-Based Flipped Learning on Nurse Practitioner Learners' Nursing Skills, Learning Achievement and Learning Perceptions. *Computers & Education, 139*, 207-221.
28. Lo, C. K., Hew, K. F., & Chen, G. (2017). Toward a Set of Design Principles for Mathematics Flipped Classrooms: A Synthesis of Research in Mathematics Education. *Educational Research Review, 22*, 50-73.
29. McCormack, A., & Fortnum, H. (2013, May). Why do people fitted with hearing

aids not wear them? *Int J Audiol, 52*(5), 360-368.

30. Missildine, K., Fountain, R., Summers, L., & Gosselin, K. (2013). Flipping the Classroom to Improve Student Performance and Satisfaction. *Journal of Nursing Education, 52*(10), 597–599.
31. Ormrod, J. E. (2004). *Human learning, 4th edition*. Pearson.
32. Palmer, K. (2015). Flipping a Calculus Class: One Instructor's Experience. *Problems, Resources, and Issues in Mathematics Undergraduate Studies, 25*(9-10), 886-891.
33. Perkins, D. N., & Salomon, G. (1992). Transfer of Learning. In T. Husen & T. Postlethwaite (Eds.), *The international encyclopedia of education, 2nd Edition* (Vol. 11, pp. 6452–6457). Elsevier Science Ltd.
34. Popelka, M. M., Cruickshanks, K. J., Wiley, T. L., Tweed, T. S., Klein, B. E., & Klein, R. (1998, Sep). Low prevalence of hearing aid use among older adults with hearing loss: the Epidemiology of Hearing Loss Study. *J Am Geriatr Soc, 46*(9), 1075-1078.
35. Richardson, M., Abraham, C., & Bond, R. (2012). Psychological Correlates of University Students' Academic Performance: A Systematic Review and Meta-Analysis. *Psychological Bulletin, 138*, 353–387.
36. Roach, T. (2014). Student Perceptions Toward Flipped Learning: New Methods to Increase Interaction and Active Learning in Economics. *International Review of Economics Education, 17*, 74–84.
37. Sahin, A., Cavlazoglu, B., & Zeytuncu, Y. E. (2015). Flipping a College Calculus Course: A Case Study. *Educational Technology & Society, 18*(3), 142-152.
38. Sams, A., & Bergmann, J. (2013). Flip Your Students' Learning. *Educational Leadership, 70*(6), 16-20.
39. Sangster, J. F., Gerace, T. M., & Seewald, R. C. (1991). Hearing loss in elderly patients in a family practice. *CMAJ, 144*, 981-981.
40. Scott, C. E., Green, L. E., & Etheridge, D. L. (2016). A Comparison Between Flipped and Lecture-Based Instruction in the Calculus Classroom. *Journal of Applied Research in Higher Education, 8*(2), 252-264.
41. Silver, E. A., & Cai, J. (2005). Assessing Students' Mathematical Problem Posing. *Teaching Children Mathematics, 12*(3), 129.
42. Smeeth, L., Fletcher, A. E., Siu-Woon Ng, E., Stirling, S., Nunes, M., Breeze, E., Bulpitt, C. J., Jones, D., & Tulloch, A. (2002). Reduced hearing, ownership, and use of hearing aids in elderly people in the UK–the MRC Trial of the Assessment and Management of Older People in the Community: a cross-sectional survey. *The Lancet, 359*(9316), 1466-1470.
43. Sohrabi, B., & Iraj, H. (2016). Implementing Flipped Classroom Using Digital

Media: A Comparison of Two Demographically Different Groups Perceptions. *Computers in Human Behavior, 60*, 514-524.

44. Soliman, N. A. (2016). Teaching English for Academic Purposes via the Flipped Learning Approach. *Procedia-Social and Behavioral Sciences, 232*, 122-129.
45. Spotts, J. D., & Gutierrez de Blume, A. P. (2020). A Pilot Study on the Effect of the Flipped Classroom Model on Pre-Calculus Performance. *SAGE Open, 10*(4).
46. Strelan, P., Osborn, A., & Palmer, E. (2020). The Flipped Classroom: A Meta-Analysis of Effects on Student Performance Across Disciplines and Education Levels. *Educational Research Review, 30*, 100314.
47. Tawfik, A. A., & Lilly, C. (2015). Using a Flipped Classroom Approach to Support Problem-Based Learning. *Technology Knowledge and Learning, 20*(3), 299-315.
48. The-Speech-Language-Hearing Association, T. (2024). *Jobs*. https://www.slh.org.tw/index.php?do=jobs
49. Wang, X. M., & Hwang, G. J. (2017). A Problem Posing-Based Practicing Strategy for Facilitating Students' Computer Programming Skills in the Team-Based Learning Mode. *Educational Technology Research & Development, 65*(6), 1655–1671.
50. Ward, J. A., Lord, S. R., Williams, P., & Anstey, K. (1993). Hearing impairment and hearing aid use in women over 65 years of age. *Medical Journal of Australia, 159*(6), 382-384.
51. WHO. (2021). *Deafness and hearing loss*. Retrieved Feb 16 from https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss
52. Williams, V. A., Johnson, C. E., & Danhauer, J. L. (2009, Jul-Aug). Hearing aid outcomes: effects of gender and experience on patients' use and satisfaction. *J Am Acad Audiol, 20*(7), 422-432; quiz 459-460.
53. Wilson, R. H., Noe, C. M., Cruickshanks, K. J., Wiley, T. L., & Nondahl, D. M. (2010). Prevalence and degree of hearing loss among males in Beaver Dam cohort: comparison of veterans and nonveterans. *J Rehabil Res Dev, 47*(6), 505-520.
54. Ye, X. D., Chang, Y. H., & Lai, C. L. (2018). An Interactive Problem-Posing Guiding Approach to Bridging and Facilitating Pre-and In-Class Learning for Flipped Learnings. *Interactive Learning Environments, 27*(8), 1075-1092.
55. Zack, L., Fuselier, J., Graham-Squire, A., Lamb, R., & O'Hara, K. (2015). Flipping Freshman Mathematics. *25*(9-10), 803-813.