Teaching and Teacher Education 125 (2023) 104053

Contents lists available at ScienceDirect

Teaching and Teacher Education

journal homepage: www.elsevier.com/locate/tate

Research paper

What students can teach each other: Promoting optimal voice use for teaching through a speech-language pathology student-led voice clinic

Elissa Finn [a], R. Hewetson [a, *], S. Howells [a], J. Clifton [b], E. Cardell [c]

[a] Discipline of Speech Pathology, School of Health Sciences and Social Work, Griffith University, Australia
[b] Faculty of Education, Queensland University of Technology, Brisbane, Australia
[c] School of Medicine and Dentistry, Griffith University, Australia

HIGHLIGHTS

- Teachers are occupational voice users who are at a high risk of developing voice problems.
- The development of voice problems may occur before teachers commence their professional career.
- Voice education and training may reduce the risk of vocational voice injury.
- Tertiary institutions provide a unique opportunity for inter-program student collaboration.

ARTICLE INFO

Article history:
Received 13 February 2022
Received in revised form
21 December 2022
Accepted 31 January 2023
Available online xxx

Keywords:
Voice disorder
Teacher preparation
Speech-language pathology
Student-delivered service
Screen6
Voice handicap index 10

ABSTRACT

Initial teacher education (ITE) students experience voice problems while studying and subsequently in their careers with the potential to impact their teaching careers. Education about voice and vocal techniques required for teaching is not routine in teacher education. Speech-language pathology (SLP) programs require clients for voice-related training. This descriptive study considered student experiences and perceptions of benefit related to an SLP student-led voice clinic for ITE students. A cross-sectional survey revealed that 28.9% of ITE students presented with a voice problem on the Screen6, and 24.4% perceived themselves as vocally handicapped (VHI-10). Findings support the importance of routine screening of voice in ITE students, and that a student-led clinic may address preparation/training needs of both ITE and SLP students.

1. Introduction

Teachers are occupational voice users who are at a greater risk of developing voice problems compared with the general population (Thomas et al., 2007). Voice problems have been shown to impact teachers' communicative effectiveness, reduce work capacity and limit the potential for student-learning to occur (Akinbode et al., 2014; Leão et al., 2015). The education system incurs costs associated with voice problems as a result of absenteeism and presenteeism (attending work despite being unwell) (Devadas et al., 2017; Van Houtte et al., 2011). The presence of voice problems may also place strain on teachers' quality of life, affecting their ability to engage in personally valued activities (Lu et al., 2017; Moy et al., 2015). The potential occupational, economic, and personal impacts of voice problems therefore present a challenge to the profession, and for initial teacher education (ITE) students who are preparing to enter the workforce.

1.1. Prevalence and risk factors associated with voice problems in teachers

The development of voice problems may occur before teachers commence their professional career, emerging during their initial teacher education program (de Jong et al., 2006; Ohlsson et al.,

* Corresponding author. Speech Pathology Department, School of Health Sciences and Social Work, Griffith University, Gold Coast, QLD, 4222, Australia.
E-mail address: r.hewetson@griffith.edu.au (R. Hewetson).

https://doi.org/10.1016/j.tate.2023.104053
0742-051X/

2012; Simberg et al., 2004; Thomas, de Jong, et al., 2006). Literature suggests that between 14 and 39% of ITE students experience a voice problem while studying (Fairfield & Richards, 2007; Greve et al., 2019; Ohlsson et al., 2019; Simberg et al., 2000),

Over the course of their program, ITE students in Australia complete approximately 60–100 days in schools/early childhood sectors as part of the practical component of professional experience. Professional experience, also known as practicum or field experience, is a highly valued component of ITE programs and essential for obtaining a qualification as a teacher (Ure et al., 2009). Professional experience can take multiple forms depending on the university program. However, many of the specifics of professional experience, such as the number of placement days, are regulated as part of the program standards developed by the Australian Institute for Teaching and School Leadership (AITSL, 2017). ITE students may be engaged in professional experience for one day a week for several weeks or daily over a 2–10 week block of time. During professional experience, students gain valuable practical experience teaching in schools as they are provided with the opportunity to learn and practise teachers' work. Over the progression of their degree, ITE students undertake increasing duties of a teacher progressing from teaching small groups to whole class sequences of teaching. During professional experience placements, ITE students may experience heavy vocal loading (Franca, 2013), health related factors such as throat infections that preclude optimal voice use (Ohlsson et al., 2019), psychological circumstances or environmental factors such as sustained vocal effort in the presence of background noise known to impact vocal health (Greve et al., 2019), and limited time to implement voice rest in a typical workday (Giannini & Ferreira, 2012). In addition to increased vocal demands, false perceptions of own voice function and lack of awareness surrounding typical and disordered voice can increase the risk of sustaining a vocal injury (Kovacic, 2005; Thomas et al., 2006b, 2007). Furthermore, the ITE student population may demonstrate reduced insight into the potential risks of their future profession on their voice (Franca, 2013).

In response to COVID-19 related restrictions many teachers had to, and/or continue to, engage in altered teaching patterns which might include synchronous online teaching or a combination of online teaching and face-to-face teaching while wearing personal protective equipment such as masks. Online teaching and teaching while wearing a mask require a different pattern of voice use than what is used when teaching in a classroom (Sresuganthi et al., 2022; Tracy et al., 2020). Face-to-face and one-on-one synchronous online communication involves a two-way interaction, where verbal and non-verbal cues are used to evaluate how effectively a message was conveyed. Synchronous online communication to large groups generally limits the visual cues available to the speaker to determine if their communication is effective (Itzchakov & Grau, 2022). To compensate for different communication contexts, speakers may increase their vocal intensity and experience greater vocal effort during online interactions compared to in-person communication (Tracy et al., 2020). Until quite recently few teachers may have had experience at prolonged periods of synchronous or asynchronous online teaching and for many the decision to move to online teaching occurred with short notice with potential negative impact on mental wellbeing and vocal health (Besser et al., 2020; Sresuganthi et al., 2022). Following a period of online teaching due to COVID-19 restrictions to in-classroom teaching, teachers have reported increased vocal fatigue (Sresuganthi et al., 2022), increased laryngeal sensations of dryness and negative impacts on vocal quality (Nemr et al., 2021).

The American Speech-Language-Hearing Association highlight the negative impact of mask wearing from the listener's perspective as the speaker's intelligibility is reduced by factors such as a 3–12 dB attenuation of sound caused by the mask (ASHA, 2022; Gama, Castro, van Lith-Bijl, & Desuter, 2021). From the speaker's perceptive, considering vocal parameters in particular, systematic reviews highlight a significant increase in vocal intensity which is associated with vocal loading, speech breathing coordination difficulties, and self-reported vocal tract discomfort while wearing a mask (Gama et al., 2021; Shekaraiah & Suresh, 2021). The wearing of personal protective equipment while teaching has similarly been associated with self-reported increased vocal effort, vocal complaints, and reduced water intake (Furnas & Wingate, 2022).

Conversely, many environmental challenges associated with classroom-based teaching, such as voice projection against background noise and poor acoustics, is not found when teaching online (Vertanen-Greis et al., 2020). Surveys of teachers in Finland and Saudi Arabia reported a reduction in self-reported voice-related difficulties after a period of distance teaching that was required due to COVID-19, despite a reported increase in workload (Alarfaj et al., 2022; Patjas et al., 2021). Of interest, both studies reported a different pattern related to the use of technology to support optimal voice use for teaching which may account, in part, for the positive effect on the voice. When teaching in the classroom, only 7% of the participants reported using amplification (personal amplification device such as a lapel microphone) while 46% of participants used a headset when teaching from home during distance education (Patjas et al., 2021). It is unclear what impact protracted periods of online teaching may have on teachers' voices nor the steps in place to teach ITE students how best to deliver distance, synchronous teaching. However, the emerging evidence from university lecturers raises some concern that voice difficulties may arise when education about optimal voice use in online teaching environments, including the importance of amplification and ergonomics, is not provided.

Despite voice training being associated with fewer self-reported voice problems in professional teachers (Leão et al., 2015), voice ergonomics and training are not prioritised in professional experience specifically, or ITE generally (Greve et al., 2019). Preventative education and/or training have been recommended as part of teacher preparation to reduce occupational voice problems amongst this at-risk population (Franca, 2015; Kovacic, 2005; Ohlsson et al., 2012; Van Houtte et al., 2011). Notwithstanding demonstrated gains in voice health and control associated with accessing vocal training, only 14.3% of teachers with a diagnosed dysphonia seek voice related treatment (Roy et al., 2004).

1.2. Preventative and therapeutic approaches

Many approaches aimed at preventing voice problems for ITE students are discussed in the literature with evidence that voice education may have a long-term preventative effect on occupational voice problems (Ohlsson et al., 2016). Interventions need not be time consuming with some commentators suggesting that rapidly delivered individually tailored voice education may reduce the short-term risk of voice injury (Nanjundeswaran et al., 2012). Coping mechanisms including a focus on stress management also has been identified as a potential supplementary tool to traditional voice intervention (Meulenbroek et al., 2010; Van Lierde et al., 2010). Speech-language pathologists provide preventative and/or therapeutic voice education and training to occupational voice users, including teachers (Speech Pathology Australia, 2005). SLP voice services involve direct voice therapies that modify vocal behaviours such as breathing and resonance strategies or indirect management, which includes voice education and counselling (Colton, Casper, & Leonard, 2011). Researchers consistently suggest the need to identify and support student teachers who are at risk of sustaining voice problems (de Jong et al., 2006; Greve et al., 2019;

Orr et al., 2002). Speech-language pathologists, and SLP students are uniquely positioned to provide this service.

1.3. SLP student training in voice

For SLP students to achieve clinical competency in voice, practical experiences working with voice clients are essential. Occupational voice users, or individuals reliant on optimal voice functioning to perform work related duties, form a large part of speech pathology voice caseloads (Community Affairs References Committee, 2014; Phyland & Miles, 2019). Providing SLP students with clinical learning opportunities in assessing and managing voice difficulties and disorders is a challenge for many university programs (Speech Pathology Australia, 2005; Teten et al., 2016). This difficulty accessing voice clients has been identified as a likely reason for the perceived low levels of SLP student confidence about working with voice clients (Rumbach et al., 2021; Teten et al., 2016; Tillard, 2011). The establishment of university based, student-led voice clinics that provide services to the public or the use of standardised patients for simulation-based learning activities are two approaches that have addressed the need for clinical training experience when such training cannot be provided by external placement providers (Forbes et al., 2021; Rumbach et al., 2021).

1.4. The present study

This study posits that tertiary institutions provide a unique opportunity for inter-program student collaboration and peer teaching, creating the potential to enable ITE students, at-risk of developing occupational voice disorders, to receive assessment and treatment from SLP students. As a pedagogical strategy, peer teaching in higher education may be discipline specific or interprofessional where students learn from and with each other (WHO, 2010). In addition to offering ITE students access to voice-related care, the SLP student voice clinic create opportunities for interprofessional learning. The benefits of utilising inter-program collaboration within supervised student-led clinics as a means to teach students about the scope and role of other professions has been established in the literature (Briggs & Fronek, 2020; Gustafsson et al., 2016). To address the clinical training needs of SLP students in voice, and direct attention to vocal care for ITE students', this pilot study explored student reported perceptions of change in voice knowledge and skills following participation in an SLP student-led voice clinic for ITE students. Specifically, the aims were to explore: 1) self-reported voice symptoms and voice handicap in the ITE student cohort, 2) ITE students' perceptions of participation in the SLP student-led voice clinic, and 3) SLP students' perceptions of knowledge and confidence in the management of voice in ITE students.

2. Method

Ethical approval was obtained from the relevant university ethics committee (HREC Ref No: 2018/769). To address the first aim of gaining insight into the prevalence of self-reported vocal difficulties amongst the ITE cohort, a cross-sectional survey of students was completed. Subsequently, aim two was addressed by collecting subjective data from ITE students who attended two 1-hour voice sessions delivered by pairs of SLP students, under supervision from a practicing speech pathologist. ITE students identified changes in voice-related knowledge and skills and overall satisfaction with the student-led clinic. Aim three required collecting pre- and post-voice clinic survey data from the SLP students to identify perceived changes in confidence and knowledge about delivering voice-related services. All distributed surveys were hosted through Survey Monkey, an online platform.

2.1. Participants

This study recruited ITE students and SLP students from a single Australian university. To address aim one, ITE students were invited to complete an online survey to identify the prevalence of self-reported voice problems. The invitation to complete the survey was distributed by staff who were not involved in this research to ITE students, irrespective of their experience as ITE students, who were enrolled in either a Bachelor of Education or Master of Teaching.

To address aim two, a second invitation was extended to all ITE students who were scheduled to attend the SLP student voice clinic to consent to participate in the research that would gather information about their experiences of participating in the clinic. The voice clinic was offered to all ITE students to provide education about voice production and to teach vocal strategies. Self-reported voice difficulties and/or a current or prior diagnosed vocal disorder were not required to attend the voice clinic.

To address aim three, all SLP students enrolled in the first year of a two-year Master of Speech Pathology program, at the same university, were invited to participate in the research. The SLP students were required to participate in the voice clinic as part of their coursework; however, participation in the research about providing intervention to ITE students was voluntary. Before attending the voice clinic, the SLP students had completed theoretical voice training modules and workshops where theoretical knowledge was applied to develop clinical skills. SLP students were invited to complete an online, anonymous survey before and after the voice clinic via an emailed invitation from SLP academic staff.

2.2. Procedure

The SLP student-led voice clinic comprised two face-to-face appointments with SLP students in a clinic room setting on a university campus. SLP student pairs were assigned one voice client who was seen for two sessions; an initial assessment and a subsequent intervention session. Sessions were supervised by a qualified speech pathologist with experience working with adult clients with voice problems and disorders. SLP students also observed another student pair deliver an assessment and intervention session as part of the voice clinic to facilitate increased clinical learning opportunities and observations.

The first appointment aimed to ascertain the ITE students' current health status, vocal function, and concerns for their voice. Clinical information was obtained through a detailed case history including medical and social history, current vocal demands such as teaching load, the ITE student's work environment and perceived voice problems as defined by the ITE students' description. The case history also identified social and recreational voice use including singing and prior vocal training. Voice function was assessed using a battery of clinical assessments for voice including aerodynamic measurements and an auditory perceptual rating tool (Consensus Auditory Perceptual Evaluation of Voice: Kempster et al., 2009), and patient self-report scales that were completed a few days before attending the first session (Voice Handicap Index-10: Rosen, Lee, Osborne, Zullo, & Murry, 2004; Reflux Symptoms Index: Belafsky et al., 2002). Additional clinical inferences or observations such as the presence of life stressors, or head or neck tension, were observed and evaluated when possible factors contributing to the ITE students' voice problems were considered. In the first appointment, ITE students were also encouraged to consider goals

relating to their voice to address in the subsequent intervention session. All assessment tasks were pre-approved by the supervising qualified speech pathologist, who also observed the assessment session.

Following the initial appointment, a report was written for each ITE student by the SLP students, outlining assessment findings, including the presence or absence of a voice disorder (dysphonia), and recommendations for speech pathology intervention including but not limited to vocal hygiene, direct voice therapy tasks, and/or recommendation to a medical doctor. The second management session was individually tailored for each ITE student based on their assessment. As part of the second student-led SLP session, SLP students reported assessment results verbally and in a written report to the ITE student. Vocal hygiene advice and direct voice therapy tasks were selected based on individual ITE student needs including education on increasing hydration, reducing vocal load, use of amplification, abdomino-diaphragmatic breathing or vocal strategies such as semi-occluded vocal tract training aimed to optimize voice function. If there was concern about vocal pathology based on the SLP assessments, recommendations were made for ITE students to discuss this with their General Practitioner and to consider referral to an otolaryngologist.

2.3. Data collection

A survey was used to address aim one of this study, that being student perceptions of vocal symptoms as determined on two self-report measures. The cross-sectional survey of ITE students comprised an online survey that gathered demographic information and asked participants to complete the Screen6 in the same format as Ohlsson and colleagues (Ohlsson et al., 2009), based on the original form by Simberg, Sala, Laine, and Rönnemaa (2001) and additionally, the Voice Handicap Index-10 (VHI-10) (Rosen, Lee, Osborne, Zullo, & Murry, 2004). The completion of the survey questions required 10–15 min. The Screen6 was used to identify the presence of six self-reported voice symptoms and their frequency from 1: every day, 2: every week, 3: less often, and 4: never, with a lower score representing more frequently experienced voice related symptoms. The VHI-10 (Rosen, Lee, Osborne, Zullo, & Murry, 2004), a short-form version of the VHI-30 with comparable validity, determined student teacher perceptions of their voice handicap across functional, physical and emotional domains. Scores on the VHI-10 range from 0 to 40, with a higher score indicating a greater degree of perceived voice related handicap and a score greater than 11 indicating a potential voice problem based on normative data (Rosen, Lee, Osborne, Zullo, & Murry, 2004). Both the Screen6 and VHI-10 are useful clinically to identify potential voice problems, track changes to the voice over time when readministered, and identify areas for SLP counselling or therapeutic intervention.

ITE students who participated in the voice clinic completed a 15-minute post-clinic online survey that was purposefully developed by two speech-language pathologists employed in academic teaching positions. Firstly, demographic data such as age, year of study and the gender that they identify with was gathered from the ITE students. Demographic data may assist speech-language pathologists and education university departments in understanding the age and levels of experience of those who do and do not experience voice problems during their studies and who perceive benefit from engaging in the SLP student-led clinic. Open-ended questions prompted the ITE students to report voice related difficulties that they were experiencing or that they have experienced since commencing their education degree, as well as their perception of factors that might be contributing to or causing the voice difficulty. Lastly, the survey utilised a combination of yes/no and open-ended questions to explore perceptions of changes in voice-related knowledge or skills due to attending the voice clinic (refer to Appendix A). ITE students were also asked if they felt satisfied with the experience of participating in a SLP-student led voice clinic.

SLP students who consented to participate in the research completed a purposefully developed pre- and post-voice clinic survey (Appendix B) that used 5-point Likert scale (with 1 being no knowledge/no confidence and 5 being very good knowledge/very confident) based on their level of 1) knowledge about the assessment of voice, 2) knowledge about treatment of voice difficulties, 3) confidence in conducting a voice assessment, 4) confidence in treating voice difficulties, 5) delivering vocal care education and 6) teaching vocal techniques, before and again after, the voice clinic. The survey required 15–20 minutes to complete.

2.4. Data analysis

Data from the anonymous surveys were entered into a spreadsheet and analysed using the IBM SPSS 27 Statistics for Windows (IBM Corp., 2020). For aim one, the ITE student participants were described in relation to demographic data. Reported voice related symptoms and perceived voice handicap were determined based on the scoring protocols of the Screen6 (Ohlsson et al., 2009) and VHI-10 (Rosen, Lee, Osborne, Zullo, & Murry, 2004), respectively. Two or more daily/weekly voice related symptoms as reported on the Screen6 was considered indicative of a voice problem (Ohlsson et al., 2009). The presence of a voice related handicap on the VHI was determined based on a score of >11 as per the normative date (Arffa et al., 2011). Data gathered for ITE students who participated in the voice clinic were analysed and reported descriptively (frequency and percentage). Aim two involved collection and conventional content analysis (Kondracki, Wellman, & Amundson, 2002) of open-ended responses from the ITE student survey on items that explored perceptions of participation in the SLP student-led voice clinic. Research aim three was addressed by exploring SLP student pre-post voice clinic perceptions of change through a comparison of self-reported Likert scale ratings for knowledge and confidence, analysed using the Wilcoxon signed-rank test.

3. Results

3.1. Prevalence of voice problems in the ITE student cohort

ITE students who completed the cross-sectional survey ($n = 45$) were enrolled in a full-time Master of Education studies program. The participants' ages ranged from 21 to 53 years, and they were enrolled in either the first or second year of their program. Thirteen (28.9%) of the 45 student teachers were considered to have a voice problem based on the presence of two or more daily/weekly voice-related symptoms on the Screen6 assessment. Difficulties being heard (22.2%, $n = 10$) and needing to clear the throat or to cough (40%, $n = 18$) were the two most frequently reported voice-related symptoms on the Screen6. Eleven (24.4%) of the ITE students scored >11 on the VHI-10, indicating the presence of voice related handicap. Seven of the 13 participants who reported two or more daily/weekly voice related symptoms on the Screen6 also reported experiencing vocal handicap based on a score >11on the VHI-10. Two participants who reported voice related handicap reported experiencing weekly voice-related difficulties on only a single item of the Screen6, that being related to the voice breaking and difficulties being heard respectively. Despite not obtaining a clinically significant voice-handicap score, a further three participants with weekly/daily voice-related symptoms selected 'sometimes' on a number of VHI-10 items (VHI-10 scores between 8 and 9) indicating at least some degree of voice related restriction. Responses for the

Table 1
Perceived voice-related handicap reported by ITE students ($n = 45$).

Voice Handicap Index-10 items	Always or almost always % (n)	Sometimes % (n)	Almost never or never % (n)
My voice makes it difficult for people to hear me.	2.2 (1)	35.6 (16)	62.2 (28)
People have difficulty understanding me in a noisy room.	13.3 (6)	46.7 (21)	40.0 (18)
My voice difficulties restrict personal and social life.	–	8.9 (4)	91.1 (41)
I feel left out of conversations because of my voice.	–	20.0 (9)	80.0 (36)
My voice problem causes me to lose income.	–	4.5 (2)	95.5 (43)
I feel as though I have to strain to produce voice.	6.7 (3)	20.0 (9)	73.3 (33)
The clarity of my voice is unpredictable.	–	31.1 (14)	68.9 (31)
My voice problem upsets me.	2.2 (1)	6.7 (3)	91.1 (41)
My voice makes me feel handicapped.	2.2 (1)	2.2 (1)	95.6 (43)
People ask, "What is wrong with your voice?"	–	2.2 (1)	97.8 (44)

Table 2
Self-reported voice symptoms on the Screen6 by ITE students ($n = 45$).

	Every day or every week % (n)	Less often % (n)	Never % (n)
Does your voice become strained or tired?	17.7 (8)	46.7 (21)	35.6 (16)
Does your voice become low or hoarse?	11.1 (5)	53.6 (25)	33.3 (15)
Does your voice break?	11.1 (5)	37.8 (17)	51.1 (23)
Do you have difficulties in being heard?	22.2 (10)	42.2 (19)	35.6 (16)
Do you need to clear your throat or to cough?	40.0 (18)	22.2 (10)	37.8 (17)
Do you have a sensation of pain or lump in the throat?	13.3 (6)	40.0 (18)	46.7 (21)

VHI-10 and the Screen6 are summarised in Tables 1 and 2, respectively.

Forty per cent ($n = 18$) of the ITE students reported experiencing voice difficulties since commencing their education degree. Content analysis of the open-ended survey question of "Have you experienced difficulties with your voice since commencing your education degree? Please describe what you experienced and what you think might have been the cause." revealed that these voice difficulties were attributed to an increased amount of time talking ($n = 6$) (*"I sometimes have a very tired voice at the end of a day if it requires a lot of talking"*), the need to use a louder voice than habitual intensity and other vocal demands ($n = 4$) (*"When on prac I noticed that my throat was sore when I was taking several classes and was raising my voice to be heard"*), managing vocal demands following illness ($n = 4$) (*"Every time I got a cold my voice will be damaged and I will not be able to speak at all for several days"*). Further, feeling as though vocal demands of teaching were unsuited to their personality ($n = 3$) (*"I am naturally softly spoken, I have an introvert nature"*), a lack of understanding of vocal techniques ($n = 2$) (*"I have to take someone else's word for on whether or not I can project. My mentor says I just need to speak louder"*), and environmental factors such as a high level of background noise ($n = 2$) (*"I find it difficult to be heard over students engaged in group work"*).

3.2. ITE student perceptions about the SLP student-led voice clinic

ITE students who participated in the SLP student-led voice clinic ($n = 18$) were enrolled in both the Bachelor of Education and Master of Teaching degrees, ranging from 19 to 49 years old. Of the 18 students, 13 consented to participate in the research and completed the post-clinic survey, representing a 72% response rate. Increasing voice-carrying capacity, improving vocal quality, reducing vocal fatigue and curiosity about voice were reported reasons that motivated the ITE students to participate in the voice clinic. All ITE students reported a perceived increased understanding of voice production following the voice clinic, although data surrounding this was not evaluated prior to their participation in the clinic. Content analysis of open-ended responses about perceived knowledge and skills that were gained were grouped into three categories representing the most frequent responses (Refer to Table 3). ITE students reported a better understanding of voice production (100%, $n = 13$), reported an appreciation for the value of voice care strategies (46%, $n = 6$) and perceived that they had gained vocal techniques (54%, $n = 7$) after attendance. Of the skills most useful for the future, ITE students perceived vocal warmups and exercises (54%, $n = 7$), and vocal technique advice (76.9%, $n = 10$) as skills that they will continue to use.

When asked what the best aspect of the voice clinic was, ITE students indicated it was the student-clinic environment (38.4%, $n = 5$) (*"I really enjoyed the friendly environment of the voice clinic, whilst it was informative, it was nice to also feel comfortable within the space"*) and learning about voice production (30.7%, $n = 4$) (*"The best aspect was the in depth yet simple explanations that I could understand"*). A range of other factors were also mentioned, including the professional attitude of the SLP students (*"I was surprised by the extensive knowledge of the students"*), receiving a voice assessment report (*"I appreciated the assessment report and professional advice"*), and developing a new way of thinking about voice production (*"I didn't realise I spoke from the back of my throat"*).

3.3. Speech-language pathology student outcomes

Survey data was collected from participating SLP students before ($n = 26$) and after ($n = 22$) participating in the voice clinic, representing 74% and 63% response rates, respectively. SLP students reported an increase in overall confidence in delivering services to adult clients with voice problems from an initial 53.8% ($n = 14$) to 86.4% ($n = 19$) following completion of the voice clinic. Refer to Fig. 1 for a summary of SLP student-reported confidence about assessment of and intervention for voice problems pre- and post-participation in the voice clinic.

A Wilcoxon signed-rank test determined that there was a statistically significant increase in SLP student self-reported knowledge about voice assessment ($z = -2.592$, $p = .010$) and treatment ($z = -2.368$, $p = .018$) after completing the clinic (refer to Table 4). Despite a significant positive change in self-perceived levels of

Table 3
ITE student ($n = 13$) perceptions of increased knowledge and skills gained from attending the Voice Clinic.

Category frequency in analysed data % (n)	Example quotations from ITE student survey responses
Knowledge of voice production 100 (13)	• I was surprised to learn about some of the things that can affect the voice and how our voices work in general. • The ladies (SLP students) helped me to understand exactly what was happening and why, making me conscious of different aspects of the voice. The handouts were especially helpful. • Learning about the different studies on impacts of vocal damage for teachers and the implications this has not only on a daily professional practice but also for potential interruptions of career longevity.
The value of voice care 46 (5)	• Warming up the voice appropriately and resting my voice after school and overall awareness of vocal health. • Thinking about my posture, speaking more slowly, and breathing from the diaphragm rather than using the upper body muscles to get a fuller voice. • I am going to drink more water … resting my voice for deliberate periods of time can help it.
Gaining new vocal techniques 54 (7)	• I learned that I am able to hold a sound within my range for three times longer than when I try to hold a higher pitch. Speaking in my normal range is more efficient. • Strategies to minimise voice strain like the yawn sigh and how to use it as a daily technique. • I didn't realise I spoke from the back of my throat instead of bringing my voice to the front of my mouth as I was taught.

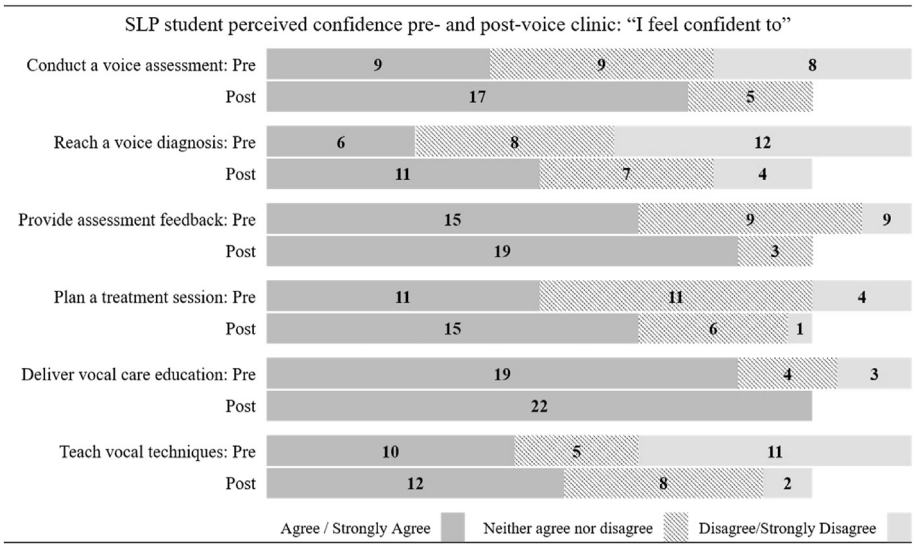

Fig. 1. SLP-student perceived confidence pre- ($n = 26$) and post-voice clinic ($n = 22$).

Table 4
SLP student perceived knowledge about voice disorders pre-post voice clinic.

	Pre-voice clinic $n = 26$	Post-voice clinic $n = 22$	Wilcoxon Signed Rank test
Knowledge about:	Median[a] (range)	Median (range)	Z, p
The assessment of voice disorders	2 (1–4)	3 (2–5)	2.592, .010[b]
The treatment of voice disorders	2 (1–4)	3 (2–5)	−2.368, .018[b]

[a] A higher median reflects greater knowledge.
[b] Statistically significant change.

knowledge, only 45% of participants indicated that, following the clinic, they had good or very good knowledge about assessment of and intervention for voice problems, respectively.

4. Discussion

The findings reported in this study lends support to individualised voice-related programs for ITE teachers, where even a brief intervention can have positive outcomes. The results confirm that ITE students are an at-risk population for developing voice problems during their tertiary education. Based on student perception, this may especially be attributable to increased vocal loading during their professional placement experience. Of the ITE students surveyed in this study, 28.9% experienced two or more voice symptoms weekly or more often as reported on the Screen6 and 25% of student teachers ($n = 11$) presented with perceived voice related handicap as indicated on the VHI-10. These results are in line with the upper range of voice difficulty prevalence that has been reported in the literature for student teachers (Greve et al., 2019; Ohlsson et al., 2019; Simberg et al., 2004) and further highlight the need for early education and intervention, preferably before commencing employment as a teacher.

The presence of voice symptoms and perceived voice handicap in more than a quarter of the ITE students in this study highlights the significant occupational risks for student teachers. As suggested in the literature (Greve et al., 2019; Ohlsson et al., 2009), the Screen6 and VHI may identify different voice symptoms and restrictions to valued roles and activities due to the presence of a self-

reported voice problem and the combination of both tools is considered beneficial for screening purposes (Greve et al., 2019). The use of screening tools may serve to benefit the identification of at-risk ITE students and demonstrate to tertiary institutions the prevalence of voice problems amongst this cohort, supporting the need for training to prevent or diminish future occupational voice problems. Routine screening and provision of education and training on vocal use, including online delivered teaching and or therapy, could be incorporated into other aspects of university programs where there are known high incidences of voice problems such as in support of academic teaching staff (Besser et al., 2020; Korn et al., 2015).

The provision of vocal education and voice use strategies for ITE students is noted as necessary in the literature, however, this is often not a core element of teacher preparation at university for the profession (de Jong et al., 2006; Greve et al., 2019; Orr et al., 2002). As previously noted, an array of therapeutic approaches has been reported in the literature about ITE students. Nanjundeswaran et al. (2012) found that even rapid, individually delivered voice education may serve to reduce the risk of injury in teachers' voices adequately. Findings from the current study highlight positive outcomes for ITE students who attended the SLP student-led voice clinic. ITE students indicated that they appreciated theoretical and practical tools to guide their voice use and that a voice clinic delivered by SLP students facilitated a positive experience.

SLP student outcomes related to knowledge and confidence demonstrate that the delivery of one assessment, one intervention session, and observation of two other sessions can increase SLP student perceptions about their knowledge and confidence in providing voice-related services to student teachers. The individualised management plans meant that SLP students had varied experiences in the types and number of vocal techniques they taught. It is possible that the 45% of SLP students who reported very high levels of confidence after the voice clinic had the opportunity to implement a greater variety of vocal techniques. Clinical experiences with voice clients obtained during clinical placements have been identified as essential to improving newly graduated speech-language pathologists' ability and interest in working with voice (Teten et al., 2016; Tillard, 2011). To ensure that graduate speech-language pathologists can not only meet professional competency but graduate with a high degree of confidence in their clinical skills with voice clients, exposure to a diversity of client presentations is warranted. Clinical education models that utilise standardised patients, as outlined by Rumbach et al. (2021), exclusively or in conjunction with patient care are beneficial to provide SLP students with various clinical experiences in the area of adult voice.

Universities that offer both Education and SLP programs have an opportunity to consider the untapped potential for partnerships found in student-led and student-attended voice clinics that target the specific needs of ITE student during their program. Clear and concurrent benefits to the ITE and SLP students are noted, including the educational and clinical components, addressing a concurrent need in tertiary education (Franca, 2015; Simberg et al., 2004; Teten et al., 2016). There is precedence for the utilization of students to deliver healthcare related services. Evaluation of student-delivered allied health services, including speech pathology services, has demonstrated high levels of patient satisfaction with the delivery of sessions and the outcomes achieved (Forbes & Nolan, 2018; Pershey & Reese, 2003; Sokkar et al., 2019).

5. Limitations and future directions

Several limitations should be noted. The cross-sectional survey distributed amongst student teachers was completed by Master (post-graduate) level students only ($n = 45$), whereas the voice clinic participants were both Bachelor (undergraduate) and Master level. It could be argued that given possible inherent age differences between these student groups, a different level of 'vocal preparedness' or varied vocal physiologies may be present, depending on participants' mean age range and vocational experience. It could also be argued that student teachers experiencing vocal difficulties were more inclined to complete the cross-sectional survey and request to participate in the voice clinic, which may have skewed the results.

Variable findings have been reported in the literature about the long-term effect of education and vocal technique training delivered in a brief intervention, compared to a more intensive and prolonged training program on vocal health (Richter et al., 2016; Timmermans et al., 2011). A limitation of the current study is that no long-term follow-up was conducted to determine if the brief participation in an SLP student-led voice clinic was associated with awareness of voice production and voice production techniques in the student teachers in the future. An evaluation of the long-term outcomes of an SLP student-led clinic utilising a brief management model should be a future research direction. Findings would support a review of the optimal delivery method and dose of voice sessions delivered by SLP students to teaching students. A comparison of face-to-face and online delivery and influence on voice production technique, posture and ergonomics, use of technology such as amplification and environmental factors would provide more explicit guidance on the nature of the education and training that would support ITE students for both teaching formats. Furthermore, ITE students' actual knowledge about voice and voice production and objective acoustic measurements of voice would be valuable pre-post outcome measures in future studies. A further limitation to the findings was that the ITE and SLP student perceptions about the voice clinic were obtained from surveys that were not pilot tested and purposefully developed to meet the needs of the study. The usefulness of the surveys in different contexts can therefore not be extrapolated.

Lastly, the utility of online delivered services within a SLP student delivered voice clinic for ITE students should be explored. Traditionally, voice related services have been delivered in person during one-on-one sessions. A growing body of literature demonstrates efficacy of telerehabilitation-based service delivery models in speech pathology (Adams et al., 2020; Rangarathnam et al., 2015). The flexibility that online delivered services offer potential clients improves ease of access to services, especially when taking time away from work (or study) is challenging and further provides a solution to COVID-19-related restrictions around physical attendance. Online delivered SLP voice services offer an additional opportunity to develop vocal technique that is uniquely suited for sustained periods of online teaching, thus supporting sustained and flexible options for teaching in the future.

6. Conclusion

This study affirms the benefits of a student-led clinic for both SLP and ITE students during their university studies. There is benefit for ITE students, as they receive direct attention to vocal care in teacher preparation, and for SLP students, as they are provided with clinical training opportunities in this area of practice. Early education and training in voice for ITE students may reduce immediate and long-term difficulties experienced by this at-risk population and address the need for intervention prior to developing a vocal injury. ITE students perceived benefit in attending a student-led voice clinic and obtained skills and tools relevant to their practice as occupational voice users. The opportunity for SLP students to work with voice clients during their training may boost confidence, improve clinical skills and assist in meeting necessary

competencies. The opportunity to partner with established university departments such as ITE may serve to enhance the learning opportunities across both speech-language pathology and education degree programs.

Disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors report no conflict of interest.

Data availability

The authors do not have permission to share data.

Appendix A

ITE students: Post voice clinic survey questions.

1. Which School of Education and Professional Studies degree are you enrolled in?
2. What is your year of study?
3. What is your age?
4. Have you experienced difficulties with your voice since commencing your education degree? Please describe what you experienced and what you think might have been the cause.
5. What did you expect from the voice clinic?
6. Do you feel you understand your voice better since attending the voice clinic?
7. What knowledge and skills from the voice clinic will you use in the future?
8. What was the best aspect of the voice clinic for you?
9. Were there any negative aspects?

Appendix B

SLP student survey.

We are interested in determining your confidence and perceptions about your skills in managing adult clients with voice issues. Please complete the following questions by selecting an option from the dropdown menus or rating scales.

To what extent do you agree with the following statements about your confidence in working with voice clients? (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree). I feel confident in my ability to …

1. Establish rapport with a voice client
2. Conduct a voice assessment
3. Identify and classify different voice behaviours
4. Reach a voice diagnosis
5. Write a voice assessment report
6. Provide feedback to clients about their voice status
7. Plan a treatment session
8. Deliver vocal care education to voice clients
9. Model and teach vocal techniques to clients

Please complete the following questions by indicating your level of knowledge in the following areas: (no knowledge at all, some knowledge, quite a bit of knowledge, good knowledge, very good knowledge).

1. The assessment of voice disorders
2. The treatment of voice disorders
3. The impact that vocal dysfunction has on a person
4. The team working with voice disorders

Please respond to the following questions.

1. What did you learn from the Voice Clinic experience? Consider the knowledge and skills that you think you would use in your future work as a speech pathologist.
2. What was the best aspect of the Voice Clinic?
3. What where the negative aspects to the Voice Clinic?
4. What was the most surprising aspect of the Voice Clinic?

References

Adams, J. L., Myers, T. L., Waddell, E. M., Spear, K. L., & Schneider, R. B. (2020). Telemedicine: A valuable tool in neurodegenerative diseases. *Current Geriatrics Reports, 9*(2), 72–81. https://doi.org/10.1007/s13670-020-00311-z

Akinbode, R., Lam, K. B. H., Ayres, J. G., & Sadhra, S. (2014). Voice disorders in Nigerian primary school teachers. *Occupational Medicine, 64*(5), 382–386. https://doi.org/10.1093/occmed/kqu052

Alarfaj, A., Alyahya, K., Alutaibi, H., Alarfaj, M., & Alhussain, F. (2022). The effect of online teaching on vocal health among Saudi teachers during COVID-19 pandemic. *Journal of Voice*. https://doi.org/10.1016/j.jvoice.2022.04.006

American Speech-Language-Hearing Association. (2022). Using masks for in- person service delivery during the COVID-19 pandemic. February, 16) *What to consider* https://www.asha.org/practice/using-masks-for-in-person-service-delivery-during-covid-19-what-to-consider/.

Arffa, R. E., Krishna, P., Gartner-Schmidt, J., & Rosen, C. A. (2011). Normative values for the voice handicap index-10. *Journal of Voice, 26*(4), 462–465. https://doi.org/10.1016/j.jvoice.2011.04.006

Australian Institute for Teaching and School Leadership. (2017). Australian professional standards for teachers. https://www.aitsl.edu.au/standards.

Belafsky, P. C., Postma, G. N., & Koufman, J. A. (2002). Validity and reliability of the reflux symptom index (RSI). *Journal of Voice, 16*(2), 274–277. https://doi.org/10.1016/S0892-1997(02)00097-8

Besser, A., Lotem, S., & Zeigler-Hill, V. (2020). Psychological stress and vocal symptoms among university professors in Israel: Implications of the shift to online synchronous teaching during the COVID-19 pandemic. *Journal of Voice, e9–291*. https://doi.org/10.1016/j.jvoice.2020.05.028. e16.

Briggs, L., & Fronek, P. (2020). Student experiences and perceptions of participation in student-led health clinics: A systematic review. *Journal of Social Work Education, 56*(2), 238–259. https://doi.org/10.1080/10437797.2019.1656575

Colton, R. H., Casper, J. K., & Leonard, R. (2011). *Understanding voice problems : A physiological perspective for diagnosis and treatment* (4th ed.). Wolters Kluwer Health.

Community Affairs References Committee. (2014). *An inquiry into the prevalence of different types of speech, language and communication disorders and speech pathology services in Australia*. Commonwealth of Australia. Submission 223).

Devadas, U., Bellur, R., & Maruthy, S. (2017). Prevalence and risk factors of voice-problems among primary school teachers in India. *Journal of Voice, 31*(1), 117-e1. https://doi.org/10.1016/j.jvoice.2016.03.006

Fairfield, C., & Richards, B. (2007). Reported voice difficulties in student teachers: A questionnaire survey. *British Journal of Educational Studies, 55*(4), 409–425. https://doi.org/10.1111/j.1467-8527.2007.00387.x

Forbes, R., Beckman, E., Tower, M., Mandrusiak, A., Mitchell, L. K., Sexton, C. T., Cunningham, B., & Lewis, P. A. (2021). Interprofessional, student-led community health clinic: Expanding service provision and clinical education capacity. *Australian Health Review, 45*(2), 255–260. https://doi.org/10.1071/AH20021

Forbes, D. R., & Nolan, D. (2018). Factors associated with patient-satisfaction in student- led physiotherapy clinics: A qualitative study. *Physiotherapy Theory and Practice, 34*(9), 705–713. https://doi.org/10.1080/09593985.2018.1423592

Franca, M. C. (2013). A comparison of vocal demands with vocal performance among classroom student teachers. *Journal of Communication Disorders, 46*(1), 111–123. https://doi.org/10.1016/j.jcomdis.2012.11.001

Furnas, D. W., & Wingate, J. M. (2022). The effects of mask wearing on reported health of educators. *Journal of Voice*. https://doi.org/10.1016/j.jvoice.2022.04.011 (in press).

Gama, R., Castro, M. E., van Lith-Bijl, J. T., & Desuter, G. (2021). *Does the wearing of masks change voice and speech parameters?* (pp. 1–8) European Archives of Oto-Rhino-Laryngology.

Giannini, S. P., & Ferreira, L. P. (2012). Voice disorders related to job stress in teaching: A case-control study. *Cadernos de Saúde Pública, 28*(11), 2115–2124. https://doi.org/10.1590/s0102-311x2012001100011

Greve, K., Bryn, E. K., & Simberg, S. (2019). Voice disorders and impact of voice handicap in Norwegian student teachers. *Journal of Voice, 33*(4), 445–452. https://doi.org/10.1016/j.jvoice.2018.01.019

Gustafsson, L., Hutchinson, L., Theodoros, D., Williams, K., Copley, A., Fagan, A., &

Desha, L. (2016). Healthcare students' experiences of an interprofessional, student-led neuro-rehabilitation community-based clinic. *Journal of Interprofessional Care, 30*(2), 259–261.
IBM Corp. (2020). *IBM SPSS Statistics for Windows*. IBM Corp. Version 27.0.
Itzchakov, G., & Grau, J. (2022). High-quality listening in the age of COVID-19: A key to better dyadic communication for more effective organizations. *Organizational Dynamics, 51*(2), 1–7. https://doi.org/10.1016/j.orgdyn.2020.100820
de Jong, F. I. C. R. S., Kooijman, P. G., Thomas, G., Huinck, W. J., Graamans, K., & Schutte, H. K. (2006). Epidemiology of voice problems in Dutch teachers. *Folia Phoniatrica et Logopaedica, 58*(3), 186–198. https://doi.org/10.1159/000091732
Kempster, G. B., Gerratt, B. R., Verdolini Abbott, K., Barkmeier-Kraemer, J., & Hillman, R. E. (2009). Consensus auditory-perceptual evaluation of voice: Development of a standardised clinical protocol. *American Journal of Speech-Language Pathology, 18*(2), 124. https://doi:10.1044/1058-0360(2008/08-0017.
Kondracki, N. L., Wellman, N. S., & Amundson, D. R. (2002). Content analysis: Review of methods and their applications in nutrition education. *Journal of Nutrition Education and Behavior, 34*(4), 224–230. https://doi.org/10.1016/S1499-4046(06)60097-3
Korn, G. P., de Lima Pontes, A. A., Abranches, D., & de Lima Pontes, P. A. (2015). Hoarseness and risk factors in university teachers. *Journal of Voice, 29*(4), 518-e21. https://doi.org/10.1016/j.jvoice.2014.09.008
Kovacic, G. (2005). Voice education in teacher training: An investigation into the knowledge about the voice and voice care in teacher-training students. *Journal of Education for Teaching, 31*(2), 87–97. https://doi.org/10.1080/02607470500127178
Leão, S. H. D. S., Oates, J. M., Purdy, S. C., Scott, D., & Morton, R. P. (2015). Voice problems in New Zealand teachers: A national survey. *Journal of Voice, 29*(5). https://doi.org/10.1016/j.jvoice.2014.11.004. 645-e1.
Lu, D., Wen, B., Yang, H., Chen, F., Liu, J., Xu, Y., … Wang, H. (2017). A comparative study of the VHI-10 and the V-RQOL for quality of life among Chinese teachers with and without voice disorders. *Journal of Voice, 31*(4), 509-e1. https://doi.org/10.1016/j.jvoice.2016.10.025
Meulenbroek, L. F., Thomas, G., Kooijman, P. G., & de Jong, F. I. (2010). Bio-psychosocial impact of the voice in relation to the psychological features in female student teachers. *Journal of Psychosomatic Research, 68*(4), 379–384. https://doi.org/10.1016/j.jpsychores.2009.10.002
Moy, F. M., Hoe, V. C. W., Hairi, N. N., Chu, A. H. Y., Bulgiba, A., & Koh, D. (2015). Determinants and effects of voice disorders among secondary school teachers in peninsular Malaysia using a validated Malay version of VHI-10. *PLoS One, 10*(11), Article e0141963. https://doi.org/10.1371/journal.pone.0141963
Nanjundeswaran, C., Li, N. Y., Chan, K. M., Wong, R. K., Yiu, E. M. L., & Verdolini-Abbott, K. (2012). Preliminary data on prevention and treatment of voice problems in student teachers. *Journal of Voice, 26*(6), 816-e1. https://doi.org/10.1016/j.jvoice.2012.04.008
Nemr, K., Simões-Zenari, M., Almeida, V. C. D., Martins, G. A., & Saito, I. T. (2021). COVID-19 and the teacher's voice: Self-perception and contributions of speech therapy to voice and communication during the pandemic. *Clinics, 76*, Article e2641. https://doi.org/10.6061/clinics/2021/e2641
Ohlsson, A. C., Andersson, E. M., Södersten, M., Simberg, S., & Barregård, L. (2012). Prevalence of voice symptoms and risk factors in teacher students. *Journal of Voice, 26*(5), 629–634. https://doi.org/10.1016/j.jvoice.2011.11.002
Ohlsson, A. C., Andersson, E. M., Södersten, M., Simberg, S., Claesson, S., & Barregård, L. (2016). Voice disorders in teacher students—a prospective study and a randomized controlled trial. *Journal of Voice, 30*(6), 755-e13. https://doi.org/10.1016/j.jvoice.2015.09.004
Ohlsson, A. C., Demitz-Helin, G., Furu, A. C., Hällgren, I., & Karjalainen, S. (2019). Potential risk factors and prevalence of voice symptoms in students starting their teacher education. *Journal of Voice, 35*(2), 323-e1. https://doi.org/10.1016/j.jvoice.2019.08.008
Orr, R., Jong, F.d., & Cranen, B. (2002). Some objective measures indicative of perceived voice robustness in student teachers. *Logopedics Phoniatrics Vocology, 27*(3), 106–117. https://doi.org/10.1080/140154302760834831
Patjas, M., Vertanen-Greis, H., Pietarinen, P., & Geneid, A. (2021). Voice symptoms in teachers during distance teaching: A survey during the COVID-19 pandemic in Finland. *European Archives of Oto-Rhino-Laryngology, 278*(11), 4383–4390. https://doi.org/10.1007/s00405-021-06960-w
Pershey, M. G., & Reese, S. (2003). Consumer satisfaction with speech-language pathology services in university clinics: Implications for student supervision. *The Clinical Supervisor, 21*(2), 185–205. https://doi.org/10.1300/J001v21n02_12
Phyland, D., & Miles, A. (2019). Occupational voice is a work in progress: Active risk management, habilitation and rehabilitation. *Current Opinion in Otolaryngology & Head and Neck Surgery, 27*(6), 439–447.
Rangarathnam, B., McCullough, G. H., Pickett, H., Zraick, R. I., Tulunay-Ugur, O., & McCullough, K. C. (2015). Telepractice versus in-person delivery of voice therapy for primary muscle tension dysphonia. *American Journal of Speech-Language Pathology, 24*(3), 386–399. https://doi.org/10.1044/2015_ajslp-14-0017
Richter, B., Nusseck, M., Spahn, C., & Echternach, M. (2016). Effectiveness of a voice training program for student teachers on vocal health. *Journal of Voice, 30*(4), 452–459. https://doi.org/10.1016/j.jvoice.2015.05.005
Rosen, C., Lee, A. S., Osborne, J., Zullo, T., & Murry, T. (2004). Development and validation of the voice handicap index-10. *The Laryngoscope, 114*(9), 1549–1556. https://doi.org/10.1097/00005537-200409000-00009.
Roy, N., Merrill, R. M., Thibeault, S., Parsa, R. A., Gray, S. D., & Smith, E. M. (2004). Prevalence of voice disorders in teachers and the general population. *Journal of Speech, Language, and Hearing Research, 47*(2), 281–293. https://doi.org/10.1044/1092-4388(2004/023
Rumbach, A. F., Dallaston, K., & Hill, A. E. (2021). Student perceptions of factors that influence clinical competency in voice. *International Journal of Speech Language Pathology, 23*(2), 124–134. https://doi.org/10.1080/17549507.2020.1737733
Shekaraiah, S., & Suresh, K. (2021). Effect of face mask on voice production during COVID-19 pandemic: A systematic review. *Journal of Voice, S0892–1997*(21), Article 00327. https://doi.org/10.1016/j.jvoice.2021.09.027, 1.
Simberg, S., Laine, A., Sala, E., & Rönnemaa, A. M. (2000). Prevalence of voice disorders among future teachers. *Journal of Voice, 14*(2), 231–235. https://doi.org/10.1016/S0892-1997(00)80030-2
Simberg, S., Sala, E., Laine, A., & Rönnemaa, A. M. (2001). A fast and easy screening method for voice disorders among teacher students. *Logopedics Phoniatrics Vocology, 26*(1), 10–16. https://doi.org/10.1080/14015430119481
Simberg, S., Sala, E., & Rönnemaa, A. M. (2004). A comparison of the prevalence of vocal symptoms among teacher students and other university students. *Journal of Voice, 18*(3), 363–368. https://doi.org/10.1016/j.jvoice.2003.12.005
Sokkar, C., Penman, M., Raymond, J., & McAllister, L. (2019). An evaluation of client satisfaction with student-delivered speech-language pathology services in private practice. *Journal of Clinical Practice in Speech Pathology, 21*(2), 19–23.
Speech Pathology Australia. (2005). *Position Statement Clinical Education: The importance and value for the speech pathology profession*. The Speech Pathology Association of Australia, 2005 https://www.speechpathologyaustralia.org.au/.
Sresuganthi, J. R., Nallamuthu, A., & Boominathan, P. (2022). Comparison of client-led asynchronous and clinician-led synchronous online methods for evaluation of subjective vocal measures in teachers: A feasibility study. *Journal of Voice*. https://doi.org/10.1016/j.jvoice.2022.04.015
Teten, A. W., DeVeney, S. L., & Friehe, M. J. (2016). Use of student perceptions to measure voice disorders course impact on learning. *Journal of Curriculum, Teaching, Learning and Leadership in Education, 1*(1), 10. https://digitalcommons.unomaha.edu/ctlle/vol1/iss1/10.
Thomas, G., de Jong, F. I., Cremers, C. W., & Kooijman, P. G. (2006). Prevalence of voice complaints, risk factors and impact of voice problems in female student teachers. *Folia Phoniatrica et Logopaedica, 58*(2), 65–84. https://doi.org/10.1159/000089609
Thomas, G., Kooijman, P. G. C., Cremers, C. W. R. J., & De Jong, F. I. C. R. S. (2006). A comparative study of voice complaints and risk factors for voice complaints in female student teachers and practicing teachers early in their career. *European Archives of Oto- Rhino-Laryngology and Head & Neck, 263*(4), 370–380. https://doi.org/10.1007/s00405-005-1010-6
Thomas, G., Kooijman, P. G., Donders, A. R. T., Cremers, C. W., & de Jong, F. I. (2007). The voice handicap of student-teachers and risk factors perceived to have a negative influence on the voice. *Journal of Voice, 21*(3), 325–336. https://doi.org/10.1016/j.jvoice.2005.12.003
Tillard, G. (2011). Perceptions of the clinical competence of new speech-language pathology graduates in New Zealand: A research note. *The Open Rehabilitation Journal, 4*(1), 23–27. https://doi.org/10.2174/1874943701104010023
Timmermans, B., Coveliers, Y., Meeus, W., Vandenabeele, F., Van Looy, L., & Wuyts, F. L. (2011). The effect of a short voice training program in future teachers. *Journal of Voice, 25*, 191–198. https://doi.org/10.1016/j.jvoice.2010.04.005
Tracy, L. F., Segina, R. K., Cadiz, M. D., & Stepp, C. E. (2020). The impact of communication modality on voice production. *Journal of Speech, Language, and Hearing Research, 63*(9), 2913–2920. https://doi.org/10.1044/2020_JSLHR-20-00161
Ure, C., Gough, A., & Newton, R. (2009). *Practicum Partnerships: Exploring models of practicum organisation in teacher education for a standards-based profession*. Australian Learning and Teaching Council. http://apo.org.au/files/Resource/altc_practicum-partnerships_electronic.pdf.
Van Houtte, E., Claeys, S., Wuyts, F., & Van Lierde, K. (2011). The impact of voice disorders among teachers: Vocal complaints, treatment-seeking behavior, knowledge of vocal care, and voice-related absenteeism. *Journal of Voice, 25*(5), 570–575. https://doi.org/10.1016/j.jvoice.2010.04.008
Van Lierde, K. M., Claeys, S., Dhaeseleer, E., Deley, S., Derde, K., Herregods, I., … Wuyts, F. (2010). The vocal quality in female student teachers during the 3 years of study. *Journal of Voice, 24*(5), 599–605. https://doi.org/10.1016/j.jvoice.2009.01.004
Vertanen-Greis, H., Loyttyniemi, E., Uitti, J., Putus, T., et al. (2020). Work ability of teachers associated with voice disorders, stress, and the indoor environment: A questionnaire study in Finland. *Journal of Voice, S0892–1997*. https://doi.org/10.1016/j.jvoice.2020.09.022, 20)30366-0.
World Health Organization. (2010). *Framework for action on interprofessional education and collaborative practice*. Geneva: World Health Organization. http://apps.who.int/iris/handle/10665/70185.